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My journey through the history of development economics

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WIDER Working Paper 2018/138

My journey through the history of development economics

Erik Thorbecke*

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Abstract: This paper is essentially autobiographical and describes Erik Thorbecke's journey through the history of development economics between the 1950s and the present. The paper consists of four parts. First, an introduction reviews briefly his professional career as a development economist and his research interactions with major contributors to the discipline. The next three parts review critically his contributions to research on and training in, respectively, (i) the ongoing process of African development; (ii) income distribution, inequality, and poverty; and (iii) economic structure, interdependence, and quantitative development analysis.

Keywords: development doctrine, inequality, poverty, Africa, economic structure, Erik Thorbecke
JEL classification: B31, B40, C54, O10

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1 Introduction

I recently completed a ‘History of the Evolution of the Development Economics Doctrine: 1950–2017’ (Thorbecke 2017). It occurred to me that recalling and describing my own journey through the evolution of development economics could be of some interest for the following reasons. First, my professional career, starting in the 1950s, overlapped almost completely with the period covering the lifetime of development economics. Second, I am fortunate enough to have known personally and often collaborated with giants in the field, and third, I thought that by reviewing some of my modest contributions to development economics and my interaction with some of the major contributors, I could hopefully enliven the narrative around the history of development economics through personal anecdotes. Finally, there might be some lessons (not always positive) that younger researchers might learn from my story.

In this introduction, I will attempt to review, briefly and selectively, my professional career and some of the more influential interactions that I enjoyed with major contributors and innovators in the domain of development. Many of these interactions led to collaborative research projects that have shaped my career.

A disclaimer is in order at the outset. In any semi-autobiographical account, humility is called for, and I have tried hard to be as modest as I can, realizing perhaps better than anyone else the limitations of my own contributions. I may not always have been successful and I beg your indulgence for any possible failure and lack of modesty.

Over the course of my career, my research interests evolved. The progression was usually chronological but I often would revisit and embrace earlier themes and combine them with new ones. I must confess that my natural curiosity and impatience has led me to work simultaneously on research projects in different fields,¹ as the brief review in the next subsection will attest. I would get bored of focusing on only one specific issue as I felt diminishing returns set in, and would embark on a new topic, to later often return to earlier subjects that I had temporarily abandoned. In retrospect, I can see a number of issues and concepts that have guided my research methodology and my choice of research themes. In a sense these issues and concepts, such as *inequality*, *poverty*, *structure*, *interdependence*, and *globalization*, are the threads of a canvas reflecting my modest contributions to development economics.

In the next subsection I highlight briefly (and in the form of vignettes) some of my interactions with distinguished economists I am fortunate to have met and a number of collaborative projects that I was involved in with different development institutions. In some instances I try to enliven the text with personal anecdotes and the idiosyncrasies of some of those economists.

Following this introduction I discuss in separate sections and in greater detail my research contributions in each of the following different, but interrelated, research themes: (i) African development; (ii) income distribution, inequality, and poverty; (iii) economic structure, interdependence, and quantitative economic development analysis; (iv) patterns of world trade, integration, and globalization; (v) the role of agriculture in economic development and structural transformation; (vi) employment and basic needs; and (vii) the role of institutions in economic

¹ I would not recommend this model to young researchers. Concentrating on one specialized topic, in almost myopic fashion, is almost required today to gain tenure. The downside of this strategy is that it narrows the domain of competence and interest of young scholars.

development. The sequence in which I address these themes is not chronological and perhaps even follows a somewhat reverse chronological order. I suspect that that by unrolling the film of my life backwards, I understood better the progression of research themes and topics that I have adopted.

Finally, the reader should be aware that in this paper that I prepared for the UNU-WIDER conference, I cover only the first three of the themes mentioned above. My intention is ultimately to complete covering the remaining themes and, hopefully, produce a little booklet of my lifelong journey.

1.1 Brief review of influential experiences and collaborations

As an undergraduate, I studied at the Netherland School of Economics (1947–50). At that time the faculty included some distinguished members. I took courses in statistics from Jan Tinbergen (the first Economics Prize Nobel laureate). Johan Witteveen (who became managing director of the International Monetary Fund and later a minister of finance) taught me monetary economics and Koyk (famous for his theory of distributed lags) taught microeconomics. While I did not realize it at the time, Tinbergen was to have a seminal influence on my approach to economics, as I elaborate upon in Section 4. After I had immigrated to the USA and started my career, on some of the occasions I went back to the Netherlands he would invite me to his office for brief conversations. He was one of the most courteous, civilized, and disciplined people I ever met. We would sit around a small table and right in the middle of the table was a timer. It seems to me that when I visited him the timer was set for 20 minutes. Invariably, when the timer went off he would stand up, escort me out, and thank me for my visit.² Twice, he invited me for lunch at his home in The Hague. These were formal occasions with only Mrs Tinbergen present and the warm lunch served by their old maid attired in black with a white lace apron. As a budding and timid young economist I was clearly intimidated and my contribution to the conversation must have left something to be desired. Subsequently, I learned from my Dutch colleagues that such invitations were a signal honour. Later on I was glad to serve with Tinbergen as a member of the Steering Committee of the International Labour Organization's World Employment Programme on Income Distribution.

I received my PhD from the University of California in 1957, after spending five years at Berkeley. At that time the qualitative (liberal arts) approach to economics was dominant within the Department of Economics. For a couple of years, I was a research assistant to Professor J.B. Condliffe, who had previously been a professor at the London School of Economics and was the author of a major volume, *The Commerce of Nations*. He supervised my dissertation on 'The Tendency towards Regionalization in International Trade 1929–56'.³ Yet, I was also attracted by a more quantitative approach and I enjoyed the few opportunities available, such as Robert Dorfman's course in statistics and Andreas Papandreou's course on set theory. Irma Adelman was a classmate; we became close personal and lifetime friends and later collaborated on a variety of research topics, including co-editing what was likely one of the first textbooks in development economics (Adelman and Thorbecke 1966). I was also influenced by Harvey Leibenstein. I found him truly creative and I interacted with him throughout his life, including on X-efficiency.

In 1961, I was invited to a conference at Southern Methodist University and gave a paper on 'Welfare Implications of European Economic Integration'. Gottfried Haberler, who was in the

² I have wondered whether the time set on the timer depended on how distinguished the visitor was.

³ An expanded version of the dissertation was published as a book by Martinus Nijhoff (The Hague) in 1960.

audience, was very complimentary and invited me to present a paper at the annual meeting of the American Economic Association (AEA), of which he was the president. Hence my first published paper appeared in the *American Economic Review* (Thorbecke 1963). This occasion, combined with the research I undertook in writing my dissertation, launched my lifelong interest in the pattern of world trade and globalization—a theme I will discuss in the forthcoming extended version of this paper.

My first job as an assistant professor was at Iowa State University (ISU). I arrived there in 1957 when the memories of a distinguished past history were still vivid. Theodore Schultz and Leo Hurwicz (two subsequent Nobel laureates) had resigned, together with other colleagues from the Department of Economics and Agricultural Economics, over an issue of principle involving a bulletin claiming that margarine was as good as butter. The Iowa dairy industry, whose interests were threatened, put so much pressure on the president of ISU that he denied publication of that bulletin. The department was in rebuilding mode after Karl Fox took over as director, yet still included distinguished members such as Gerhard Tintner, one of the founding members of the Econometric Society, and Earl Heady, arguably the dominant agricultural economist of his generation. Karl was an excellent quantitative economist and a strong admirer of Tinbergen. He took me under his wing as a beginning assistant professor, and my collaboration with him was invaluable in improving my knowledge of statistics and econometrics. Karl and I initiated a project on ‘Quantitative Economic Policy with Application to Development’, funded by the Ford Foundation. This project led, among other things, to a graduate workshop where I had to do all the lecturing, with Karl only engaged in answering questions and writing a book (Fox et al. 1966 and 1973). This research collaboration was instrumental in opening up what was to become a lifetime interest in economic structure, interdependence, and quantitative economic development policy—one of my major research themes, which is discussed in Section 4.

In the first half of the 1960s, I was deeply involved in a large-scale programme of research and training on agrarian reforms and economic development in Peru under a grant to ISU from the Alliance for Progress. I acted as an adviser to the National Planning Institute in Lima and worked on the income distribution between the coastal region, characterized by very large commercial farms producing sugar and cotton, and the Sierra (Altiplano), dominated by small to minuscule subsistence farms. The extremely uneven land and income distribution and the enormous contrast between the luxurious standard of living of the white elite and the subsistence existence of the indigenous Indian ‘campesinos’ convinced me to become a development economist and led me to devote much of my energy to a new research theme of income distribution, inequality, and poverty, covered in Section 3.

During the 1960s Peru went through a growth spell almost fully propelled by exports. Together with a graduate student, I built a very simple and, by today’s standards, naive model where exports (as an exogenous variable) influenced growth (as an endogenous variable). The model relied on multiplier analysis (Condos and Thorbecke 1966). During my tenure at the National Planning Institute, Robert Mundell⁴ (a future Nobel laureate) and David Meiselman, who were both on the Economics faculty at the University of Chicago at that time, visited Lima as members of a team of experts sponsored by the International Monetary Fund (IMF). During some of our many briefing sessions, they became critical of my use of multiplier analysis and felt strongly that a monetarist approach would be much more appropriate and effective in stimulating growth. I believe it is fair to say that in the 1960s most development economists focused on the ‘real

⁴ Robert Mundell was a famous for one-upmanship, as the following anecdote reveals. I had invited him to the Lima Cricket and Tennis Club and after a few drinks he got bored and found somebody to play chess with. As I offered to get the chessboard from the bartender, he said ‘Who needs a chessboard? Of course, I expect to play blindfold chess.’

economy' and knew little about, or even dismissed, the impact of monetary tools in development. Mundel and Meiselman tried to convince me that by varying the supply of money the Central Bank could affect GNP through Fisher's famous equation of exchange, $MV = PT$, revitalized by Milton Friedman and the Chicago School. By increasing the money supply (M) and assuming the velocity of circulation of money (V) constant and some excess capacity in the economy, GNP (T) would rise without (or with minor) inflation (P). My first reaction was that I doubted that V had remained constant over time in Peru.

They put me to the test and I derived V by dividing PT by M using the Peruvian official statistics on GNP and the price level and money supply over the preceding decade, and to my consternation I found out that V had remained absolutely constant each year of that period. I had been defeated, and it was only later that I learned from the chief economist at the Central Bank that this latter, in the absence of reliable national income accounts, estimated GNP by multiplying M in any given year by an *assumed constant* V . This was one of my first lessons about reverse causality.

In the second half of the 1960s I worked for and closely with Hollis Chenery and Gustav Ranis after they became, in turn, chief economists at the US Agency for International Development (USAID).⁵ At that time the large group of economists at USAID was considered to be the best in Washington. One of the main instruments available to USAID was programme and sector lending which was used to influence recipient countries to spend more on education and health and other measures reducing income inequality and poverty.⁶ We were very conscious that any 'take-off into sustained growth' (Rostow 1956) required not only a boost in investment but also some redistribution of income. This led to the concept of growth with redistribution that is described in Section 3.

One of the signal achievements of USAID in the mid-1960s was the building of a large research capacity in development economics under the guidance of the leading scholars of the time, especially Chenery and Ranis. To attract top PhD students the institution ran a summer research programme to showcase the research opportunities available to such students upon completion of their degrees.⁷ This effort provided a major impetus to the evolution of development economics.

After Robert McNamara became president of the World Bank (WB) in 1967, he realized that this latter totally lacked any research capability. He immediately decided to build such a capacity within the WB.⁸ Given how successful the USAID research programme was, Chenery was contacted to provide advice. He would take me along to talk to WB staff and explain how this research capacity had been built at USAID and its operational usefulness in designing growth strategies in recipient countries. Shortly thereafter, McNamara decided to establish a Development Research Centre (DRC) at the WB. I had a small role in the subsequent success of the DRC. A friend of mine, Louis Goreux, who had just joined the WB from the Food and Agriculture Organization (FAO), was named acting director. As he was not familiar with the US market for economists and was

⁵ I served as chief of the Sector and Market Analysis Division, Office of Program Coordination, USAID (1966–67), on a leave of absence from Iowa State University.

⁶ I remember playing tennis very early in the morning with Walter Rostow, who was much more awake than me and would excuse himself as he was being picked up by a White House limousine with his favourite expression: 'I have to see how the world is doing.'

⁷ Although I do not have an exact count, my recollection is that about two dozen economists worked in the Office of Program Coordination on development issues.

⁸ McNamara hired Guy Orcutt (a distinguished econometrician and system analyst) as a consultant to advise him on how to build a research capability at the WB. Orcutt's report made a compelling case for such a capacity.

given twenty-five slots to fill, he asked me to suggest names of young, promising economists whom he could try to hire.⁹ The rich research environment which evolved within the DRC propelled the careers of a number of distinguished economists and politicians, including Montek Ahluwalia and Kemal Derviş. A combination of events—especially the budgetary cutbacks following the Vietnam War, Chenery moving to the WB as chief economist, and McNamara’s objective of creating a strong research group—led to a mass exodus of economists from USAID to the WB.

In the first half of the 1970s, I was directly involved with the launching of the International Labour Organization’s World Employment Programme and participated in some of the ‘High Level Country Missions’. I spent almost two years at the ILO’s headquarter in Geneva, where I met Graham Pyatt, who introduced me to the concept and methodology of the social accounting matrix (SAM). It was a revelation to me, as it provided a framework for capturing and combining two fundamental concepts close to my heart: (i) the socioeconomic structure and interdependence of an economy and (ii) the mapping from the pattern of production to the income distribution by socioeconomic household groups. In the mid-1980s under a large grant from the Dutch Aid Agency to the Institute of Social Studies in The Hague and Cornell, I helped to direct a long-term programme of research and technical assistance with the Central Bureau of Statistics in Indonesia to build a SAM, which was institutionalized and became one of the most elaborate and disaggregated SAMs in the world. These contributions, among others, are discussed in Section 4, ‘Economic structure, interdependence, and quantitative development analysis’.

During my stint working at the ILO on world employment issues, I was particularly taken by a new concept of ‘basic needs’ that was being developed as part of a rich research agenda. This novel approach greatly broadened and enriched the unidimensional concept of monetary poverty. It helped reveal the multidimensional nature of poverty and the fact that individuals and households could be deprived in one or multiple basic needs. The World Bank proceeded to adopt this concept and promote its use under the leadership of Paul Streeten and Shahid Burki. This is about the time (the mid-1970s) that I first met Paul Streeten. I was immediately attracted by his charming personality. He is one of the most cultured and polite individuals I have ever met. He was born in Austria in 1917¹⁰ and even though he was too young to have been part of the famous ‘Vienna Circle’, he was clearly influenced by it. Just in time, he escaped the Nazi regime and emigrated to England and later to the USA. Paul founded *World Development* and invited me to be a member of his editorial board. He would often consult me and ask my advice on issues related to *World Development*. I still cherish the many wonderful occasions we shared together. He made me appreciate the richness of economics and how it fitted within the broad cultural fabric of our civilization.

After I joined Cornell in 1974, I collaborated with Walter Galenson and contributed a chapter on agricultural development to a volume on Taiwan’s economic development which also involved, as contributors, Simon Kuznets and Ian Little, among others (Galenson 1979). I remember fondly a working meeting in Kuznets’ old-fashioned study. Subsequently, Henry Wan and I organized a major conference on Taiwan to highlight the roles of market and government in its successful development experience and the lessons that could be learned from it by other developing countries (Thorbecke and Wan 1999). For a number of years I directed the Program on Comparative Economic Development and interacted closely with many colleagues, especially Kaushik Basu, Gary Fields, Ravi Kanbur, David Sahn, Jan Švejnar, and Henry Wan.

⁹ I remember spending many long evenings around a tasty dinner he had prepared, discussing possible candidates.

¹⁰ In 2017 Paul celebrated his hundredth birthday.

In the late 1970s, I was invited by Harris Mule (one of the lions among African civil servants) to write a report on ‘Employment, Basic Needs and Poverty in Kenya’. This was the beginning of and trigger for my interest in poverty analysis and measurement. The survey of rural smallholders in Kenya provided the opportunity for Joel Greer and me to analyse poverty in Kenya, and subsequently, with the help of James Foster, to come up with the FGT (Foster-Greer-Thorbecke) class of decomposable poverty measures. These measures and, more generally, my interest and work on income distribution, inequality, and poverty are discussed in Section 3.

Between 1980 and 2000, I was closely engaged with the OECD Development Centre, first under a project involving Monty Yudelman and Ian Little on employment issues in the developing world and subsequently with Christian Morrisson, François Bourguignon, and Jaime de Melo on macro-micro computable general equilibrium (CGE) modelling of the process of growth with equity—which today would be referred to as inclusive growth. While building a CGE model of Indonesia with a number of collaborators under the auspices of this project, I interacted with Alain de Janvry and Betty Sadoulet (who were building a similar model of Ecuador) on methodological issues.

Over the last twenty-five years I have devoted much of my energy to furthering development in Africa—a continent plagued by massive poverty and stagnation, at least until the beginning of this new millennium. I worked very closely with the African Economic Research Consortium (AERC), where I was instrumental in establishing a strong training and research programme on poverty analysis and measurement. Section 2 is devoted to my activities on research, training, and technical assistance related to African development.

In the late 1990s I started collaborating with Finn Tarp (Development Economics Research Group) and organized a number of modular courses for the Nordic Development Association. In the mid-2000s, I co-directed, with Machiko Nissanke, a major project on globalization and the world’s poor under the auspices of UNU-WIDER that yielded multiple books and articles and helped enlighten the differential impact of globalization on the poor in Asia, Latin America, and Africa. This project, among many others, will be reviewed in the forthcoming booklet which will be an extended version of this paper.

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2 African development

2.1 Socioeconomic development performance: 1960 to the present

The history of the economic performance of Africa, and more particularly sub-Saharan Africa (SSA), in the four decades preceding the new millennium is dismal and sad. Real per capita GDP around 2000 was only marginally above its level in 1960.¹¹ The contrast with other developing regions is remarkable. This same measure increased about seven times in East Asia, rose two and a half times in South Asia, and doubled in Latin America (based on World Development Indicators). With the exception of a very few outliers such as Botswana and a few other countries that went through temporary and short-lived growth spells, most of the SSA region was mired in stagnation, with its development blocked by a maze of micro and macro poverty traps. The incidence of monetary poverty kept climbing, and progress in human development indicators was stalled. In short the majority of households lived an existence characterized by deprivation.

For a long time, comparative development analysts were at a loss to explain rigorously the underlying causes of African stagnation and were using a so-called 'African dummy' in their cross-sectional analyses, implying that being an SSA country translated into poor economic performance.

In retrospect, the use of an African dummy was a mark of ignorance that was later unveiled by a number of rigorous studies by social scientists. In essence, scholars now seem to agree that the growth stagnation in much of the SSA region before the new millennium was not due to some intrinsic feature specific to Africa but mainly a result of a poor choice of policies (Englebert 2000: 1822; Easterly and Levine 1997¹²). Easterly and Levine (1997: 1, 9, and table 2), for example, found that much of the growth gap with East Asia could be accounted for by poor public policies leading to, for example, low school attainment, poorly developed financial systems, large government deficits, inadequate infrastructure, and political instability.¹³

The period around the new millennium marked a major (some have called it a dramatic) shift in the regime and pattern of growth in SSA, characterized by a quantum leap in the pace of growth,¹⁴ a significant reduction in poverty, substantial improvement in human development indicators, and

¹¹ Ndulu et al. (2008), in their magisterial historical study of economic growth in SSA, estimated that real per capita GDP (population weighted) grew at a minuscule 0.13 per cent annually between 1960 and 2000. When the World Bank brought out a document entitled *Can Africa Claim the 21st Century?* in 2000, most observers were most sceptical (World Bank 2000).

¹² Easterly and Levine (1997: 1) concluded that 'Although an enormous literature points to a diverse set of potential causes of SSA's ills, existing work does not explain ... why so many public policies went so badly wrong in Africa'.

¹³ For a more elaborate discussion of the correlates of stagnation in SSA before 2000 and the 'African dummy' see Thorbecke and Ouyang (2017a).

¹⁴ Most SSA countries had an annual rate of per capita GDP growth of close to 3 per cent between 2000 and 2015.

a more inclusive structure of growth. Factors that appear to have contributed to the new growth regime have been analysed in some detail and can be summarized as follows:

The endogenous factors—in the sense that they are at least partially influenced by the development strategies adopted by SSA governments—include (i) a more friendly policy environment for agriculture that triggered a healthier structural transformation and (ii) other more inclusive (democratic) economic and political institutions that improved the quality of governance. The exogenous factors—in the sense that they are largely beyond the control of individual African states—include (i) rising global commodity prices, and (ii) a rapid increase in Foreign Direct Investment (FDI) inflows from both the developed economies and the emerging markets. (Thorbecke and Ouyang 2017b)

The recent deceleration of growth in SSA is a cause for concern. While there are signs that Africa is starting to catch up, the sustainability of this process will be contingent on the continuation of appropriate policies and institutions, and a greater integration within Africa and between it and the global economy.

2.2 Contributions to the development doctrine influenced by the initial African conditions

The African setting and structure provided a ripe domain of investigation for development researchers. Many important (and even fundamental) contributions to the field of development were influenced directly or indirectly by the prevailing African conditions and were often conceived by researchers who had spent some time in Africa. In some instances, findings originating from research on existing conditions in other parts of the developing world (such as dual economy models) seem to apply even better to the anatomy and physiology of Africa. Ironically W.A. Lewis, who visited and wrote a report for the future economic development of Ghana (Gold Coast) in the early 1950s, argued that unlike India, Ghana did not exhibit surplus labour.¹⁵ Hence he recommended measures to encourage more labour to move into agriculture and raise agricultural productivity (Kanbur 2017).

Next, I provide some brief and selective examples of some of these contributions.¹⁶ First, the Harris-Todaro model (1970) explaining rural-to-urban migration (or, alternatively by extension, the migration from agriculture to non-agriculture, or from the informal to the formal sector) was conceived while the authors were visiting the Institute for Development Studies (IDS) in Nairobi. They observed the continuous movement from the country to fast-growing shanty towns and slums in the suburbs and the low and falling marginal productivity of labour in subsistence agriculture, and came up with an explanation for this process.¹⁷

A second fundamental contribution was that of Stiglitz's efficiency wage theory. It is remarkable that in his Nobel Lecture, Stiglitz credits his visits to Kenya as having provided the impetus for this contribution, as the following quote makes clear:

¹⁵ Clearly the structure of Ghana at that time was atypical of that prevailing in most SSA countries.

¹⁶ I am well aware that the nine examples that I describe next are only a subsample of a much larger set.

¹⁷ It is noteworthy that the Harris-Todaro model, which appeared in the *American Economic Review* (AER), was selected as one of the top twenty papers ever published in the AER during its first 100 years of existence.

My first visits to the developing world in 1967, and a more extensive stay in Kenya in 1969, made an indelible impression on me. Models of perfect markets, as badly flawed as they might seem for Europe or America, seemed truly inappropriate for these countries. (Stiglitz 2001: 473).

A third contribution was the much better understanding of the role and operation of the informal sector highlighted by the World Employment Mission of the ILO after its extended visit to Kenya.¹⁸ Even though the informal sector concept had a long history and had been clothed in different forms, such as Gandhi's emphasis on traditional cottage industries, it became revitalized in a more general and formal sense in the ILO Kenya report (International Labour Organization 1973). The main and novel message of that report and subsequent studies was that the informal sector was relatively efficient and dynamic, and often strongly discriminated against because of market imperfections or inappropriate national or municipal regulations. Under this new conception, informal activities, instead of being considered unproductive and reprehensible, represented an important potential source of output, employment, and learning growth. Unfortunately, in too many instances municipal governments do not design and implement nurturing measures that could make the informal sector more productive and provide a platform for workers to move into more formal activities.¹⁹

A closely related contribution is that of Gary Fields' segmented labour markets; Fields also credits his stay in Kenya for inspiring him to develop this concept. For many commodities in the developing world (such as furniture, car repair, and food), an informal labour market using rudimentary traditional technologies operates next to a formal market relying on modern technologies. These dual markets are generally unconnected, and the formal worker earns a high wage premium for comparable jobs.

A fourth example is the seminal work of Robert Bates (1981) demonstrating the systematic discrimination against agricultural smallholders by the urban elites and politicians in SSA. Among other instruments, marketing boards—which had a monopoly on exports—were used to tax small-scale agriculture to benefit other sectors. In many respects, the exploitation of subsistence agriculture and the urban bias were stronger in Africa than in any other developing region. It is clear that prior to 2000, the neglect of and failure to nurture small-scale agriculture was the Achilles heel of African development progress.

Fifth, the characteristic production structure prevailing in much of SSA provided the impetus for early research on 'enclave economies'. Oil and mining exploitation in many SSA countries contribute significantly to GDP but have only marginal linkages to the rest of the economy. The power of the multinational corporations running these operations has often led to extractive economic and political institutions.

Sixth, a concept closely related to enclaves within economies, is the resource curse implying that countries with more natural resources paradoxically perform worse. The stylized facts characterizing the African subcontinent have been fertile grounds for innumerable studies of the

¹⁸ The head of the large mission was Dudley Seers, who at that time was the director of the Institute of Development Studies at Sussex and also served as the chief economist of the UK Department for Development Assistance. I interacted closely with him on a number of occasions, including during a small mission to encourage President Pastrana of Colombia to adopt some of the recommendations generated by the ILO World Employment Programme and particularly not to discriminate against the informal sector.

¹⁹ For an extensive discussion of the functioning of the informal sector over time in Ghana, see Aryeetey and Kanbur (2017).

corruptive impact of being well endowed in natural resources. Ndulu et al. (2008) found that the resource curse accounted for a large and significant part of the growth gap between Africa and other developing regions between 1960 and 2000. Recently, Africa has been subjected to two new forms of resource curse—both largely influenced by China’s almost insatiable thirst for natural resources: (i) the pollution and destruction of the environment which is endemic to meeting that demand; and (ii) some concern that the exploitation contracts between African governments and China, while beneficial in the short run, could prove costly in the long run by depriving the subcontinent of its stock of natural resources.

Seventh, many Africa experts have identified the lack of property rights as a major obstacle to agricultural growth and rural poverty reduction. According to *The Economist* (2016):

More than two-thirds of Africa’s land is still under customary tenure, with rights to land rooted in communities and typically neither written down nor legally recognised. In 31 of Africa’s 54 countries, less than 5% of rural land is privately owned. So giving peasants title to their land seems like an obvious first step towards easing African rural poverty.

Acemoglu and Robinson (2012) build a strong case that the highly successful growth performance of Botswana was greatly helped by a coalition in favour of secure property rights who owned the major assets in the economy, i.e. cattle, at the time of independence. Even though land was held communally, cattle was privately owned. In a broader sense the same authors attribute the African growth stagnation until recently to extractive institutions created under the colonial powers.

Eighth, in the light of my slightly contentious interaction with Paul Collier (described in the next subsection), it would be particularly unfair on my part to overlook his seminal contribution to post-conflict economics and the policies needed by countries undergoing social and political conflicts to escape ‘conflict traps’. Unfortunately, many of the characteristic initial conditions of SSA countries—such as artificial boundaries, ethnic fragmentation, resource curse, poor governance, and weak institutions—made them vulnerable to conflicts. Collier argued that aid and external peace-keeping could play an important role in helping the post-conflict recovery and in preventing the recurrence of conflict (see, among others, Collier et al. 2008).

Finally, the Foster-Greer-Thorbecke (FGT) class of poverty measures was conceived in Kenya and first tested on the basis of a survey of smallholders conducted under the auspices of the Kenyan Statistical Office. The history of the birth of the FGT measures is discussed in detail in Section 3.

2.3 My personal journey through the history of African development

In 1994 I was invited by the OECD Development Centre to a conference and experts’ meeting on ‘What Future for Africa?’ I presented a paper co-authored with S. Koné on ‘The Impact of Stabilization and Structural Adjustment Programs on Performance in Sub-Saharan Africa’ (Thorbecke and Koné 1995). We argued that a case could be made for a balanced combination of two very different approaches to adjustment: the hard-nosed conditionality approach endorsed by the World Bank and IMF at that time, and the kinder ‘adjustment with a human face’ strategy promoted by UNICEF.

Paul Collier was the discussant of this paper and proceeded to attack the premise that the latter had anything to offer except to encourage a continuation of the disastrous policies of African governments that had led to both serious and unsustainable external (balance of payments) and internal (budget deficit) disequilibria. As I remember (or, hopefully, misremember) it, Paul

proceeded to question my competence in evaluating African development issues—reminding the audience that although I had made some contributions to the field of development in my younger days, my capacity to do so at my advanced age of sixty-five had become weaker. I confess that I was hurt by this personal attack—yet, in retrospect, I have to admit that at the time my knowledge of Africa left much to be desired. In my reply to Paul’s comments, I mentioned that I had just experienced a cold shower as bad as those that I had to endure as a young boarding school pupil every morning after rising under the supervision of a cruel headmaster.²⁰

My involvement with African development issues prior to that conference was indeed limited. I had been involved with some research projects in Kenya on ‘A Basic Needs Strategy for Kenya’ together with an ILO team, and in a report with Eric Crawford on income distribution, poverty alleviation, and basic needs, in the late 1970s, at the request of Harris Mule,²¹ the permanent secretary of the Ministry of Finance and Planning. As there was no information available on monetary poverty, we had to rely on a survey of food intake, defining poor households as those whose food consumption was below the recommended calorific requirements (Crawford and Thorbecke 1980).

This early foray into a better understanding of the Kenyan economy was instrumental in the subsequent work I did jointly with my student Joel Greer on the analysis of poverty and its measurement. As is described in detail in Section 3, the FGT poverty measure was conceived in Kenya and born at Cornell University.

The one other episode worth recalling, in this early period, was my extended visit to Zaire (now the Democratic Republic of the Congo) in the early 1990s. Under the auspices of an USAID grant to Cornell, I tried to establish a network of development research centres. It opened my eyes and introduced me to the worst case of corruption I have ever encountered in my long career, with corruption being rampant and accepted throughout all social and income classes. It taught me the pervasive and pernicious effects of an extreme rent-seeking society (Thorbecke et al. 1994).

After the contentious interaction with Paul Collier and his pointed critique of my shortcomings, I was very surprised that Benno Ndulu,²² one of the conference participants who, at that time, was the executive director of the AERC, invited me to undertake a major evaluation of the research output of the AERC. I decided to accept his invitation. I spent almost four months in Nairobi and in Ithaca interviewing AERC researchers and reviewing research documents produced under the auspices of AERC. It is still somewhat of a mystery why Benno would have entrusted me with this important task after the earlier debacle described above. As you will see, it changed my life and in the last twenty-five years I have become a *bona fide* African development expert.

My evaluation of the AERC research programme (Thorbecke 1996) contained a comprehensive set of recommendations. The most important one was to add a new theme of research covering the interrelated nexus of poverty, employment, labour markets, human capital, and the fiscal role of government with reference to human resources. At that time, and since its creation in 1988, the major role of the AERC was to analyse stabilization and structural adjustment policies (SSAPs) so

²⁰ Later, as I reviewed the session with Jean Claude Berthélemy (the organizer of the conference), he asked me what I had done to Paul to deserve this ‘règlement de comptes’ (score-settling). I was as baffled as he was.

²¹ Harris Mule was singled out as one of the most successful development administrators in Africa in Leonhard (1991).

²² Benno Ndulu had a brilliant career following his term at AERC. He first joined the World Bank, where he became a vice-president, and until very recently was the governor of the Central Bank of Tanzania.

as to better prepare African policymakers in their dialogue and interaction with IMF and World Bank officials. The research orientation was almost exclusively at the macroeconomic level and the hope was that a better understanding of the consequences of conditionality measures inherent to the ‘Washington consensus’ would help African governments to better defend their national interests.

While, this emphasis on SSAPs in the 1990s made eminent sense, what tended to be overlooked was that these policies (such as major reductions in social expenditures to reduce the budget deficit) could have dire effects on the wellbeing of the lower income classes and worsen poverty that was already endemic in the African subcontinent. Based on my report, the AERC Board agreed to add a new thematic research group focused on poverty, and I was asked to become the chairman of this group, which I led until 2015.²³ Over two decades, approximately 300 research projects conducted by African resident scholars were funded and nurtured under the auspices of this new thematic group.

In addition, the AERC embarked on a large-scale collaborative research and training programme on ‘Poverty, Income Distribution and Labor Markets in SSA’, consisting of two phases over the period 1997–2006, generously funded by a group of donors including USAID, the Swedish International Development Cooperation Agency (SIDA), the Danish International Development Agency (DANIDA), and the Ford Foundation. I co-directed the first phase with Ali Ali and the second phase with Germano Mwabu.

Given the reality that, at that time, very few African researchers were familiar with the methodology of poverty analysis, the first task was to educate and train a large core group of African scholars. We organized three 7–10-day workshops in different African venues and enlisted the most distinguished poverty analysts available as trainers.²⁴ These workshops were instrumental in creating a core group of about 150 African economists endowed with the necessary knowledge to explore the various dimensions of poverty in their countries and across SSA.

The collaborative institutions consisted of the universities of Cornell, Copenhagen, Gothenburg, Laval (for the francophone researchers), and to a lesser degree Oxford and the Centre d’Etudes et de Recherches sur le Développement International (CERDI). The poverty project incorporated several capacity-building mechanisms and activities. The most important one was the ‘twinning’ process that supported visits by individual African national country teams to one of the collaborating institutions. Twinning visits gave the opportunity for these teams to improve their skills through close contact with renowned scholars and institutions on methods of analysing poverty, inequality, employment, and the functioning of labour markets. Cornell played a leading role,²⁵ and must have hosted in excess of half a dozen national teams that would spend between

²³ Many distinguished economists served long terms as resource persons in this thematic research group, including Jean-Yves Duclos, Germano Mwabu, Patrick Plane, David Sahn, John Strauss, and Finn Tarp.

²⁴ The three venues of the workshops were Kampala, Cape Town, and Abidjan. The set of trainers included some of the best-known economists who had contributed to the poverty analysis methodology, including Martin Ravallion, Michael Lipton, John Strauss, David Sahn, and Jean-Yves Duclos. Among other things, the African trainees learned about how to manipulate and analyse large survey data sets. David Stifel, who at that time was completing his PhD at Cornell, spent innumerable hours teaching the African researchers how to analyse large surveys and other data sets. He taught them Stata and other software systems and showed them how poverty measures could be used to develop a poverty profile based on the existing surveys.

²⁵ The lead institution at Cornell was the Cornell Food and Nutrition Policy Program, directed by David Sahn. Among the Cornell faculty members who were most active in the twinning process, one should mention Stephen Younger, Ravi Kanbur, Gary Fields, Peter Glick, and Erik Thorbecke.

one and three months in residence—including teams from South Africa, Kenya, Nigeria, Uganda, Cameroon, and Madagascar.²⁶ The total number of national teams (anglophone and francophone) that twinned with the collaborative universities must have been around fifteen.

The intent was that these national teams, after they returned to their countries, would set up a network of institutions analysing the various dimensions of poverty. This objective was achieved in a number of cases and led to what should be considered a major contribution to policy formulation of this AERC project, namely, the direct involvement of many of these country teams in the preparation of poverty reduction strategy papers for their respective governments and for the World Bank.

These teams, in collaboration with counterpart scholars in the twinning institutions, contributed to the poverty nexus literature in the following areas: poverty incidence and measurement (in particular, new approaches to determining and identifying the appropriate poverty line specific to initial conditions prevailing in the different countries); national poverty profiles including the relative importance of the correlates of poverty; inequality and income distribution issues; the operation and functioning of labour markets; and the benefit incidence of public expenditures on education and health (for more details, see Thorbecke and Mwabu 2004).

Finally, in completing this review of my journey through African development, I beg your indulgence in allowing me to very briefly outline my own relatively recent contributions to research focused on Africa. In 2004 Machiko Nissanke and I undertook a large research programme under the auspices of UNU-WIDER, lasting almost eight years, on the impact of globalization on the world's poor. As part of this programme we analysed the impact on Africa (Nissanke and Thorbecke 2008)²⁷ and compared how the various globalization transmission mechanisms affected Africa differently from Asia and Latin America (Nissanke and Thorbecke 2010).

A second area that I concentrated on was the anatomy of growth, and more particularly the growth-inequality-poverty nexus, within the context of SSA (Thorbecke 2013, 2015b, 2017b). A better understanding of the interrelationship among these three variables is crucial to the design of development strategies conducive to a pattern of more inclusive growth with development.²⁸ I have argued, and hope to have made a convincing case, that while economics traditionally focused on the causal link from growth to inequality and poverty, it is critical to examine the reverse impact of poverty on growth. If it can be further confirmed that greater inequality and poverty (beyond a certain level) can dampen future growth through such channels as social and political instability, unproductive rent-seeking activities, and increased insecurity of property rights, then the trade-off between efficiency and equity vanishes (Thorbecke 2007, 2016).

A third issue I researched is whether the African subcontinent is finally starting to catch up, and the extent to which the present growth regime in SSA is becoming more inclusive (Thorbecke 2015a; Thorbecke and Ouyang 2017a). I concluded affirmatively on the basis of a comprehensive quantitative analysis of multiple indicators. Among other things, I explored the structural

²⁶ The first national team that visited Cornell was from South Africa and included two economists who have since become leading African development experts, Haroon Borat and Murray Leibbrandt—a strong testimony to the lasting impact of this AERC collaborative programme.

²⁷ Six case studies by leading African researchers of the impact of globalization on different types of African settings, undertaken under the auspices of this WIDER project, appeared in the April 2008 issue of *African Development Review*.

²⁸ I have benefited much over the years from many interactions and discussions with Augustin Fosu, whom I believe was the first to apply the Bourguignon triangular quantitative relationship between growth, inequality, and poverty to SSA.

transformation in a dozen SSA countries in the post-2000 period and found that it was more in line with the (normal) successful transformation undergone by the East and South-East Asian countries. The recent transformation was also in dire contrast with the flawed structural transformation in the pre-millennium era—often characterized by workers being pushed out of agriculture into even less productive jobs in the informal sector, which has been referred to as a migration of misery. In recent years, there is some evidence that African workers leaving agriculture moved into more productive jobs in other sectors, but with only a few finding employment in manufacturing. If this trend continues, it would suggest that the future African development model will take a very different form from the traditional historical model based on labour-intensive industrialization. Africa may have to find niches in which it has a comparative advantage in the various contemporary and future global value chains.

In the last couple of years, I have also explored whether SSA countries followed the same pattern as Ravallion (2012) found for the full sample of developing countries, namely, that high initial poverty reduced subsequent growth. In contrast, we found econometric evidence—based on a large number of growth spells and panel data both at the international cross-sectional level and inter-regionally within two countries for which we had detailed regional data (Ethiopia and Rwanda)—that the poorest initial countries (regions) grew faster subsequently (Ouyang et al. 2018). One plausible and likely reason for this finding could be that many African governments, as well as public and private aid donors, allocated their aid flows proportionately more towards poorer countries, regions, and segments of the population.

I was deeply touched and humbled when the African Development Institute at Cornell and the African Economic Research Institute (jointly) organized a symposium in my honour on ‘Poverty Reduction in the Course of African Development’ at which a dozen scholars presented papers, and which led to the publication of a festschrift (Nissanke and Ndulo 2017).²⁹ It was with all due humility yet great satisfaction that I read the foreword of that book by Lemma Senbet, the executive director of the AERC, in which he wrote:

Erik Thorbecke’s contributions to the African Economic Research Consortium have been truly transformational. His impact has pervaded all dimensions of the AERC research capacity-building framework—thematic research (learning-by-doing research), collaborative research, policy outreach, and networking—all anchored by the AERC collaborative project on ‘Poverty, Income Distribution and Labour Markets in Sub-Saharan Africa’ led by Erik and a younger generation of African researchers whom he has nurtured.

So perhaps, in conclusion, I should be thankful to by-now Sir Paul Collier for the shock of the previously described cold shower he subjected me to, and the impetus that it gave me to become more thoroughly involved in the African development process and focus much of my energy in the last two decades on helping to build a lasting research capacity in the poorest of all developing regions.

2.4 References: Section 2

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²⁹ I owe an immense debt of gratitude to Muna Ndulo (the director of the Institute of African Development at Cornell) for organizing the symposium in my honour and to Machiko Nissanke, without whose indefatigable energy the volume would not have seen the light of day.

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3 Income distribution, inequality, and poverty

Marx held that politics is determined by economics ... and imagined that what people most desire is to grow rich ... Experience since his time has shown that there is something which people desire even more strongly and that is to keep others poor. (Russell 1951)

... a fair balance. As it is written: ‘The one who had much did not have too much, and the one who had little did not have too little’. (2 Corinthians 8)

3.1 Income distribution and inequality

My first real-life experience with an extremely unequal and racist society occurred when I spent a couple of years in Peru in the early 1960s. President Kennedy had just initiated the Alliance for Progress in 1961—a ten-year plan for Latin America ‘to build a hemisphere where all men can hope for a suitable standard of living and all can live out their lives in dignity and in freedom. To achieve this goal political freedom must accompany material progress.’³⁰

³⁰ President John F. Kennedy (1961), ‘On the Alliance for Progress’.

At that time I was a young associate professor at Iowa State University (ISU), which had just received a very large grant from USAID (under the auspices of the Alliance for Progress) to (i) undertake research on agrarian reforms and economic development and (ii) provide graduate training in economics and agricultural economics to Peruvian students. For the next decade, a resident mission consisting of between half a dozen and a dozen ISU researchers was embedded in different Peruvian development agencies.

At that time in the history of development doctrine, agrarian and land reforms were a major theme of research at leading institutions.³¹ Peru's land tenure system was one of the most unequal in Latin America. In 1958 (i) the Gini coefficient of land distribution was 0.88, (ii) 2 per cent of the landowners controlled 69 per cent of arable land, and (iii) conversely, small farmers holding less than 5 hectares controlled only 6 per cent of arable land (Mother Earth Travel 2013).

The extremely uneven income distribution and endemic poverty characteristic of most Latin American countries was thought to be directly linked to the highly skewed land distribution. In the specific Peruvian setting of that period the contrast was enormous between the coastal region, dominated by large commercial haciendas producing mainly cotton and sugar for exports, and the minuscule subsistence corn and potato plots in the Sierra. It would have been difficult to find a more dualistic setting. Peru's agriculture was a prime example of *latifundia* and *minifundia* operating side by side. In addition to the immense differences in farm size and technology, there were also land tenure issues. Many poor indigenous Indian subsistence farmers did not have clear titles to their land. The enormous inequality, combined with demographic pressures, led to a massive migration from the Sierra to Lima—the outskirts of which became surrounded by *barriadas* (shanty towns).

Under these conditions, it made sense to research whether appropriate land reform could make a contribution not only to reducing inequality and poverty but also to growth. Yet, I felt that a broader development strategy was called for. The first step in helping to design such a strategy was to obtain a better assessment of the state of the income distribution both within and between the three major regions: the Coast, the Sierra, and the Selva. At the time of my stay in Peru the president was Fernando Belaúnde, a professional architect and urban planner who saw the promotion of large physical infrastructure projects as a major instrument of development.³² The lead development agency at that time was the National Planning Institute, which I joined as a junior researcher and adviser.

Given the almost total lack of any income and expenditures (consumption) household surveys, any estimates of income distribution had to rely on rough production data. This simple methodology confirmed the staggering gap between the average income on the Coast and that in the Sierra, as well as the extremely uneven income distribution within the coastal region. The prevailing view among experts and the elite was that the Indian (indigenous) campesinos were lazy and lacked the initiative to improve their wellbeing. This provided a rationale against any attempt at redistribution and, in particular, land reforms. Some of my colleagues and I estimated the costs of a land reform programme that compensated the larger landowners fairly, and we found that a sensible land reform programme was financially feasible but politically utopian.

³¹ Arguably the most important research centre on land reforms in the US, the Land Tenure Center at the University of Wisconsin, was founded in 1962.

³² Among other things, he initiated the central highway connecting the Coast (Lima) to the Sierra and the Selva (inland jungle region).

During my time in Peru I was confronted with the moral conflict of, on the one hand, enjoying the luxurious life of the oligarchy and, on the other, trying to make a convincing case against the wealth inequality that made this lifestyle possible. Many of the Peruvian graduate students funded by the Alliance for Progress programme had taken my course in international trade at ISU and, not surprisingly, came from wealthy and well-connected families. My wife and I would be invited to haciendas and beautiful homes belonging to the parents of these students. During my secondary studies in Switzerland I had read extensively about the Middle Ages in Europe, and the experience of visiting these haciendas reminded me of the lord of the manor uphill and the serfs subsisting in the valleys below. As we climbed the steps of the hills to reach the haciendas, we would typically see campesinos' children in rags and appearing under-nourished, watching us from both sides of the steps—just as I imagine would have been the case in the European Middle Ages. The standard of living of the oligarchs and the luxury of the entertainment surpassed anything else I have experienced during my long life.³³ Even though in a somewhat hypocritical way I enjoyed this lifestyle, I came to the realization that I should and would devote my professional career to changing the unfair conditions that benefited the very few at the expense of the great mass. The shock of the prevailing socioeconomic conditions in Peru in the 1960s is what led me to become a development economist.

In retrospect, the main lesson I learned from the Peru project was the enormous difficulty of achieving a less unequal income distribution through a redistribution of existing assets. This is likely to be true under both right-wing and left-wing regimes. In the former case, the oligarchy possesses both the economic and the political power and wants to maintain the status quo. In the latter case, doctrinaire principles and lack of technical competence get in the way of fair and viable land reform, as was subsequently demonstrated by forced and flawed agrarian reform based on land expropriation instituted by a left-wing junta, which reduced agricultural productivity and sent the economy into a tailspin.

In the mid-1960s, I was invited to join the Office of Program Coordination at USAID for a two-year period. At that time it was widely accepted that the best group of economists in Washington DC worked at USAID. I interacted closely with Gustav Ranis and Hollis Chenery, among others. Our operational interest in income distribution issues stemmed from the fact that, at that time, one of the main instruments of USAID was programme and sector lending. This made it possible to design conditions that the debtor country had to fulfil in order to be eligible for a programme loan (budget and balance of payments support) or a sector loan (principally in education and health). In other words, we could help to design a development strategy that was distributionally sensitive. Hollis Chenery, as chief economist for USAID (on leave from Harvard), had much contact with his British counterpart Dudley Seers (on leave from the Institute of Development Studies at Sussex), as did the respective staffs of these institutions with each other. This fruitful interaction led to the concept of 'redistribution with growth' (RWG).

The strategy underlying RWG originated from a number of country reports of world employment missions under the auspices of the International Labour Organization. The basic idea was simple: the benefits of growth could be shared in such a way that the incomes of the poor increased proportionally more than the incomes of the rich. This would ensure that the income distribution would become less uneven. Later on, this strategy was formalized and further elaborated in Chenery et al. (1979). I still remember vividly the discussions we had about what could be considered a fair and feasible weighting scheme concerning the relative income increases that

³³ Let me give you some anecdotal evidence: some of the Peruvian ladies from the elite would fly to Paris over weekends to buy designer clothes; often the table settings consisted of high-grade silver or gold; at one of the many parties we attended as guests we met a Miss Universe.

different deciles of the income pyramid should be receiving. We were searching (in vain?) for an optimal income distribution and were well aware that a degree of inequality was essential in a capitalist or mixed economy to provide the necessary incentives to reward innovators.

Subsequent contributions clarified the crucial importance of human and health capital, especially at an early age, in reducing income inequality. In a more general sense the principal root cause of income inequality is the vast differences in the set of opportunities available to different individuals.

3.2 Poverty

My Peruvian experience and subsequent professional trips to Africa, Asia, and Latin America sensitized me to the human cost and suffering resulting from and inherent to poverty. Although I realized intuitively that poverty alleviation needed to be at the heart of development, I had not given much thought to how to measure it. It was only after I was invited by Harris Mule (the permanent secretary of the Treasury and Planning Ministry in Kenya) to write a White Paper on basic needs and poverty that I was confronted with the fundamental necessity of how to apprehend and measure poverty prior to analysing it. As I mentioned in Section 2, handicapped by the almost total absence of information on poverty, Eric Crawford and I used a crude food poverty line based on the recommended daily calorific requirements. From a survey of smallholders, constituting about 80 per cent of the total Kenyan population, we obtained the calorific consumption per adult equivalent of all households in the sample and defined the poor as those whose calorific consumption fell below the food poverty line (Crawford and Thorbecke 1980). The survey had been carried out by the Central Bureau of Statistics (CBS) in the mid-1970s and contained an impressive variety of socioeconomic and standard-of-living information. The size of the sample was large compared with other surveys conducted in other developing countries at that time. The problem was that the CBS did not have the necessary competence to organize, clean, manipulate, and analyse the wealth of information it had collected. At this juncture, I was invited to undertake this task under an ILO grant.

At that time I was supervising a very bright PhD student, Joel Greer, who was searching for a dissertation topic. Joel, who had a strong mathematics and statistics background, gladly agreed to spend a year at the CBS in Nairobi undertaking the above-mentioned tasks and using the resulting information to measure and analyse food poverty in Kenya. When he returned to the Cornell campus, the main issue we faced was deciding on an appropriate poverty measure. A visit by Amartya Sen to Cornell in 1979 turned out to be an important catalyst in the birth of what ultimately became the FGT measure.³⁴ At that time Sen's poverty measure was arguably the gold standard among alternative poverty measures. One interesting creative moment was when, in one of many discussions with Joel, I objected to the rank-ordering weighting system underlying Sen's measure. The weighting scheme is such that the least poor individual was given a weight of 1, the next poorest a weight of 2, and so on, with the poorest individual assigned a weight of n (assuming

³⁴ I cannot refrain from recalling an embarrassing event that happened to me during Sen's visit to Cornell. We invited Sen for dinner and my wife (normally a good cook) served one of her signature dishes (chicken cut in small pieces and stir-fried with vegetables following a Chinese recipe). When the guests tasted the food I could see horror on their faces. What had happened was that our cleaning lady had used the container my wife used for corn starch and had filled it instead with bicarbonate of soda. Charla quickly removed all the plates and served an alternative dish. Many years later Sen visited Cornell and we invited him again to dinner at our home. I still remember Sen's immediate reaction: 'Can we not go to a restaurant instead?' We probably had forgotten the earlier incident and were shamed into having to relive it. Needless to say, we honoured Sen's request. I felt a certain coolness and reserve in the way Sen interacted with me after the earlier incident, which is quite understandable for somebody who was almost poisoned.

n poor individuals). I felt that this ordering scheme was arbitrary, as an infinite number of different distributions could yield the same rank ordering. Instead, I proposed to use the actual distance from the poverty line as weights. This yielded the squared poverty gap measure (FGT P2), which satisfied most of the important axioms dear to theorists—something I did not realize at the time.

It is not unfair to suggest that the FGT concept (Foster et al. 1984) was conceived in Kenya and born at Cornell. The FGT measure is a class of additively decomposable poverty measures, where the exponent (the poverty-aversion parameter) can take any positive value, including zero. The three most used measures are P0 (the headcount ratio), P1 (the poverty gap), and P2 (the poverty gap square).³⁵ The measures have become the standard for evaluations and measurement of poverty by international organizations, applied researchers, and individual countries.³⁶

The formalization of the FGT concept was the product of different complementary skills and interests. I learned a lot from Joel about large-scale data management and survey analysis, as I did from James Foster (who became a distinguished theorist) about the desirable axioms a poverty measure ought to satisfy. For me (and I presume for my colleagues as well) it was a labour of love. An interesting anecdote is that the initial full-fledged paper with a concrete example and explanatory graphs that was submitted to *Econometrica* was almost turned down by the editor. We were asked to convert it into a short note and given a probability of acceptance of only one-half.³⁷

Twenty-five years after the FGT class of decomposable poverty measures were introduced, the co-authors retrospectively reviewed the contributions that these measures had made to the subsequent literature. Among other contributions, the FGT measures:

are naturally suited for targeting exercises and other policy implementations. They have a central role in the growing statistical literature on stochastic dominance and multidimensional dominance tests. And they have been adapted to measure a host of other phenomena, such as the ‘graying’ of a population, corruption, obesity, the ‘rich’, affordability of low-income housing, food insecurity, and the research productivity of economics departments. (Foster et al., 2010: 492)

An interesting policy application of the FGT measures relates to the issue faced by governments in deciding how to allocate a given budgetary amount so as to minimize poverty. This is the issue I tackled with another of my students (Thorbecke and Berrian 1992). Assuming that targeting is possible, the budgetary decision rules chosen by a government will depend on its degree of poverty aversion. The more a government (or agency) cares about reducing poverty and the more distributionally sensitive it is, the higher the value of the exponent that will be selected. Hence, the FGT measures can be used as a social welfare function in the fight against poverty. A government that is strongly concerned about improving the lot of the poorest individuals while simultaneously reducing income-distribution inequality will choose to minimize P2, whereas another state that wants to reduce the maximum *number* of poor and is not as concerned about a possible worsening of its income distribution will select to minimize P0 (the headcount ratio).

³⁵ At the limit, when the exponent is infinite, this yields the Rawls measure when the full weight is on the poorest of the poor.

³⁶ As of the end of June, 2018, the total number of citations amounted to 6,441, according to Google Scholar. This is likely to greatly underestimate the actual use of FGT, as many authors use it as a generic term without attribution.

³⁷ As an applied development economist I found the note so obtuse and lacking in transparency that I was actually surprised at its acceptance for publication. I still believe that the original paper that appeared as Cornell Department of Economics Working Paper 243 in 1981 was much clearer.

I was very pleased and humbled that the Mexican Constitution of 1999 (chapter V, article 34) adopted FGT P2 as decision rule and specified that central government transfers should be allocated according to the severity of poverty.³⁸ This meant that P2 was used to allocate funds from the federal government in Mexico to regions for educational, health, and nutritional programmes benefiting the poorest households—including at one time the successful social protection scheme *Progresa*. In 2010 the government of Mexico adopted a multidimensional poverty measure based on a variant of the FGT P2 measure that is used in targeting the allocation of social funds to poor households at the municipality level.

As I described in some detail in Section 2, starting in the mid-1990s I collaborated very closely with the AERC and, over the next twenty years, directed well-funded and large-scale research and training programmes on poverty analysis. The outcome of all these efforts has been the institutionalization within Africa of a robust capacity and competence to (i) measure poverty; (ii) analyse the dynamics and proximate causes of poverty; and (iii) design more effective policies to combat poverty.

I also mentioned in Section 2 that a significant part of my research in the last decade has been focused on the anatomy of growth and more especially on understanding better the growth-inequality-poverty nexus and its interrelationships within the context of sub-Saharan Africa.³⁹

The causal chain linking growth to poverty has been thoroughly and critically researched worldwide and is today relatively well understood. This research has given rise to a rich literature on *pro-poor growth*. The main message from this literature is that an inclusive structure of growth, anchored on employment and resulting in a less unequal distribution of opportunities and income, would not only reduce poverty but also set the stage for an acceleration of future growth.

The reverse causal chain from poverty reduction to lower inequality and more inclusive growth has been long ignored if not rejected on the untested premise that any poverty-reducing measure could not also be productive. An early study (Perry et al. 2006) made a case for a *pro-growth poverty-reduction strategy* on the grounds that there are multiple channels through which the existence of poverty acts as a major obstacle to growth. Examples of such channels and poverty traps are that poor people (i) have limited access to credit and financial markets, which seals them off from potentially profitable and productive investment opportunities; (ii) often suffer from ill health and malnutrition that affects their productivity; and (iii) attend low-quality schools that constrain their human capital.

The underlying logic of pro-growth poverty reduction is that by focusing on poverty directly and reducing it, some major constraints on the behaviour of the poor will be removed. Poor households will be better able to keep their children in school, acquire more education and skills, borrow and invest in their farms and informal activities, and afford to adopt riskier but more productive technologies such as high-yielding seed varieties in small-scale agriculture. The difference between the latter strategy and the more conventional pro-poor growth strategy is that the trigger or intervention point is directly focused on reducing poverty. Policies and institutions—such as social protection schemes helping poor households acquire human capital and rural

³⁸ Alain de Janvry and Elisabeth Sadoulet prepared an extended video/PowerPoint demonstration entitled ‘Erik Thorbecke, the Alchemist of the Poor’ which they presented at the conference honouring my retirement from Cornell in 2003. The video is still accessible through the internet and is hilarious in describing my capacity for the alchemy of turning poverty into gold, and its possible dire consequences for Mexico or any other country daring or foolish enough to adopt my recommendations.

³⁹ The next three paragraphs are taken directly from Thorbecke (2014).

infrastructure projects of the ‘food for work’ variety—can facilitate rural-to-urban migration. They do so by providing poor potential migrants with additional skills and by reducing the transaction costs of moving. Such schemes can engender a virtuous spiral, generating a faster and more inclusive growth pattern that, in turn, reduces the inequality of opportunities and income and propels further rounds of poverty alleviation and inclusive growth.⁴⁰

On the other hand, the trigger point of a policy or institutional intervention under the pro-poor growth strategy would be focused more directly on altering the structure of growth, such by creating as a more inclusive pattern of government investment.

In order to make a convincing case in support of the validity and feasibility of a pro-growth poverty reduction strategy, two key questions need to be affirmatively answered. First, is there evidence that a high incidence of poverty in a given setting presents an obstacle to subsequent growth? Second, are there realistic measures, institutions, and projects that can contribute to growth by reducing poverty? I believe that I made a case that both of these questions could be answered affirmatively in Thorbecke (2014). While much more research is needed to further validate a development strategy based on pro-growth poverty reduction, I feel reasonably confident that it is both technically sound and feasible.

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⁴⁰ See Thorbecke (2014) for a detailed description of the mechanisms underlying the operation of this virtuous spiral.

4 Economic structure, interdependence, and quantitative development analysis

4.1 Quantitative economic policy and economic structure

In my introduction I mentioned the seminal influence that Tinbergen had on my approach to economics. I started reading his books on quantitative economic policies as Karl Fox and I initiated a research project and a workshop on the same topic. Tinbergen saw the economy as an interdependent structure and socioeconomic system. Its structural and behavioural relations could be captured through appropriate equations. In this sense he introduced some of the tools of physics into economics. In this connection, it is relevant to recall that his doctoral degree was in physics. His thesis supervisor and mentor was Paul Ehrenfest, a famous physicist and close friend of Einstein and Bohr⁴¹ who, among other things, was interested in developing mathematical theories in economics. This interest was stimulated by his notion that there should be an analogy between thermodynamics and economic processes.

I have already discussed in the introduction the research Karl Fox, Jati Sengupta, and I undertook on quantitative economic policy, which culminated in a well-received book that went through two editions. The Tinbergen approach which we adopted distinguished different types of variables in an economic system. The target variables reflected the policymaker's objectives, while the instrument variables were the policy measures under the control of the policymaker. Other variables were data and so-called irrelevant variables. Once the target variables considered as exogenous were fixed (chosen), the model (set of equations), presumably mirroring the underlying economic system, would be solved for the (endogenous) instrument variables. The model had to satisfy a number of conditions to yield solutions, including that the number of target variables be equal to the number of instrument variables.

In retrospect, the assumption that policy instruments are exogenous and can be manipulated at will by policymakers must appear naive today when the prevailing view is that policy choice is endogenous. However, in the context of the immediate post-WWII period and even the 1960s, the faith in planning and using technocratic methods to affect the economy was strong and led to some very successful outcomes in terms of growth, inflation control, and income distribution (particularly relating to the share of GNP received by labour and employers).⁴² I would submit that even if one accepts that the formulation of economic policy is largely influenced by the political balance of power and existing institutions (e.g. independent vs non-independent central banks), there remains an important place for strategic planning in our contemporary world.

The Brookings Institution decided to organize a conference on quantitative economic policy and planning in the mid-1960s. I contributed a chapter (co-authored with Karl Fox) on 'Specification of Structures and Data Requirements in Economic Policy Models' to the volume that resulted from this conference (Fox and Thorbecke 1965). I had become fascinated with 'causal ordering'—

⁴¹ After Niels Bohr's first visit to Leiden in 1919, he wrote to Ehrenfest: 'I am sitting and thinking of all what you have told me about so very many different things, and whatever I think of I feel that I have learned so much from you which will be of great importance for me; but, at the same time, I wish so much to express my feeling of happiness over your friendship and of thankfulness for the confidence and sympathy you have shown me, I find myself so utterly incapable of finding words for it.' Wikipedia (2018), 'Paul Ehrenfest', available at: https://en.wikipedia.org/wiki/Paul_Ehrenfest (accessed 29 October 2010).

⁴² Tinbergen was for a long time the director of the Dutch Central Planning Bureau (CPB). The CPB used an elaborate model of the Dutch economy. In deciding on the trade-off between macroeconomic objectives, such as growth vs inflation and the factorial income distribution, it followed the recommendations of the Social Economic Council, which consisted of representatives of labour, employers, and the Crown (government).

a concept developed by Herbert Simon (1953)—and ‘causal arrow diagrams’ that identified clearly how influence is transmitted within a socioeconomic system. The essence of this concept is that even in a completely static system different orders of causality can be defined in the sense that the values of first-order endogenous variables can be computed exclusively as a function of the exogenous variables; values of second-order variables, in turn, can be computed as a function of first-order endogenous variables ... and so on for higher causal orders (Fox and Thorbecke 1965). From an operational viewpoint, causal ordering can be interpreted as indicating the direction of influence among variables and the stimulus-response chains. In this connection, recursive models have the great advantage, from a policy standpoint, that they allow a complete unidirectional interpretation of the effect on the whole system of changes in exogenous variables (policy instruments).

I met Henri Theil at this Brookings conference. He invited me to spend a year at his Econometric Institute in Rotterdam.⁴³ I had already accepted when I found out that I was not eligible for the Fullbright grant as a Dutch (and not a US) citizen at that time. Theil, who had been trained at the University of Amsterdam before becoming a junior colleague of Tinbergen at the Netherland School of Economics, was a supremely self-confident individual. I had the impression that he resented the latter’s fame and was very critical, in private, of the fact that Tinbergen’s approach was deterministic and not stochastic.

4.2 Early development theory: dualism, dual-dual framework, employment creation, and basic needs doctrine

In 1965 I organized a major conference with Irma Adelman at ISU on ‘The Theory and Design of Economic Development’, attended by Hollis Chenery (who at that time was the chief economist for USAID), Dudley Sears (his counterpart at the British Aid Agency), Gustav Ranis, Dale Jorgenson, and Samuel Bowles, among others. The conference generated a volume that I co-edited with Irma Adelman which was used as one of the first textbooks on economic development (Adelman and Thorbecke 1966). Much attention was devoted to models of dual economies following the seminal contributions of W.A. Lewis and Ranis and Fei. I found it a very useful structural distinction that conformed well, as a first approximation, to the typical features of a developing country at an early stage of development.

While I admired the simplicity and the conceptual power of dual models, I felt that a richer and more accurate reflection of the structure of a developing country at an early stage of development could best be captured by a dual-dual structure distinguishing between rural (essentially agriculture) and urban (essentially non-agricultural production) areas on the one hand, and between modern and traditional technologies and forms of organization on the other. This extension yields a four-sector framework: agriculture/modern (e.g. large-scale commercial farms); agriculture/traditional (e.g. small-scale and subsistence agriculture); non-agriculture/modern (e.g. industry and infrastructure); and non-agriculture/traditional (the informal sector). I applied this multisectoral framework to, among other things, the analysis of labour mobility in Puerto Rico (Santiago and Thorbecke 1988) and later used the dual-dual structure to build a CGE model of an archetype African economy to simulate the welfare effects of trade liberalization specifically on poverty (Stifel and Thorbecke 2003)—briefly discussed below.

In the early 1970s, the ILO embarked on new large-scale research and technical assistance programme focused on employment. It had become clear to the development community that

⁴³ At that time the Econometric Institute at the Netherland School of Economics was a leading centre that attracted young visiting econometricians such as Goldberger and Zellner, many of whom became famous subsequently.

economic growth *per se* would not create enough job opportunities for the rising labour force in the developing world. The resulting ILO World Employment Programme (WEP) did much more than sensitize the development community to the employment problem: it organized High Level Employment Missions to half a dozen countries, as well as a massive research programme on the causes of unemployment and under-employment that helped identify measures conducive to employment creation.⁴⁴ I spent the first half of the 1970s working with and advising the WEP. Arguably the most important contribution of the WEP to the development doctrine was the unveiling of the ‘basic needs’ concept.

4.3 Social accounting matrix, structural path analysis, and computable general equilibrium models

It was very serendipitous that I would meet Graham Pyatt, who was also a consultant to the WEP at that time and who introduced me to the SAM methodology. As a firm believer in the importance of economic structure and interdependence, and given my interest in issues related to equity, I found that the SAM provided an almost ideal framework. It allowed the full circular flow of income to be followed in a quantitative and disaggregated fashion from the structure of production to the income distribution by household groups to their consumption pattern and back to production.

After Graham taught me the SAM methodology (and a lot of matrix algebra), we extended it to address a variety of development issues such as income distribution in what became an influential book: *Planning Techniques for a Better Future* (Pyatt and Thorbecke 1976).⁴⁵ In our book we showed, among many other things, how the SAM could be used to ascertain the extent to which different socioeconomic groups could satisfy their basic needs. It was a lot of fun collaborating with Graham, mixing hard work with pleasurable evenings around good food and wine in some of the best restaurants around Geneva, and later Washington after Graham had joined the World Bank.

In 1978, I was invited to present a paper on ‘Consistency Models for Planning’ at a conference at Cambridge University on social accounting matrices. I had the pleasure of meeting Sir Richard Stone (the major architect of the SAM for which he received the Nobel Prize) and his wife. As Jeffrey Round, one of the participants, noted in a recent note to me, ‘It was a profoundly important occasion for me—there were exchanges between you, Graham Pyatt, Richard Stone and Alan Brown in particular—all quite transformative’. Richard Stone was courteous and charming and impressed me as a ‘gentleman of the old school’.

In the late 1970s, the Institute of Social Studies (ISS) in the Netherlands approached me to see if I (as one of the earlier architects of the SAM) would be interested in joining forces with it in preparing a proposal to be submitted to the Dutch Ministry of Overseas Development on the measurement of social welfare in Indonesia. The essence of the proposal was to introduce the SAM methodology at the Central Bureau of Statistics (CBS) in Indonesia and to use it to ascertain progress in social welfare. We submitted a joint proposal that was accepted and generously funded. I became the technical adviser and co-leader of this large programme of research and technical assistance. The project lasted more than ten years and was instrumental in institutionalizing the SAM within the CBS. Since then, the CBS has built a new SAM every five years. The SAM of

⁴⁴ This programme will be discussed in more detail in the forthcoming booklet which will be an extended version of this paper.

⁴⁵ This book was prepared for the World Employment Conference that ILO organized in 1975 and was one of the research showpieces.

Indonesia is one of the most disaggregated and is considered by experts to be one of the most, if not the most, reliable in the world.

At the time the project was starting, I was supervising a very mature graduate student: Roger Downey, a Jesuit father who had recently embarked on his second or third PhD.⁴⁶ I immediately contacted Roger, who expressed great interest in being involved. The proposal called for a small team of experts to be located at the Indonesian CBS in Jakarta first for a three-year period, subsequently renewable. Roger became the first chief of party of a small group of experts which included Steven Keuning, a young Dutch econometrician, who proceeded to have a brilliant career and is now the chief statistician for the European Central Bank. In retrospect, the timing could not have been better. Just at the time Roger was ready to work on the PhD topic he had selected years earlier and which led him to pursue an advanced degree in economics, destiny intervened with a golden opportunity.⁴⁷

To the extent that the SAM is meant to reflect the underlying socioeconomic structure and system, I have long argued that it should be as accurate as possible. The building of a SAM is a strenuous task. A variety of different data sets—such as input-output, national income accounts, manufacturing censuses, household income, and expenditures surveys—are needed. As the statistical information is generated by a host of different agencies using different methodologies, inconsistencies appear and have to be reconciled. The process of reconciliation calls for judgement in addition to specialized software packages. It is time consuming and will, generally, not be rewarded as it should be. The more accurately the SAM reflects the underlying socioeconomic system, the more operationally useful are any SAM-based simulations, such as SAM-multipliers and CGE models that are SAM-calibrated. It is unfortunate that shoddy, back-of-an-envelope SAMs have weakened the profession's confidence in this methodology that (together with CGE models) is the only one available in estimating general equilibrium effects.⁴⁸ The SAM is the foundation upon which a CGE model can be built and calibrated. By analogy, the SAM provides the skeleton and the anatomy and the CGE the lifeblood of a socioeconomic system. The latter is the vitalization of the former.

My continuing interest in understanding better the structure of an economy and the paths through which influence travels within a large-scale interdependent socioeconomic system led me, in collaboration with Jacques Defourny, to develop the concept of structural path analysis (Defourny and Thorbecke 1984). Structural path analysis (SPA) identifies all the paths through which influence is transmitted within a socioeconomic system as reflected by a SAM. The total influence from a pole (variable) of origin to a pole of destination is the sum of all the paths linking these two poles. Some of these paths may be direct and some quite indirect, going through multiple poles. Thus, for example, in understanding how the incomes of a particular household group (say, small-

⁴⁶ Roger Downey was the only graduate student I supervised who had already decided at the beginning of his graduate studies that the general topic of his PhD dissertation would deal with welfare aspects of Indonesia's development.

⁴⁷ As co-technical director of this project, one of my duties was to prepare a budget, including settling on a salary for Roger. Since Roger's lifestyle was very modest and frugal and since he was planning to live in the Jesuit complex in Jakarta, I naively assumed that he would be satisfied with a likewise modest salary. To my great surprise Roger proved to be a hard-nosed and demanding negotiator, requesting the remuneration that he thought befitted the position. My first reaction was that this behaviour was not in keeping with Roger's character, but then I realized that I was wrong and that he was fully entitled to the market salary. It was only years later that I heard that most of Roger's salary, if not all of it, went to build a school in a remote part of Indonesia. Needless to say, I learned a valuable lesson and felt guilty about my lack of sensitivity.

⁴⁸ The tedious and time-consuming nature of building a SAM would discourage any young researchers from undertaking such a task. The temptation is great to uncritically select an existing SAM to build a CGE.

scale farmers) may be affected by an exogenous increase in the output of textile products, SPA identifies all the paths spanning the latter to the former. One of these paths might link the incomes of small-scale farmers directly to increased output of textile products via the hiring of unskilled labour supplied by these households to the textile sector. Other paths may be indirect, such as through the stimulus of increased spending on food crops resulting from the increased incomes of small-scale farmers' unskilled labour, which would generate a flow of additional income to this household group. On the few occasions I had to describe the SPA to policymakers (especially in Indonesia) I found that it was a useful tool in explaining how an exogenous shock (such as the Asian financial crisis of 1996–97) is transmitted through a variety of paths to affect the incomes of different household groups. This helped policymakers to better grasp the measures they could potentially initiate to protect the more vulnerable groups. The SPA concept has been used in a large variety of contexts, such as to identify the network of paths spanning the impact of different productive activities on poverty (Thorbecke and Jung 1996), employment, and the environment (pollution).

In the early 1990s, the OECD Development Centre initiated a large-scale research project on growth with equity. The novel methodology underlying this project was based on linking a macro CGE to a micro structure allowing the simulation of, among other things, the impact of macroeconomic shocks and macro policies on incomes (poverty) and employment of specific household groups and even individuals (Bourguignon et al. 1991). As part of this project (together with a number of collaborators) I built a highly disaggregated CGE model of Indonesia that allowed the impact of alternative policy measures on income distribution and poverty to be simulated (Thorbecke and collaborators 1992). I interacted with Christian Morrisson, François Bourguignon, and Jim de Melo, as well as with Alain de Janvry and Betty Sadoulet, who were building a similar model of Ecuador. One difficult and rather intractable issue that we explored together was how to impute the value of the benefits received by vulnerable and poor households from direct and indirect government transfers covering such areas as education, health, and nutrition. Although we were not very successful, we suggested improvements over the conventional procedure of valuing those benefits as equal to the government expenditures on those services.

Subsequently, following the devastating impact of the Asian financial crisis of 1996–97 on Indonesia's economy—leading to a 14 per cent fall in GDP in one year and a large increase in poverty—I decided, together with a leading Indonesian economist and ex-student of mine (Iwan Azis), to explore the effects of the conditions and policy recommendations that the IMF imposed on that country to obtain a loan as its currency crumbled (Azis et al. 2001). We realized that this exercise would require building a financial SAM to be coupled with a real SAM. With the help of the Central Bank we built a financial SAM, integrated it with a real SAM, and added an elaborate poverty module to the CGE. One of the key measures the IMF recommended to reduce capital flight was an almost exorbitant rise in the prime interest rate, which starved domestic borrowers and led to a liquidity crisis that further pushed the economy into a tailspin. We used our model to show the ill-fated consequences of the IMF's conditions and simulated the less negative impact of alternative policy packages.

As I mentioned above, together with my student David Stifel I built a SAM, and corresponding CGE model, of an archetype African country at an early stage of development and simulated the effects of trade reform on the structure of growth, and more particularly on migration and poverty (Stifle and Thorbecke 2003).

Although the SAM methodology has been applied mostly to national economies, the concept has been extended to cover regions and villages too. A few of my students extended the conventional use of SAMs to explore village economies. One such attempt by Lewis and Thorbecke (1992)

highlighted intersectoral linkages particularly between agricultural and non-agricultural activities, and inter-regional linkages between a Kenyan district and the rest of the country and the rest of the world. Furthermore, by adding anthropological information the SAM can help unveil some more dynamic features of the behaviour of villagers in a typical Indian village. Thus, Parikh and Thorbecke (1996) explored the impact of decentralized rural industrialization (the establishment of a factory on the outskirts of the village) on employment, incomes, and the modernization trend within the village.

4.4 Regional science

One of my rewarding interactions at Cornell was with Walter Isard—the father of regional science. Walter had been a student of Leontief and was a proponent of the input-output approach. At an advanced age (late seventies and eighties) he became interested in the more general SAM approach that includes input-output as one of its many components. He realized the potential of the SAM methodology and asked me to help convey it to him. I spent many hours teaching him the rudiments of this concept. He was a very quick learner and soon became a strong advocate.

Under his guidance, Cornell had built a strong graduate programme in regional science. After he had mastered this new quantitative approach he enlisted a number of faculty members (including me) to write a new textbook, *Methods of Multiregional and Regional Analysis* (Isard et al. 1998). Much of the treatise was anchored on the SAM and CGE modelling approach.

Walter was a Quaker, endowed with an indomitable spirit and will for peaceful conflict resolution. He repeatedly tried to introduce a new multidisciplinary field of graduate studies, which he coined ‘Peace Science’, based on quantitative methods. He continued to work at Cornell long after he had become an emeritus professor and without any monetary compensation. While he lived in Philadelphia and did not have a residence in Ithaca, such was his dedication to his work that he often slept in his office whenever he visited Cornell.

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