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C. PETER TIMMER

Managing Structural Transformation:

A Political Economy Approach



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Foreword

As world leaders prepare to decide on the exact constellation of the Sustainable Development Goals (SDGs) that will make up the post-2015 Development Agenda the challenge of structural transformation is central to most debates. It is also a core theme of the 2014–18 UNU-WIDER Work Programme: ‘Transformation, Inclusion and Sustainability’. We were therefore most grateful to Professor C. Peter Timmer for accepting our invitation to give the WIDER Annual Lecture 18 on the topic ‘Managing the Structural Transformation: A Political Economy Approach’, on 18 November 2014 at the UN Headquarters in New York.

The WIDER Annual Lecture is a high point in the Institute’s calendar and is delivered each year by an eminent scholar or policy maker who has made a significant contribution in the field of development. Peter Timmer falls squarely in this category. He is an internationally-known and respected scholar as the Thomas D. Cabot Professor of Development Studies, emeritus, at Harvard University. Timmer has been dean of the Graduate School of International Relations and Pacific Studies at UC-San Diego, and in addition to his faculty positions in three schools at Harvard, he has held professorships at Cornell and Stanford.

In 1992, Timmer received the Bintang Jasa Utama (Highest Merit Star) from the Republic of Indonesia for his contributions to food security. He served as the chief outside advisor to USAID for developing their strategy on growth and agriculture for the Natsios Report (Foreign Assistance in the National Interest), and he was one of the key advisors for the World Development Report 2008: Agriculture for Development. He currently serves as an advisor to the Bill and Melinda Gates Foundation on agricultural development and food security issues.

In his lecture Professor Timmer highlights the vital, and precarious, period of structural transformation, when agriculture represents a declining share of the economy and labour moves to the cities. Focusing on the difficulties and paradoxes that developing economies face when navigating this liminal phase, he argues that the process has, if anything, become more difficult over time. Historically, successful structural transformation has been the only sustainable pathway out of poverty, as labour productivity in the agricultural and non-agricultural sectors converges. Professor Timmer warns, however that there are other ‘possible outcomes’, and that states should be wary of them. Much of Asia, he argues, may be heading into a ‘Lewis Trap’, where the income gap between the two sectors actually increases, while much of sub-Saharan Africa moves towards ever smaller farms, reducing the prospects for productivity further. In these trying environments he looks at each aspect in turn-examining the role of markets in efficiently allocating resources, of governments intervening to provide the socially-desired results that markets alone cannot guarantee, at the micro-level of individual food security, at the macro-level of aid agendas, and asks, ‘is there any way to manage the process without hurting the poor?’

Professor Timmer’s lecture is a vital and thought-provoking analysis of a key development issue of our time. I would like to sincerely thank him for taking on this task. I am certain that his lecture will be food for thought – and hopefully action – to all of those whom we try to reach out to, policy makers, researchers, development practitioners, and the public.

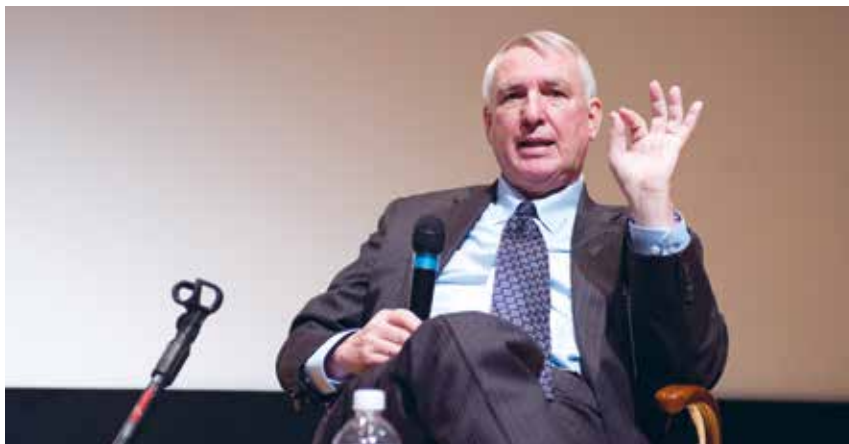
**Finn Tarp, Director
UNU-WIDER, Helsinki**



Author's acknowledgments

A paper as broad-sweeping as this one obviously incurs many debts, both intellectual and logistical. On the intellectual front, I am a product of Professor Alexander Gerschenkron's perspectives on "economic backwardness in historical perspective." I took his course and research seminar as a PhD student at Harvard in the 1960s and was then privileged to co-teach a similar course for two decades to graduate students in the Economics Department at Harvard. My colleagues in that endeavour, Professors Dwight Perkins and Jeffrey Williamson contributed significantly to the views now expressed in this paper. Nick Eberstadt, one of the students who took that course and who now holds the Henry Wendt Chair in Political Economy at the American Enterprise Institute, offered me the opportunity to reflect on the course and historical lessons of structural transformation in my Wendt Lecture in 2008, from which a precursor to this paper emerged: *A World without Agriculture: The Structural Transformation in Historical Perspective*, published by AEI Press in 2009.

Logistically, I would like to thank Finn Tarp for inviting me to give the WIDER Annual Lecture 18 and his encouragement to think broadly about the process of structural transformation. The day before I gave the lecture at the UN in New York, Roger Williamson interviewed me for two videos about the topic. Roger's questions really helped me think through how to present the issues in my lecture the next day. I dare say that the videos are better than the lecture itself and I thank Roger for that. Finally, I thank Annett Victorero and the entire editorial staff at UNU-WIDER for the superb help in translating my initial written draft into the current publication.



About the author

C. Peter Timmer is the Thomas D. Cabot Professor of Development Studies, Emeritus, at Harvard University.

A core advisor on the World Bank's World Development Report 2008: *Agriculture for Development*, Timmer also works with several Asian governments on domestic policy responses to instability in the global rice market. Among other awards, in 1992 he received the Bintang Jasa Utama (Highest Merit Star) from the Republic of Indonesia for his contributions to food security. He is also an advisor to the Bill and Melinda Gates Foundation on agricultural development issues.

Timmer's work focuses on the nature of "pro-poor growth" and its application in Indonesia and other countries in Asia; the supermarket revolution in developing countries and its impact on the poor; and the structural transformation in historical perspective as a framework for understanding the political economy of agricultural policy.

1

Introduction

No country has been able to sustain rapid economic growth until its citizens and investors were confident that food was reliably available in the main urban markets.



Understanding structural transformation is mainly an exercise in economic history, but learning how to manage the process involves understanding the political economy of policy-making. This paper draws on more than four decades of academic and advisory work devoted to improving food security – ending hunger – in developing countries, but this effort has always been through the lens of long-run economic growth and reductions in poverty. The food system is at the core of this process, in both the long run and short run. In the long run, the food system is a key element of the structural transformation, which historically has been the only sustainable pathway out of poverty. In the short run, the food system is the arena in which many of the poor make their living, and also face the risks of volatile food prices.

This study asks how to manage the historical process of structural transformation in both the short run and the long run. Inevitably, given my experience, it has an Asian bias and a focus on the world rice economy. That is not all bad: Asia still has most of the world's poor and food-insecure households, and rice has increasingly become the foodstuff of the poor. The lessons on how Asia has coped with these problems are well worth understanding for the light they shine on similar problems in other regions.

The message here is that markets, for all of their problems and failures (and I will spend a lot of time on these), will be at the core of successful management of structural transformation. In all of the escapes from hunger over the past two centuries – from the OECD countries to the wealthier countries in East and Southeast Asia – markets have done the heavy lifting. Their role in generating signals of resource scarcity and inducing producers and consumers to make decisions that are consonant with those signals has never been carried out successfully by government planners.

At the same time, none (just for emphasis, not a single one) of the escapes from hunger was driven entirely by market forces. Governments have had to intervene in myriad ways, from stabilizing the economic environment to providing critical public goods such as transportation and communications networks, agricultural research and development, and access to quality health and educational facilities. There is scope for more or less government involvement, depending on institutional capacity (which is actually endogenous to the process, to be discussed later).

But again, to be clear, 'none' has never been the right answer. 'Too much' has been a common mistake, as government ambition often exceeded capacity to design and implement. How much to intervene, and where, is a tricky balance that requires constant analysis, experimentation and learning. This is the central message of my new book on Food Security and Scarcity: Why Ending Hunger Is So Hard (Timmer 2015), from which this study is largely drawn. This 'learning perspective' is also

LIST OF ACRONYMS AND ABBREVIATIONS

OECD	Organisation for Economic Co-operation and Development, Paris (the so-called 'rich countries club')
GDP	Gross domestic product
SDGs	Sustainable development goals
WTO	World Trade Organization, based in Geneva

consistent with Lant Pritchett's main message in his 16th Annual WIDER Lecture *Folk and the Formula: Fact and Fiction in Development* (Pritchett 2013).

A structural transformation that is successful in ending hunger requires that each society finds the right mix of market forces and government interventions to drive a process of economic growth that reaches the poor and ensures that food supplies are readily, and reliably, available and accessible to even the poorest households. Finding this 'right mix' has been a major challenge, and serious efforts to provide food security to a society seem to have stimulated important 'learning' by governments on how to manage not just the essentials of rural markets, but also the broader dimensions of economic growth.

Most poor people live on farms, usually quite small ones. One way to lift them out of poverty and provide sustainable food security is to help them achieve higher yields, gain reliable access to water, and to markets that are close enough to allow them to use modern seeds, fertilizer and to get decent prices for their surplus output. Good schools, nearby health clinics, and local financial markets also raise rural living standards, but just raising secure crops and feeding their children is a first priority for these families. Success at this level provides an essential starting point for inclusive economic growth.

At the same time, not all small farmers can achieve food security on their own small plots. For many of these, escaping poverty will require leaving agriculture – even moving to a city. This is the process of 'structural transformation'. It occurs as agriculture becomes a smaller share of the economy and the workforce, but grows in overall productivity. And it provides a powerful pathway out of poverty. Indeed, if history is any guide, no escape from hunger and poverty has been sustainable without a successful structural transformation.

Solving the 'food problem' is thus a key step – and a powerful catalyst – to solving the problem of poverty and finding the path to higher incomes. No country has been able to sustain rapid economic growth until its citizens and investors were confident that food was reliably available in the main urban markets. Rural poverty has always been a later concern. However, rural productivity and economic growth provide the ingredients to broad-based food security. The two are intimately linked, and identifying the many factors that must come together to generate a successful structural transformation helps understand why.

1.1 Three inter-related transformations

Two other transformations occur simultaneously with the structural transformation – sorting out which are cause and which are effect is mostly a fool's game; they happen together. The agricultural transformation takes place within the sector at the same time the sector itself is changing its relationship to the rest of the economy – structural transformation. And the dietary transformation follows surprisingly robust 'laws' as societies become richer and more urbanized. Engel's Law describes the declining share of food in the budget of all families as they become richer. Bennett's Law describes the reduced role of starchy staples (cereals and root crops) and the increased diversity of calorie and protein sources in the diets of richer families.

The persistence across countries and time of these common patterns of dietary change, and the agricultural transformations that make them possible, suggest very deep-seated global forces at work, no doubt some of them wired by evolution into the human brain. At the same time, there is widespread variance at the local level around these common pathways, so there is ample scope for unique behaviour and patterns as well. Here is the role for policy analysis at the country level.

It is important to understand the global forces at work before trying to understand how to manage local initiatives and processes of change. Knowing when the tides ebb and flow is much more productive than trying to roll them back. The international context for domestic policy analysis with respect to managing structural transformation has changed substantially since the mid-twentieth century. Several basic trends stand out, especially with respect to expectations in the early 1980s, after the full impact of the world food crisis in 1973/74 was felt.

From the 1950s through the 1970s, scholars had been developing an understanding of 'how' to do agricultural development and 'why' success in doing so was so important for the rest of the economic development process. The focus was primarily on

identifying the constraints to raising farm productivity, because it seemed so obvious that needed to be done. But early voices also pointed out the critical role this higher productivity could play in stimulating the rest of the economy (Lewis 1954; Johnston and Mellor 1961; Eicher and Staatz 1984).

Hayami and Ruttan (1971, 1985) introduced the first comprehensive approach to agricultural development. Their induced innovation model generalized such divergent development pathways as in Japan, which could not bring more land under agricultural production. Biological and chemical inputs were needed to raise output per hectare. In the USA, Canada and Australia/New Zealand, the constraint was labour availability, and increasing its productivity through mechanization was essential. Their seminal book heavily influenced the drafting of Food Policy Analysis (Timmer, Falcon, and Pearson 1983). The focus of our book expanded to the role of markets and government interventions into both the macro economy and the marketing system to improve access of the poor to food.

Although influential within the food policy community, the broader economics profession responded with quiet indifference. By the mid-1980s, agricultural development was already slipping out of favour in the donor community and government policy. Market processes had solved the problem, and would keep it solved. By the end of the first decade of the new millennium, however, the global context changed and, gradually, professional thinking changed as well (World Bank 2007). The debate about markets, government intervention, and the role of trade has resurfaced. Agricultural development specialists, at least the few who remain, are back in demand, but are astonished by the radical changes in the world food system since the early 1980s when Food Policy Analysis was published.

1.2 The changing global context

First, surprisingly rapid economic growth occurred, especially in Asia, with hundreds of millions of people pulled out of poverty. The strong connection between inclusive economic growth, especially in rural areas, and rapid reduction of poverty was simply not apparent in the empirical record in the early 1980s. The East Asian Miracle (World Bank 1993) did not appear for another decade. This rapid growth validated the central theme of the ‘macro’-food policy perspective – poverty cannot be reduced without greater economic productivity of unskilled, especially rural, labour. That theme remains powerfully relevant even as the sources of such productivity increases are increasingly elusive.

Second, a communications revolution at both the household and international levels radically reduced transactions costs and increased access to knowledge. Again, the centrality in the food policy perspective of markets and price formation – and to understanding food policy design and implementation – was boosted because marketing margins narrowed under improved and more informed competition. Consumers and farmers both benefited from more competitive local food markets. The ‘supermarket revolution’ has merely accelerated these changes. The current challenge is to keep small farmers in modern supply chains (Timmer 2009b; Reardon and Timmer 2012).

Third, global financial markets became interested in ‘emerging economies’. The early 1980s were an era of fixed exchange rates, tight controls on the flow of foreign capital, and virtually no financial intermediation beyond state banks. At first, the influx of foreign capital in the 1990s was welcomed as a sign of confidence, but except for foreign direct investment in ‘real’ assets, such as factories and real estate, the global financial interest in emerging economies was a two-edged sword. A rapid influx could cause currency appreciation and a loss of competitiveness; its rapid exit when the economy started to decline or foreign investors saw better opportunities elsewhere caused a crisis in local financial markets. Global financial integration came with very poorly understood risks, and the global financial crisis in 2009 demonstrated them clearly. The growth of foreign investments in land to produce food and/or bio-fuels for export – so-called land grabs – is controversial, but at least the capital cannot leave the country quickly. The injection of new capital into agriculture in poor countries may not be all bad. Much will depend on who benefits from the new production – foreigners or local farmers.



The strong connection between inclusive economic growth, especially in rural areas, and rapid reduction of poverty was simply not apparent in the empirical record in the early 1980s.

Fourth, bio-fuels are now a significant source of demand for basic food commodities, such as maize, sugar and palm oil. Very senior and experienced commodity analysts dispute the share of bio-fuels' contribution to high grain prices – various estimates range from 25 per cent to over 75 per cent. An empirical model – i.e., one not based on analytically-derived behavioural relationships – from the New England Complex Systems Institute suggests that nearly all of the trend increase in food prices since 1990 has come from bio-fuel demand, whereas spikes along the trend are entirely due to financial speculation (Lagi et al. 2011).

Whether the demand comes from legislative mandates or from prices for high fuel, establishing a direct link between energy prices and food prices is a powerful new force in global commodity markets. The outlook for continued high (or at least unstable) prices for crude oil thus has direct implications for the outlook for staple food prices. Most knowledgeable analysts of the US bio-fuel industry feel that maize-based ethanol will remain economically competitive in the absence of specific taxes on the conversion of food grains into ethanol. In the absence of such taxes, high-priced petroleum means high-priced maize. Because of its multiple end-uses in consumption, and land competition with soybeans (and to a lesser extent, with wheat) in the United States, high-priced maize (specifically) means high-priced food (generally), including, in the long run, even rice.

Finally, climate change is imposing itself as a reality on the increased probability of extreme weather events in general, but also on both global and localized food security outcomes in particular. Innovative empirical studies by Lobell and his colleagues show that warmer temperatures have already reduced agricultural yields in Europe since 1990 by as much as 10 per cent, controlling for other factors (Lobell, Schlenker, and Costa-Roberts 2011). Peaks in summer night-time temperatures can reduce rice yields by a third in only a day or two. Although the search is on for genetic material that resists the severe impact of high temperatures on grain yields, it will take decades for significant results, if they are possible, to be seen in average yields.

Despite the changing climate, it is important to remember that eco-system services provided by the climate are essential for all agricultural production – photosynthesis remains the most efficient way to capture solar energy for human use. The most important effects of climate change on agriculture are likely to include a net global loss of agricultural land, changing crop suitability in particular regions, and an increase in the frequency of natural disasters. It will also have negative effects on other areas of agriculture broadly interpreted. Climate change will reduce the carrying capacity of many rangelands and pose threats to fisheries and aquaculture production systems. In-country 'climate-smart agriculture' adaptation projects and programmes now form part of the policy agenda. The challenge is to design, analyse, and implement these projects and programmes, a complex task because they need to be country-specific.

1.3 Managing structural transformation means managing food prices: What have we learned?

The rapid emergence in the 1990s of China and India as global growth engines meant a gradual shift in the drivers of demand for commodities and natural resources. Advanced economies had increased their knowledge and became less dependent on energy, metals, and other basic commodities – including food commodities – to fuel their economic growth. The price depression for nearly all commodities in the 1980s and 1990s reinforced the view that the future depended on value added from skills and knowledge, not from exploitation of natural resources. But industrialization, especially as practiced by China and India, is a very intensive user of natural resources (and producer of greenhouse gases). By the turn of the millennium, it was increasingly clear that the growth path of developing countries was the primary impetus to higher commodity prices, starting with energy prices but quickly extending to food prices. The Malthusian challenge was back, but with two decades of neglected investments in raising agricultural productivity (because of the low agricultural prices), the challenge is turning out to be hard to meet.



2

Structural transformation in historical perspective ¹



All successful developing countries undergo a structural transformation, which involves four main features:

A falling share of agriculture in economic output and employment

A rising share of urban economic activity in industry and modern services

Migration of rural workers to urban settings, and

A demographic transition in birth and death rates that always leads to a spurt in population growth before a new equilibrium is reached.

The structural transformation involves declining shares of agriculture in GDP and employment, almost always accompanied by serious problems closing the gap in labour productivity between agriculture and non-agriculture. The basic cause and effect of the structural transformation is rising productivity of agricultural labour. Figure 1 presents an especially graphic illustration of the structural transformation in 86 countries between 1980 and 2010. Each red square represents the share of agriculture in total employment for a particular country and year. Similarly, each black circle represents the share of agriculture in economic output, or GDP, for the same country and year. Finally, each green cross is the difference between these two shares, measured so that the value, which is simply the gap in labour productivity between agriculture and non-agriculture, is negative.

The four dimensions of structural transformation are seen by all developing economies experiencing rising living standards; diversity appears in the various approaches governments have tried in order to cope with the political pressures generated along that pathway. Finding efficient policy mechanisms that will keep the poor from falling off the pathway altogether – managing the structural transformation – has occupied the development profession for decades. There are three key lessons.

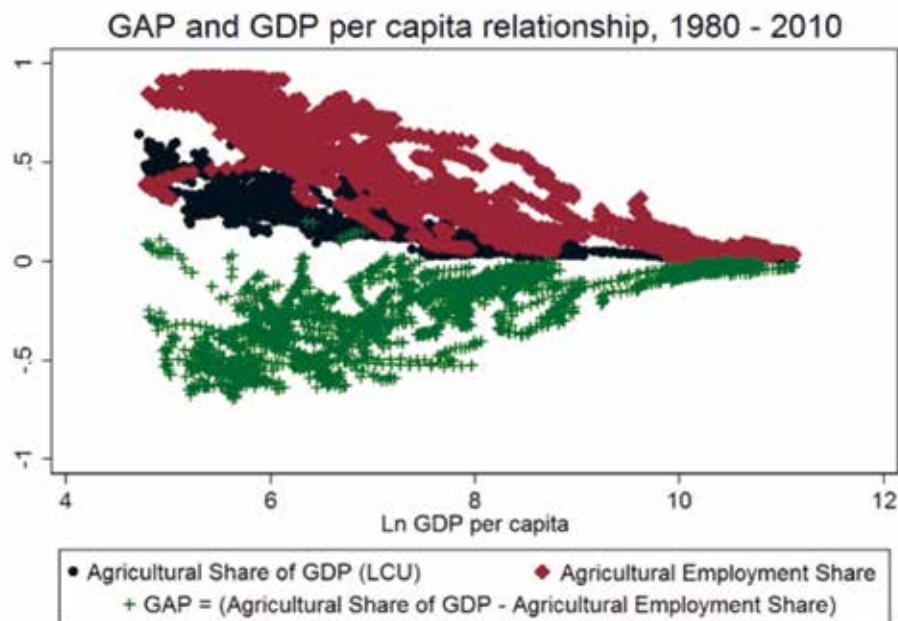
First, the structural transformation has been the main pathway out of poverty for all societies, and it depends on rising productivity in both the agricultural and non-agricultural sectors (and the two are connected). The stress on productivity growth

¹ This is the sub-title of my American Enterprise Institute (AEI) monograph *A World without Agriculture* (Timmer 2009a), from which much of this section is drawn. Detailed analysis of the gap between labour productivity in the agricultural and non-agricultural sectors is presented there.

² Both of these cases have been documented in the Stanford Symposium Series on Global Food Policy and Food Security in the 21st Century (Badiane 2011; Binswanger-Mkhize 2012).

in both sectors is important, as agricultural labour can be pushed off of farms into even lower productivity informal service sector jobs, a perverse form of structural transformation that has generated large pockets of urban poverty, especially in Sub-Saharan Africa and India.² It is no accident that these are the two regions of the world where food insecurity remains severe.

FIGURE 1:
The structural transformation in
86 countries from 1980 to 2010



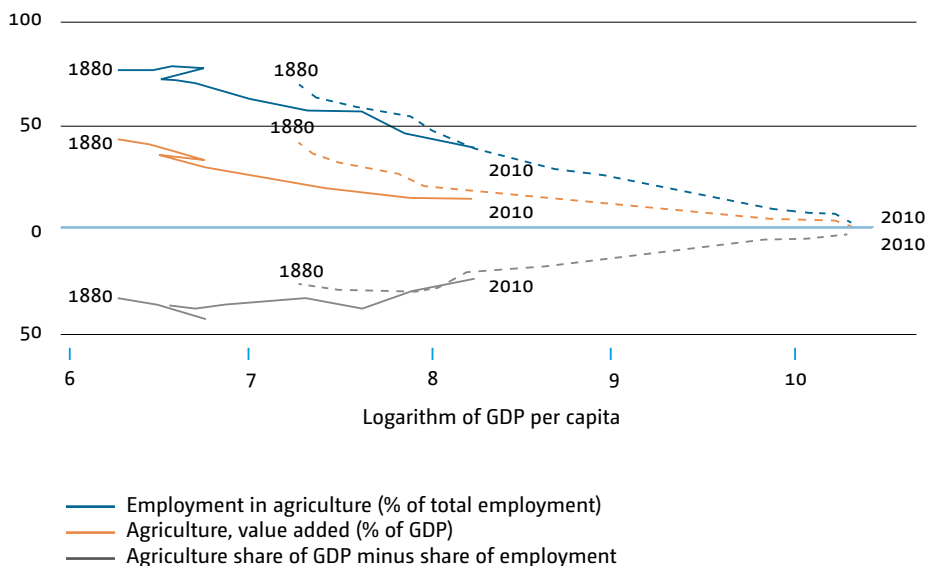
Source: Author's research, with the assistance of Selvin Akkus Clemens.

Second, in the early stages, the process of structural transformation widens the gap between labour productivity in the agricultural and non-agricultural sector – a process also seen in Figure 1. This widening gap puts enormous pressure on rural societies to adjust and modernize. These pressures are then translated into visible and significant policy responses that alter agricultural prices. The agricultural surpluses generated in rich countries because of artificially high prices then cause artificially low prices in world markets and a consequent undervaluation of agriculture in poor countries. This undervaluation of agriculture since the mid-1980s, and its attendant reduction in agricultural investments, is a significant factor explaining the world food crisis in 2007/08 and continuing high food prices into the mid-2010s.

Third, despite the decline in relative importance of the agricultural sector, leading to the 'world without agriculture' in rich societies, the process of economic growth and structural transformation requires major investments in the agricultural sector itself (Timmer 2009a). This seeming paradox has complicated (and obfuscated) planning in developing countries as well as donor agencies seeking to speed economic growth and connect the poor to it. Because of active policy concerns about providing food security to their citizens, countries in East and Southeast Asia largely escaped much of this paradox, but Sub-Saharan Africa has not.

For poverty-reducing initiatives to be sustainable over long periods of time, the indispensable necessity is a growing economy that successfully integrates factor markets in the rural sector with those in urban sectors, and stimulates higher productivity in both. That is, the long-run success of poverty reduction, and with it, improvements in food security, hinge directly on a successful structural transformation. The historical record is very clear on this path. Figure 2 shows the historical path of structural transformation from 1880 to 2010 for Japan and Indonesia. The similarity in paths is quite striking.

FIGURE 2:
Long-run patterns of structural transformation in Japan and Indonesia



Source: Author's original research.

Dashed lines indicate Japan's trajectory; solid lines show Indonesia's

Managing the ingredients of rapid transformation and coping with its distributional consequences have turned out to be a major challenge for policy makers. 'Getting agriculture moving' in poor countries is a complicated, long-run process that requires close, but changing, relationships between the public and private sectors. Donor agencies are not good at this. More problematic, the process of agricultural development requires good economic governance in the countries themselves if it is to work rapidly and efficiently. Aid donors cannot hope to contribute good governance themselves – and may well impede it (Pritchett 2013).

The strong historical tendency toward a widening of income differences between rural and urban economies during the initial stages of the structural transformation is now extending much further into the development process. Consequently, with little prospect of reaching quickly the turning point, where farm and non-farm productivity and incomes begin to converge, many poor countries are turning to agricultural protection and farm subsidies sooner rather than later in their development process. The tendency of these actions to hurt the poor is then compounded, because there are so many more food-deficit, rural poor in these early stages.

2.1 The structural transformation and economic development

No country has been able to sustain a rapid transition out of poverty without raising productivity in its agricultural sector (if it had one to start – Singapore and Hong Kong are exceptions). The process involves a successful structural transformation where agriculture, through higher productivity, provides food, labour, and even savings to the process of urbanization and industrialization. A dynamic agriculture raises labour productivity in the rural economy, pulls up wages, and gradually eliminates the worst dimensions of absolute poverty. Somewhat paradoxically, the process also leads to a decline in the relative importance of agriculture to the overall economy, as the industrial and service sectors grow even more rapidly, partly through stimulus from a modernizing agriculture and migration of rural workers to urban jobs.

Despite this historical role of agriculture in economic development, both the academic and donor communities lost interest in the sector, starting in the mid-1980s, mostly because of low prices in world markets for basic agricultural commodities. Low prices – while a boon to poor consumers and a major reason why agricultural growth specifically, and economic growth more generally, was so pro-poor for the general population – made it hard to justify policy support for the agricultural sector or new funding for agricultural research or commodity-oriented projects (World Bank 2004). Historical lessons are a frail reed in the face of market realities and general equilibrium models that show a sharply declining role for agriculture in economic growth. The current realities of the structural transformation – low farm prices and extensive rural poverty – stare policy makers in the face, not its underlying mechanisms that actually require rising productivity in agriculture.

Still, historical lessons have a way of returning to haunt those who ignore them. This is especially true when the lessons are robust, have been observed for very long periods of time, and fit within mainstream models of how farmers, consumers (and politicians) behave. The lessons from the structural transformation fit these conditions. We can translate those historical lessons into an understanding of the connections between the sectoral composition of economic growth and reductions in poverty. With this understanding come new insights into how to manage agricultural development to enhance both efficiency and equity and thus its impact on food security.

The historical perspective

The structural transformation is the defining characteristic of the development process, both cause and effect of economic growth. The final outcome of the structural transformation, already visible on the horizon in rich countries, is an economy and society where agriculture as an economic activity has no distinguishing characteristics from other sectors, at least in terms of the productivity of labour and capital, or the location of poverty. This stage also shows up in Figures 1 and 2, as the gap in labour productivity between agricultural and non-agricultural workers approaches zero when incomes are high enough.³

All societies want to raise the productivity of their economies. That is the only way to achieve higher standards of living and sustain reductions in poverty. The mechanisms for doing this are well known in principle if difficult to implement in practice. They include the utilization of improved technologies, investment in higher educational and skill levels for the labour force, lower transactions costs to connect and integrate economic activities, and more efficient allocation of resources. The process of actually implementing these mechanisms over time is the process of economic development. When successful, and sustained for decades, it leads to the structural transformation of the economy.

The structural transformation complicates the division of the economy into sectors – rural versus urban, agricultural versus industry and services – for the purpose of understanding how to raise productivity levels. In the long run, the way to raise rural productivity is to raise urban productivity, or as Chairman Mao famously but crudely put it, ‘the only way out for agriculture is industry’. Unless the non-agricultural economy is growing, there is little long-run hope for agriculture. At the same time, the historical record is very clear on the important role that agriculture itself plays in stimulating growth in the non-agricultural economy (Timmer 2002, 2005a, 2005b, 2008).

In the early stages of the structural transformation in all countries there is a substantial gap between the share of the labour force employed in agriculture and the share of gross domestic product (GDP) generated by that work force. Figure 1 shows that this gap narrows with higher incomes. This convergence is also part of the structural transformation, reflecting better integrated labour and financial markets. However, in many countries this structural gap actually widens during periods of rapid growth, a tendency seen in even the earliest developers. When overall GDP is growing rapidly, the share of agriculture in GDP falls much faster than the share of agricultural labour in the overall labour force. The ‘turning point’ in the gap generated by these differential processes, after which labour productivity in the two sectors begins to converge, has also been moving to the right over time.⁴

This lag inevitably presents political problems as farm incomes visibly fall behind incomes being earned in the rest of the economy. The long-run answer, of course, is faster integration of farm labour into the non-farm economy (including the rural, non-farm economy), but the historical record shows that such integration takes a long time. It was not fully achieved in the United States until the 1980s (Gardner 2002), and evidence shows the productivity gap is increasingly difficult to bridge through economic growth alone (Timmer 2009a).

This lag in real earnings from agriculture is the fundamental cause of the deep political tensions generated by the structural transformation, and it is getting worse. Historically, the completely uniform response to these political tensions has been to protect the agricultural sector from international competition and ultimately to provide direct income subsidies to farmers (Lindert 1991; Anderson, Rauser, and Swinnen 2013). Neither policy response tends to help the poor, even those remaining in rural areas.

³ Alternatively, the convergence between labour-productivity in the agricultural and non-agricultural sectors can be measured by the ratio of the two, which approaches one when labour productivity is equal in the two sectors. This is the main approach used by Dorin, Hourcade, and Benoit-Cattin (2013).

⁴ This is not a temporal statement, but one driven by movements in real incomes per capita. If incomes per capita fall over extended periods, as they have in Brazil or Nigeria, for example, the pathway ‘back’ is not likely to track the pathway ‘forward’ because of substantial stickiness in structural patterns of labour allocation.

The structural transformation as a general equilibrium process

The economic and political difficulties encountered during a rapid structural transformation are illustrated schematically in Figure 3, which shows a representative structural transformation, and numerically in Table 1, which presents the simple mathematics of structural change over a 20-year period of economic growth and transformation. Although Figure 3 shows the share of agricultural labour in the total labour force, and the contribution of agriculture to overall GDP, both declining smoothly until parity is reached when a country is 'rich'. The actual relationship between the two shares depends critically on the pace of change outside of agriculture and on the labour-intensity of those activities.

Figure 3 also shows a basic fact that is often overlooked in political discussions about the 'failure' of agriculture to grow as fast as the rest of the economy, and thus to decline as a share of GDP and in the labour force: despite the structural transformation, agricultural output continues to rise in absolute value. Even as the number of farmers falls toward zero, total farm output sets new records. That is what rising productivity is all about. The sustainability of the production practices that generate such high levels of labour productivity in modern agriculture is the subject of intense debate (Naylor et al. 2007).

Table 1 quantifies the impact of three alternative paths for a country's structural transformation. At the starting point, industry, services, and agriculture contribute 20, 30, and 50 per cent to GDP, respectively, and the share of workers in each sector is 9.7, 20.8, and 69.5 per cent, respectively, which is fairly typical for a country in the very early stages of development. Labour productivity in each sector is 3, 2, and 1, respectively; so overall labour productivity for the entire economy is the weighted average, or 1.4 (units of output per worker per year).

The economy then grows for 20 years. Industry grows 7.5 per cent per year, services 5.0 per cent per year, and agriculture grows 3.0 per cent per year. The overall rate of growth at the start is 4.5 per cent per year. These rates of growth result from technological change that is sector-specific on the supply side, and on differential patterns of demand that reflect Engel's Law. The trade implications of these differential growth rates, which are representative of long-run rates seen in successful developing countries, are not shown in Table 1, but the economy must be relatively open to trade to sustain such rates.

The 'simple mathematics' of the structural transformation show what happens to the economy and to labour productivity through 20 years of reasonably rapid growth. At an aggregate level, total GDP grows from 100 to 255, an annual growth rate of 4.8 per cent per year. Notice the acceleration in the growth rate despite the assumption that each sector grows at a constant rate for 20 years, a result of changing sectoral weights. Indeed, GDP growth in the last year of the exercise is 5.2 per cent, compared with just 4.5 per cent per year at the start, despite the fact that each sector continues to grow at a constant rate. If the labour force grows by 2.0 per cent per year during this exercise, labour productivity in aggregate will grow to 2.4 (from 1.4 in the base year), a healthy growth rate of 2.7 per cent per year.

But the important story is at the sectoral level, where the structural transformation becomes visible. Table 1 shows three possible growth paths that encompass modern development experience. Path A, following the basic logic of the Lewis model, holds labour productivity constant in the industrial and service sectors, as they absorb labour from the agricultural sector at the same rates as each sector itself expands. This labour-intensive path of industrial and service growth leads to the fastest structural transformation of the three scenarios. It is so successful in pulling 'surplus' labour out of agriculture that labour productivity in agriculture is actually higher at the end than in the service sector, and only 23 per cent less than that in the industrial sector. No country has actually managed a growth path with quite that much labour intensity, although the East Asian experience comes closest. The structural transformation is extremely rapid with this path, and the absolute number of workers in agriculture is already declining after 20 years of rapid growth.

Path C looks at the opposite extreme, where labour productivity in the industrial and service sectors grows at the same rate as the sectors themselves. Thus neither sector absorbs any new workers at all. The entire increase in the labour force remains in agriculture. Because agricultural GDP is still rising faster than the labour force, labour productivity in the sector does rise slightly, but at only 0.3 per cent per year. This pattern is closer to the African experience, although Indonesia in the 1950s and early

1960s looked similar. Not only is the absolute number of workers in agriculture still rising on this path, so too is the share of agricultural labour in the total labour force.

Path B is halfway between these two extremes, with labour productivity in the industrial and service sectors growing at half the rate of increase in sectoral output. The result is similar to the Indonesian experience since 1970. The agricultural labour force continues to rise (to 69, from 50 at the beginning) but is clearly near its peak – ten more years of such growth would see the agricultural labour force in absolute decline. Labour productivity in agriculture increases by 1.4 per cent per year over the entire period, somewhat less than the rate found by Fuglie (2004) for Indonesia from 1961 to 2000, the years of both rapid and slow growth in productivity.

But even this successful pattern of structural transformation leaves a serious problem for policy makers to manage. As Table 1 also shows, income distribution deteriorates under this scenario, at least as measured by the ratio of labour productivity (wages) in the top quintile of labourers to the bottom quintile. From a starting ratio of 2.55, even Path B yields a ratio of 4.02. Of course, things could be worse. If output expansion in industry and services does not employ new workers (Path C), the ratio deteriorates to 7.27. Only a pure ‘Lewis-style’ pattern of growth leads to an improvement in the distribution of labour income (Path A).

The point of this exercise is to emphasize the power, the inevitability, and the paradoxical nature of the structural transformation. Even a narrow focus on agricultural productivity per se must be set within this transformation. The crucial point is that the faster the structural transformation, the faster is the decline in the share of agriculture in both the economy and the overall labour force. And the paradox is that, the faster the structural transformation, the faster that rural productivity – proxied by rural labour productivity – rises (as in Path A). This is true even though the rate of growth of agricultural GDP is the same in all three scenarios. Consequently, a broader focus on rural productivity and pathways out of rural poverty will inevitably incorporate the structural transformation as the basic framework for macro consistency and general equilibrium. Achieving and sustaining widespread food security depends on rising rural productivity and reduced poverty, and hence structural transformation and food security are inextricably linked.

FIGURE 3:
Schematic illustrating the stylized trends in total agricultural output, output per agricultural worker, agriculture as a share of the labour force and in GDP, during the course of the structural transformation (from ‘poor’ to ‘rich’)

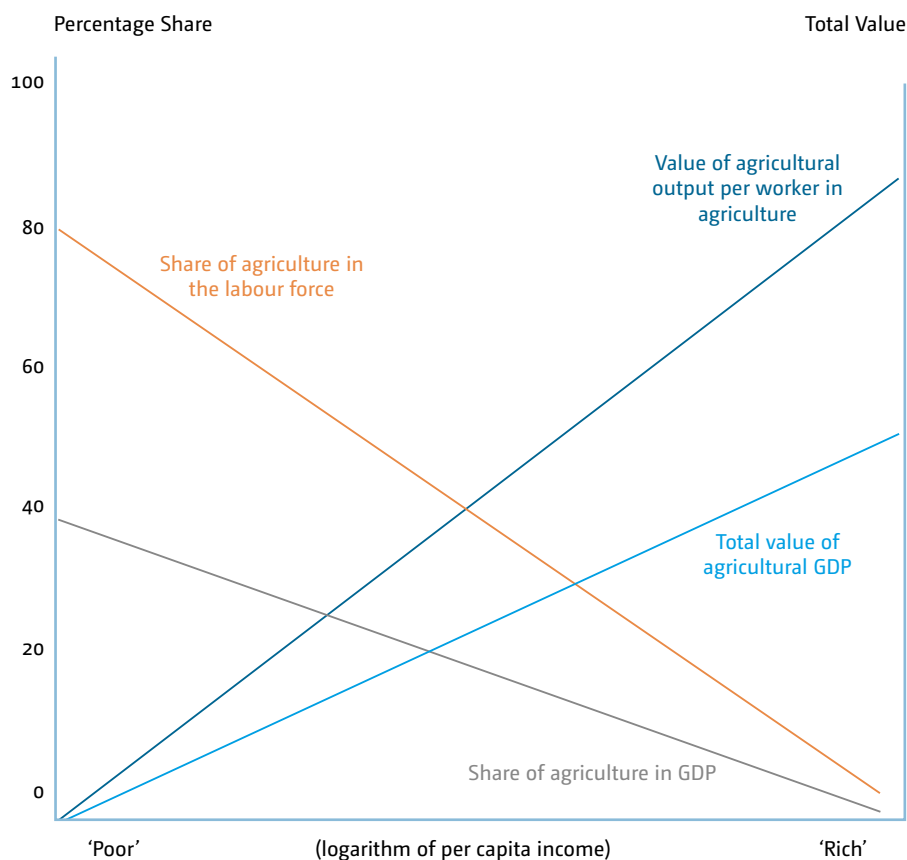


TABLE 1:
The simple
(but implacable)
mathematics of the
structural transformation

Start (year 0)	Industry	Services	Agriculture	GDP
Output	20	30	50	100
Share of GDP	20	30	50	100
Number of workers ⁵	7	15	50	72
Labour productivity	3	2	1	1.4
Share of workers in total	9.7	20.8	69.5	100
Sectoral growth rates (per cent/year)	7.5	5.0	3.0	4.5
Contribution to growth in year 1	1.5	1.5	1.5	4.5
End (year 20)				
Output	85	80	90	255
Share of GDP	33.3	31.4	35.3	100
Number of workers ⁶				
Path A	28	40	39	107
Path B	14	24	69	107
Path C	7	15	85	107
Labour productivity				
Path A	3	2	2.32	2.4
Path B	6.3	3.3	1.31	2.4
Path C	12.7	5.3	1.06	2.4
Share of workers in total				
Path A	26.2	37.4	36.4	100
Path B	13.1	22.4	64.5	100
Path C	6.5	14.0	79.5	100
Contribution to growth in year 20	2.5	1.6	1.1	5.2
Ratio of labour productivity (wages or income) in the top quintile of workers relative to the bottom quintile				
Start	2.55			
Path A	1.50			
Path B	4.02			
Path C	7.2			

Source: Timmer (2009a).

⁵ The active labour force will grow by 2.0 per cent per year.

⁶ Path A assumes that labour productivity in industry and services remains constant as the two sectors absorb new labourers at the same rate as output expansion (the classic Lewis assumption). Agricultural employment remains the residual, with changes there consistent with general equilibrium. In Path B, labour productivity in industry and services increases at half the rate of output. In Path C, labour productivity in the industrial and services sectors increases at the same rate as sectoral output, so no new labour is hired. Note that Paths A and C are extremes that are somewhat outside historical experience.

2.2 Agricultural transformation

Although the structural transformation is a general equilibrium process that is not easily visible from inside the agricultural sector, the changing demand and productivity patterns induce significant change within the sector itself (Timmer 1988). This agricultural transformation is driven by changing domestic demand, opportunities for international trade, commercialization of decision-making, and technical change. This technical change can be specific to a commodity, as in 'green revolution' varieties of wheat and rice. Or it can be sector-wide, involving better inputs, improved knowledge, communications, infrastructure, and financial intermediation. Non-staple commodities, such as palm oil, beverage commodities such as coffee, and non-food commodities such as rubber, play larger roles in certain circumstances.

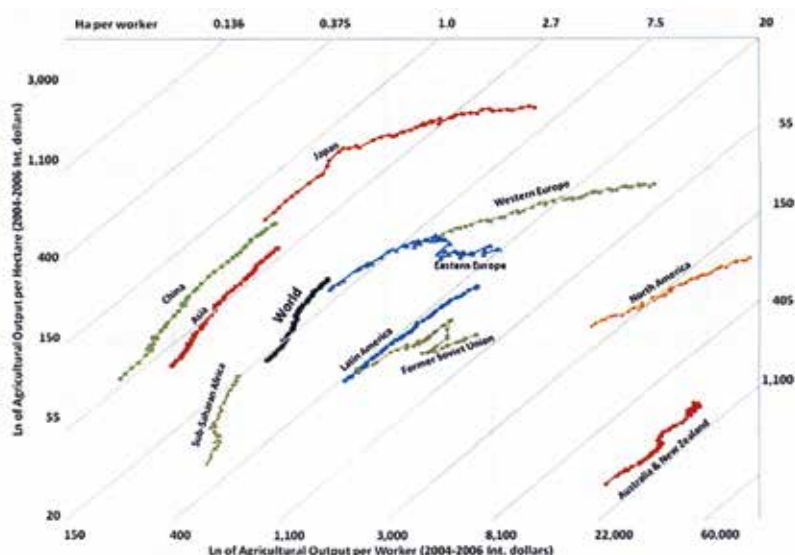
Measuring the agricultural transformation

No single measure of the pace and extent of agricultural transformation captures the complexity and heterogeneity of the process – much is country- and time-specific. The most graphic and general representation of the process of agricultural transformation is the 'Ruttan-agram', which measures the logarithm of productivity per hectare on the vertical axis and productivity per worker on the horizontal axis (see Figure 4). This two-dimensional perspective on agricultural development was developed in Hayami and Ruttan (1971, 1985), in which it was used as a powerful tool to demonstrate the multiple paths to successful agricultural transformation. The 'Asian Path' relied heavily on new biological and chemical technologies to raise yields in land-scarce, labour-surplus environments, whereas mechanical technologies were used to raise labour productivity in land-abundant, labour-scarce environments. Japan characterized the

former approach to raising agricultural productivity; the United States, Canada, and Australia/New Zealand characterized the latter. Western Europe was, appropriately, in between these two more extreme approaches.

Figure 4 shows the pathways of productivity change in the agricultural sectors of major regions, as well as the world total. Two things are striking. The first is the rapid pace of gain in most regions (indicated by the overall length of the line for each country or region because both axes are measured in logarithms). Japan and China have both seen major gains in labour and land productivity, especially since about 1980, although average farm size only started to increase in Japan since then; most of Europe has seen gains in labour productivity via larger farm size, although Eastern Europe and the former Soviet Union suffered severe reversals after the fall of communism. The most striking feature of Figure 4, however, is the stagnation of growth of labour productivity in Sub-Saharan Africa. Although yields per hectare were increasing slowly, there has been virtually no gain in labour productivity in agriculture since 1961.

FIGURE 4:
Land and labour productivity in
agriculture, 1961-2010



Source: Pardey (2011). Reprinted with the permission of the author.

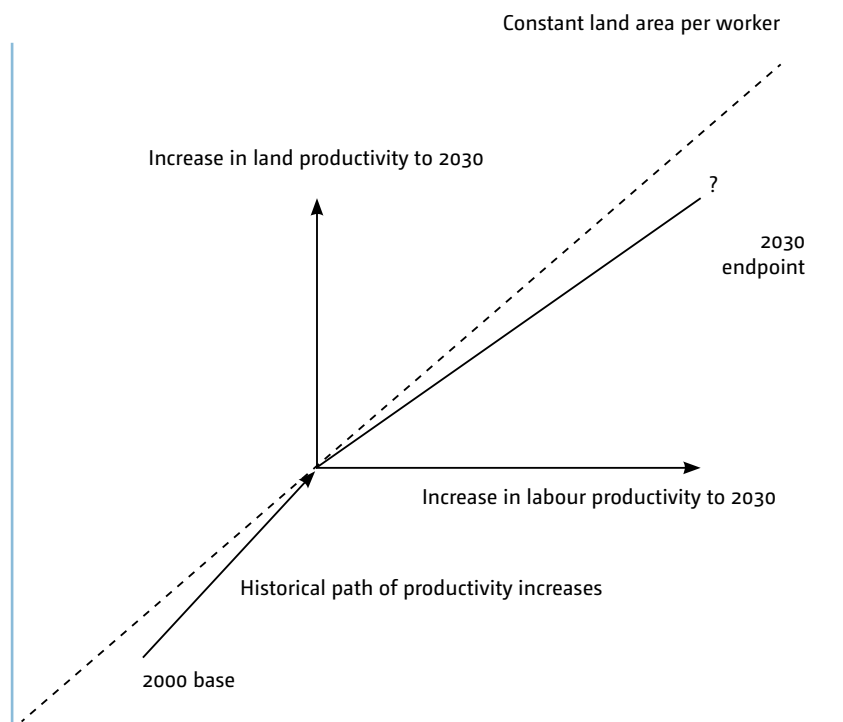
The second striking feature is that land consolidation had barely begun at a global level. Indeed, farm size continues to get smaller on average, driven by the gradually shrinking farms in Asia and the more quickly falling farm size in Africa. Farm size has been virtually constant in Latin America. Uncertain land ownership and tenancy laws in Asia and Sub-Saharan Africa may account for some of this 'stickiness' in reported farm size. Outmoded statistical definitions may also be a factor: workers might be counted in the agricultural labour force even if most of their income is derived from off-farm sources.

A 'stylized' variant of the Ruttan-agram provides a very informative framework for understanding how land and labour productivity will need to increase in agriculture if key objectives in the post-2015 Sustainable development goals (SDGs) are to be realized (see Figure 5).

FIGURE 5:
Increases in land and labour productivity needed to achieve post-2015 sustainable development goals

Notes: Diagonal line (45 degree) represents constant hectare-per-agricultural-worker ratios. Land productivity must increase to meet food demand in 2030 if area expansion (deforestation) is to be kept to a minimum. Labour productivity must increase in smallholder households if goals for poverty reduction and elimination of hunger are to be met. As drawn, some of the increase in labour productivity is achieved through higher on-farm yields and some comes through increases in farm size. This combination implies that some smallholder farmers leave the agricultural sector for better income opportunities off the farm, whether in rural non-farm activities or in urban employment. The length of the diagonal arrow (2000 to 2015 and 2015 to 2030) is a measure of the rate of total productivity increase in agriculture. For example, for the 15-year period from 1995 to 2010, global agricultural productivity increased by 2.9% per year, a result of labour productivity increasing by 1.78% per year and land productivity increasing by 2.28% per year. During this period land area per agricultural worker actually declined.

Source: Author's research.



As the notes to Figure 5 indicate, significant increases in labour productivity will be needed between 2015 and 2030 if the poverty reduction targets in the SDGs are going to be achieved. That is, a successful structural transformation will be the key ingredient to success with the SDGs.

The changing role of rice in Asia

The composition of agricultural output also can change significantly during the transformation process. The changes tend to be geographically specific, and one of the most dramatic changes in terms of global influence on food security has been the changing role of rice in production and consumption, especially in Asia, where rice has been the staple food grain for millennia – the touchstone of food security. Most Asian policy makers still think it is, or at least they think that keeping rice accessible at stable prices remains the operational definition of food security. At one level, this attitude is correct, as the poor in Asia depend heavily on rice for their daily consumption needs. But in a broader sense, rice is simply no longer all that important to most farmers, consumers, or to the macro economy. Things have changed.

The structural transformation has altered the role of rice in the agricultural and overall economies of Asia and the rest of the world. At a global level, the share of cereals has not changed much from 1961 to 2011, rising slightly from 1961 (20.8 per cent) to 1980 (23.5 per cent), reflecting the productivity impact of the new technologies for rice and wheat. By 2011, however, the share of cereals has declined to 19.8 per cent of total agricultural production, virtually unchanged from the 1961 value.

There is substantial regional variation in this pattern. The share of cereals in East Asia's total agricultural production rose from 37.2 per cent in 1961 to 39.6 per cent in 1980, before falling sharply to 18.4 per cent in 2011. A rapid agricultural transformation was going on in East Asia after 1980, both cause and effect of the rapid economic growth in the region and its accompanying structural transformation. South Asia saw similar, but more modest changes, as did Southeast Asia, from a higher base. Africa, of course, relies much less heavily on cereals in its agricultural production, and there is little change in that pattern from 1961 to 2011.

At a global level, the share of rice in total cereal production has not changed a lot between 1961 and 2011, starting at 24.6 per cent and rising gradually to 27.9 per cent. But the regional patterns of change are quite dramatic. First, it is obvious that Asia relies far more heavily on rice than the rest of the world, as East Asia's share of rice fell steadily from 56.2 per cent in 1961 to 40.6 per cent in 2011. A similar, but slower decline from a higher base is seen in South Asia. Southeast Asia is heavily dependent on rice. It accounted for 90.6 per cent of cereal production in 1961, and rice still accounted for 84.0 per cent of cereal production in 2011.

Perhaps surprisingly, Africa has steadily increased its production of rice since 1961 (by 3.7 per cent per year), and the role of rice in overall cereal production. In 1961, rice was 9.3 per cent of total cereal production in Africa, and this share has risen steadily to become 15.9 per cent in 2011. Rice has become a significant cereal crop in Africa. Rice has been about 5 to 6 per cent of agricultural production since 1961, but the share varies enormously by region. In East Asia, the share of rice has dropped from about a fifth of agricultural output to less than a tenth. Rice remains more significant in South Asia, contributing 14.7 per cent in 2011. In Southeast Asia, rice contributed 37.7 per cent of agricultural output in 1961, a figure that has dropped steadily, but slowly, since then. In 2011, rice still contributed 27.8 per cent of agricultural output in Southeast Asia.

The share of rice in Africa's agriculture is small, just 1.4 per cent in 1961. But unlike the patterns in Asia, the share of rice in Africa is rising; it was 2.2 per cent in 2011. Although still a small factor in Africa's overall agricultural production, it is clearly a commodity with a promising future.

For the entire world, agriculture contributed a bit over 10 per cent of economic output in 1961 and just 3.1 per cent in 2011. These low numbers are the result of the economic dominance of rich countries in global GDP, and the very small contribution of agriculture in these economies. Asia is much more dependent on agriculture, although the rapid structural transformation in East and Southeast Asia means that dependence has fallen rapidly. For East Asia, the share of agricultural value added in overall GDP declined from 16.9 per cent in 1961 to 5.8 per cent in 2011. In Southeast Asia, the agricultural share of GDP declined from 30.8 per cent in 1970 (the World Bank does not report these data back to 1961) to 12.5 per cent in 2011. The share of agriculture in South Asia's economy is higher, starting at 41.9 per cent in 1961 and declining to 18.1 per cent in 2011. The share of agriculture in Africa's economy is surprisingly low, and it has declined significantly because of the increased role of mineral and energy exports, from 22 per cent in 1961 to 11.9 per cent in 2011.

The contrast between Asia and the rest of the world is sharp: in 1961, agriculture was 2.8 times as important to Asian economies as to the world as a whole (taking the population-weighted average of East, Southeast, and South Asia). This ratio had climbed to 3.9 times as important in 2011. Despite the rapid transformation of Asian economies, agriculture remains very important (which is mostly because Asian economies remain, on average, very poor).

Finally, how has the role of rice changed? At a world level, rice accounted for just over one half of 1 per cent of GDP in 1961. Over the next half century, the share of rice in GDP for the entire world fell to just 0.2 per cent of GDP. In terms of overall economic output on a global scale, rice is a very small factor.⁷

In Asia, rice is far more important, although its share in national economies is not as large as many observers think. Even in 1961, rice accounted for just 3.5 per cent of GDP in East Asia, 8.5 per cent in South Asia and 11.6 per cent in Southeast Asia. Naturally, because of the structural transformation and the declining role of agriculture in successfully growing economies, and the agricultural transformation, where farmers diversify out of production of low-value rice, the share of rice in Asian economies (share of GDP) has declined very rapidly. In 2011, it was just 0.4 per cent in East Asia, 2.7 per cent in South Asia and 3.5 per cent in Southeast Asia. So, even in Asia, rice is less important economically than livestock, construction, or transportation, even banking. Total employment in the rice economy might still rival these other sectors, but that is because the economic returns to working in the rice sector are so low – a failure of the structural transformation to absorb rural workers fast enough.

The implications for food security of this rapid change in the role of rice in the agricultural economies of Asia is critical to understanding how to manage structural

⁷ It should be emphasized that these are production shares of rice to value added and do not include the value of processing and marketing. The share of rice at the level of consumption is probably about half again as large.

transformation. Two perspectives are important: what is happening to rice consumption and its role in the food security of poor households; and how does the diminished role of rice in the overall economy affect political approaches to food security (and hence to managing the structural transformation that seems to be threatening it)? These questions are addressed in the following sections.

The politics of rice

It was noted in the 1980s that a successful structural transformation has always been painful for rural households (Timmer 1988). Although the structural transformation seems to offer the only sustainable pathway out of poverty in the long run, it can be a very challenging process for the poor in the short run. Is there any way to manage the process without hurting the poor? To answer the question, a historical perspective on the structural transformation is essential, especially the experiences in the countries of East and Southeast Asia that managed both rapid growth and stability or even improvement in income distribution during the process (World Bank 1993; Ravallion and Chen 2004; Timmer 2004).

Analysis of research on ‘pro-poor’ growth suggests that an ‘Asian’ pattern of rural development and poverty reduction exists (Oshima 1987; Besley and Cord 2006; Grimm, Klasen, and McKay 2007). The common structure involves the evolution of the agricultural sector from a starting point of household subsistence production, through the adoption of new technologies that provide surpluses and rural food security, to more diversified farm activities driven by commercial forces, and finally to the full integration of the agricultural economy into the overall economy.

This structural pattern can be examined from the perspective of the main policy concerns shown by Asian countries at each stage, and the links between these policy concerns and the key economic drivers and mechanisms for change. Asia may have been unique in its early concern for food security, including for rural households, as the main policy focus that mobilized substantial resources on behalf of agriculture (Timmer 2005a). The importance of rice in Asian food security – it accounted for 30 per cent of caloric intake in 2005 – and the tenuous (and tense) relationship between domestic rice economies and the world market for rice, focused political and economic attention on agricultural productivity in ways not seen in other parts of the world.

For Asia, the Green Revolution technologies for wheat and rice transformed their potential for a domestic approach to food security. When this potential was fully realized – in Indonesia in the early 1980s, in India in the late 1980s, in Bangladesh and China in the early 1990s, and in Vietnam in the mid-1990s – the policy concern turned to supporting farm incomes in the face of declining world prices for cereals. The ‘efficient’ way to do this was through the next structural phase, into diversification and specialization. Bangladesh seems to

be moving in this direction. The more advanced regions in China are already well down this road. The alternative approach, however, is to maintain farm incomes by protecting the rice sector, using subsidies to keep inputs cheap, and thus to slow the diversification process. Both India and Indonesia are caught in this expensive and distortionary approach. It is impossible to move on to the stage of rapid productivity growth and integration into the overall economy as long as the diversification phase is postponed.

The structural transformation gradually closes off policy options for the agricultural sector. It is simply not possible to keep a third of the labour force employed growing rice and also have a modern industrial and service economy. Policy makers who fight the forces of structural transformation are fighting against the tide.

At the same time, the structural transformation opens new options to policy makers to cope with the distributional consequences of structural transformation. Making rice ‘expensive’ in East Asia, when it was 6.8 per cent of the entire economy, would have been a fiscal fiasco. In 2010, doubling the price of rice in China to increase farm income might not have been a wise economic policy, but since rice was less than 1.0 per cent of the economy, it was no longer fiscally impossible. The degrees of freedom for policy, wise or unwise, are clearly greater.



Is there any way to manage the process without hurting the poor?

In 2015, rice is still important on both counts in Asia, and it is rising, not falling, in importance in other parts of the world, especially Africa. In Bangladesh, for example, rice still provides about two-thirds of daily caloric intake, and the average for all of Asia has just fallen below 30 per cent. In much of Asia, rice is now the food of the poor. Price volatility and market shortages have a direct impact on poverty.

In nearly all of Asia, rice farmers (whether part-time or full-time) are the single largest identifiable interest group, a fact not lost on political leaders. It is no accident that political elections in 2009 in India and Indonesia were won by leaders who provided sharply higher prices to rice farmers than in the world market in the years leading up to the world food crisis in 2007, and then were able to buffer domestic consumers from the panic-driven prices in world markets in early 2008. Stable rice prices, even at high levels to support farmers, seem to be a winning political strategy. Only a successful structural transformation makes such a strategy financially feasible, even if it remains economically inefficient. But economists have not been very effective in designing efficient food price stabilization programmes that politicians need to stay in power (Dawe and Timmer 2012).

Thus the structural transformation is a two-edged sword. It reduces the importance of agriculture, and rice, to the overall economy. At the same time, it also creates the resources to spend on making the rice sector successful in contributing to the goals society has held out for it for generations: food security for consumers; and satisfactory income for producers.

2.3 Dietary transformation

As with the agricultural transformation, no single measure captures the complexity of dietary changes, and much is specific to local customs and tastes. In general, two basic regularities have been observed in food consumption patterns as countries have become richer:

Engel's Law: the share of food in budget expenditures falls with higher incomes, thus providing a buffer against the welfare impact of sudden changes in food prices, and

Bennett's Law: the share of starchy staples in the diet falls with higher incomes, as a deep, perhaps 'hard-wired' desire for diversity in the diet can be expressed (Bennett 1954).

Less well-established regularities also suggest that long-run changes in relative prices, changing demographics, as well as exposure to 'foreign' eating patterns have an impact.

Table 2 illustrates the complex changes in Southeast Asia, a rapidly developing part of the world. This dietary transformation is in a region that has made substantial progress in reducing hunger.

The dietary transformation in Southeast Asia

Four things are striking in Table 2. First, total caloric intake has risen steadily, by 0.8 per cent per year. In 1961, when average food availability per capita was just 1,814 calories per day, most citizens of Southeast Asia would have been chronically hungry. By 2009, the most recent year for which data are available, food available per capita per day reached 2657 calories.⁸ At that level, hunger would not be common, and obesity would be a rising problem.

Second, the starchy staple ratio – the share of calories coming from cereals and starchy roots – fell from 74.8 per cent in 1961 to 62.1 per cent in 2009. In roughly 40 years, intake of animal protein nearly tripled. The quality of the diet in nutritional terms improved markedly, although the doubling of fat in the diet is a worrisome sign. Third, rising consumption of animal products would require a modern feed industry to supply domestic producers of poultry, livestock and aquaculture products, unless imports of final goods increase drastically. Domestic farmers have a rapidly growing market for feedstuffs, but at the moment, a very large proportion of Southeast Asia's feed ingredients, especially maize and soy meal, is imported.



⁸ Caloric intake data are from FAO Food Balance Sheets.

TABLE 2:
The dietary transformation in Southeast Asia

Start (year 0)	1961	1970	1980	1990	2000	2009	2010	2011	Avg. % change/year 1961 to 2011
Food supply, (kcal/cap/day) Total	1841	1953	2136	2178	2377	2609	2646	2678	0.75
Cereals (ex. beer)	1189	1308	1407	1379	1462	1518	1531	1536	0.51
Rice	1071	1162	1218	1193	1232	1241	1239	1244	0.30
Rice kcal as % of total kcal	58.2	59.5	57.0	54.8	51.8	47.6	46.8	46.5	
Starchy roots	187	133	145	102	89	99	103	104	-1.17
Wheat	31	62	82	66	107	126	134	129	2.89
Starchy staple ratio	74.7	73.8	72.7	68.0	65.3	62.0	61.8	61.2	
Food supply, gm/cap/day									
Animal protein	8.5	10.2	10.6	13.0	16.8	22.8	23.5	24.1	2.11
Fat	27.6	29	32.8	40.7	46.2	58.8	59.2	60.5	1.57
Wheat as % of rice	2.89	5.34	6.73	5.53	8.69	10.15	10.82	10.37	

Source: FAO Food Balance Sheets. Adapted with the permission of the Food and Agriculture Organization of the United Nations.

Fourth, calories from wheat increased 8 per cent per year, and this consumption of wheat was more than a tenth of rice consumption. Southeast Asia imports all of its wheat. Indonesia surpassed Egypt in 2013 as the world's largest importer of wheat. A volatile world market for wheat will increasingly be seen as a threat to food security in Southeast Asia, but national agricultural development strategies cannot be used to cope with that threat. Since rice is becoming less important to food security in the region, and wheat and feed grains are becoming more important, management of food security will increasingly be a trade and macro economic issue rather than an agricultural issue.

Finally, the demand for livestock feed to enable the dietary transition raises an obvious question raised earlier: all of these 'feed stocks' also serve as 'fuel stocks'. The potential for commodities – especially maize, sugar, palm oil, and cassava – to be grown as raw materials for production of bio-fuels needs to be seen as a direct competitor for their use as feed for livestock (and fish). Continued political support for production of bio-fuels is a challenge to the dietary aspirations of hundreds of millions of households with new discretionary incomes that permit livestock and aquaculture products to be served on their table. The consequences for food security are highly uncertain.

Diet transitions and changing rice consumption

As noted, momentous changes are underway in rice consumption, especially in Asia. New data, extensive econometric analysis, and a historical perspective help build an understanding of the underlying dynamics of these changes. The result is surprising. Projections that result from these analyses suggest a significant decline in global rice consumption by 2050, with the global decline starting between 2020 and 2030. The main drivers of this decline are rapid income growth in Asia, accompanied by a massive shift of labour from rural to urban areas. With more open trade and the globalization of tastes, a shift to more balanced diets in Asia – less rice and more wheat, animal products, fats, and oils, and vegetables and fruits – means a decline in rice consumption. The foundations of this decline have been apparent in the global data since the early 1990s, when the aggregate income elasticity of demand for rice turned negative. Consumption of rice per capita peaked about the same time (see Timmer, Dawe and Block 2010, for details).

By their very nature, aggregate time series data conceal the possibly wide heterogeneity of rice consumption among individual households. This heterogeneity is indeed very wide, at least in most of the countries for which disaggregated data are available. The heterogeneity is driven by household incomes, by whether the household lives in urban or rural areas, and by many other factors, including tastes. To understand this heterogeneity, a unique set of data was assembled – rice consumption by income (or expenditure) quintile, usually for rural and urban households separately, often for several time periods, for a total of 11 countries. China, India, and Indonesia alone account for 60 per cent of world rice consumption. Disaggregated data for these countries is essential to understand the underlying dynamics of rice consumption. The Philippines and Vietnam are also large consumers of rice. The Philippines has on occasion been the world's largest importer, and Vietnam has routinely been the second largest exporter. Bangladesh is both a major rice producer and consumer. Nearly 70 per cent of its daily intake of calories still comes from rice.

Patterns of change

Six patterns stand out from these data. First, there is overwhelming diversity of rice consumption levels across countries and regions within a country. In China alone, in 2005, for example, rice consumption in rural Shandong – China's second most populous province with 94 million inhabitants – averaged less than 0.07 kg per capita per week; whereas in rural Jiangxi province, with 44 million inhabitants, rice consumption averaged over 4.3 kg per capita per week.

Second, there can be major differences in rice consumption by income class for a given country or region at one point in time, especially if they are quite poor. In rural Java-Madura in 1963–64, rice consumption by the top income quintile was 2.552 kg per capita per week, more than three times the level of the bottom quintile. At that time, of course, rural Java was desperately poor. The ratio for rural India in 1983 was 2.2, and 1.7 for rural Anhui province in China in 2005.

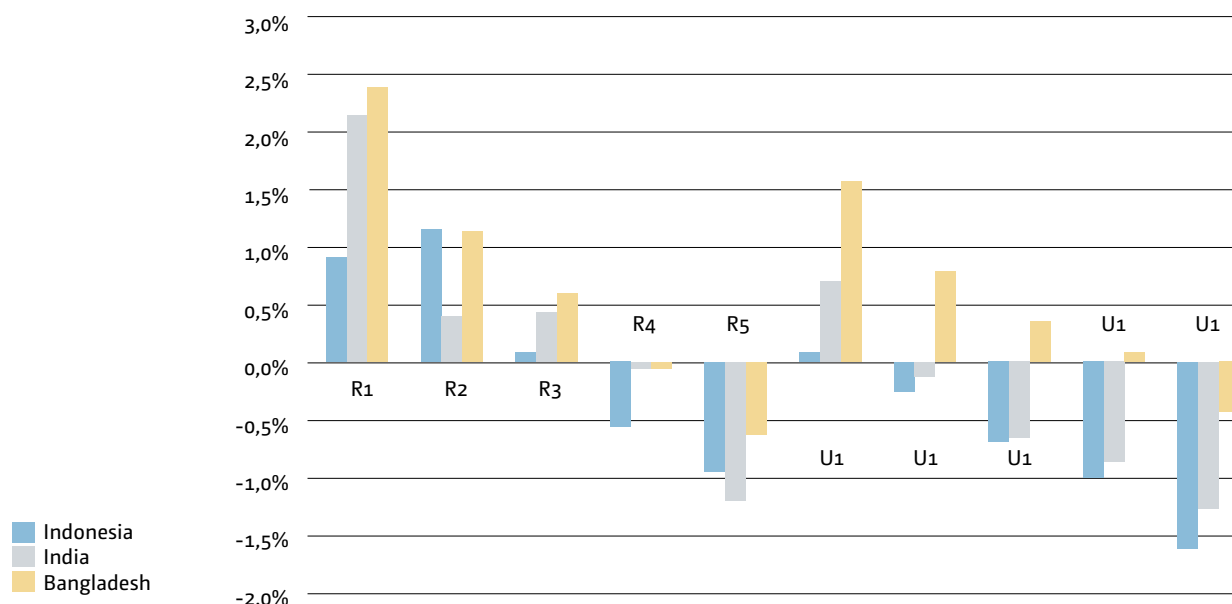
Third, large differences between rural and urban consumption of rice are common, but the differences change substantially over time and by income classes. For example, in 1963–64 Java-Madura, rural consumption of rice in the bottom quintile of income was only about half that of the same urban quintile, but in the top income quintile, rural consumption of rice was slightly larger. In 2004–05 India, rural rice consumption in the top quintile was about half again as large as in the top urban quintile. The rural-urban differences were especially large in China in 2005. In Jiangxi province, rural consumption of rice was more than 3.3 times higher than urban consumption of rice, when averaged across income quintiles, and it was 3.7 times higher in the top income quintile. In most important rice consuming areas, rural rice consumption is significantly higher than urban rice consumption. These patterns have direct implications for future levels of rice consumption when a larger share of the population works in urban areas.

Fourth, the income elasticity of demand for rice from these cross-section data depends on whether the household lived in a rural or urban area. Most income elasticities for urban households were zero or negative. Income elasticities were more positive in rural areas, no doubt because incomes in these locations were lower on average. There was still at least a modest increase in rice consumption across income quintiles in all countries and most provinces of China. Even this effect dropped significantly over time. In Indonesia, for example, the ratio of rural rice consumption in the top income quintile to that of the bottom quintile dropped from 3.29 in 1963–64 (for Java-Madura) to 2.50 in 1976 (all Indonesia) and to just 1.30 in 2006. In India, the same ratio dropped from 2.21 in 1983 to 1.07 in 2004–05. Continued growth of incomes in rural Asia is likely to cause the consumption of rice in these households to fall.⁹

Fifth, there was a dramatic convergence of rice consumption patterns across income classes in those countries for which we have multiple observations – Indonesia, India, and Bangladesh. This convergence was partly a result of flattening Engel curves across income classes as overall levels of income rose (Figure 6), but it is also possible that tastes were changing in ways that made patterns of food consumption more uniform across households, whatever their levels of income and place of residence.

⁹ In Indonesia and India, where data are available to disaggregate the top quintile of income into smaller increments, such as deciles or smaller, there is evidence of negative income elasticities for rice consumption in the top half of the top income quintile, even in rural areas.

FIGURE 6:
Annualized percentage change in rice consumption by quintile
and location (Indonesia, India, and Bangladesh)



Notes: R refers to rural quintiles, U to urban quintiles. Period over which changes are calculated are 1967-2006 for Indonesia, 1983-2005 for India and 1983-2005 for Bangladesh.

Source: Timmer, Block, and Dawe (2010).

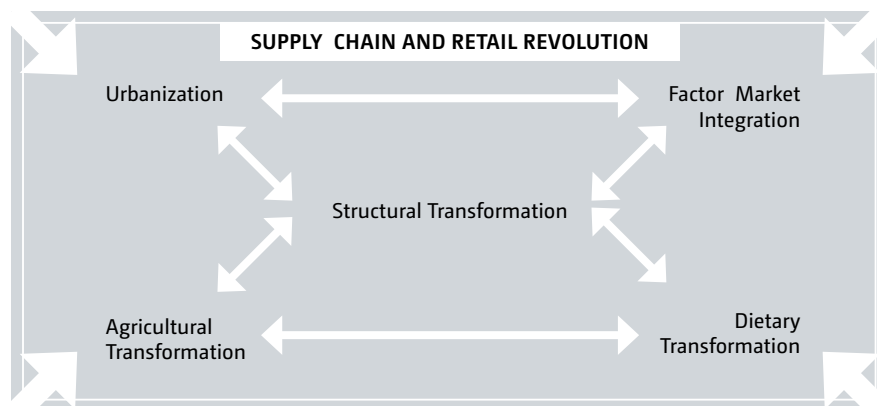
Finally, the argument that tastes are changing to become more homogeneous, especially in urban areas, seems especially relevant in China. In rural areas in China, the latitude of the capital city was a strong determinant of per capita consumption of rice. In low latitudes, rice has long been the traditional staple crop. In high latitudes, wheat is the traditional staple, and rural dwellers stuck to traditional patterns of consumption (based on the data from 2005). Thus, a one degree decline in latitude increased annual rice consumption per capita in rural areas by 11.3 kg.

As noted above, these are momentous changes in rice consumption, both driving and being driven by the broader transition of diets. Underlying the dynamics of these changes is the desire of most Asian consumers to have a more balanced diet than that which has traditionally been available to them, especially in rural areas. Historically, it was not unusual for rural Asian households to get 70 per cent of their daily calories from rice. It was the only food staple that could be grown intensively in their agro-climatic environment, and trade opportunities were limited. Furthermore, Asia is the only region in the world where a single staple grain so dominates patterns of consumption. As rising incomes, more open trade, and global communications present the opportunity to diversify their diets, we should not be surprised that they respond.

2.4 Transformation of the food marketing system

Food marketing systems need to move commodities ‘from the plow to the plate’. The ability of particular systems to do this efficiently varies widely from country to country, and even within. Some systems have modernized rapidly; others remain quite traditional. The pace and impact of change also varies widely within countries and regions, but in Asia and Latin America the majority of food purchases in urban areas are now from modern retail establishments, especially supermarkets. As this study emphasizes, the structural transformation has been the historic pathway out of poverty. Two other transformations discussed above – agricultural and dietary – accompany the structural transformation. They have lives of their own. Accompanying these three basic transformations, and helping them along, have been rapid changes in the entire food marketing system (Figure 7).

FIGURE 7:
Five key components of the
agri-food system: Drivers of
structural transformation



Source: Author's illustration.

The food marketing system is the arena for all three functions which markets must play if economic growth is going to be both efficient and sustainable – transforming food commodities in time, place and form; price discovery to determine which resources are scarce and which are abundant; and signalling to farmers and consumers, via these prices, efficient choices of what to produce and what to buy and eat.

Modern supply chains have evolved primarily to provision supermarkets. Concerns for food safety and origin are increasingly reflected in the purchasing decisions of affluent consumers in urban areas. The development of modern supply chains, which change the nature of farm-market-consumer interactions, can be an important source of income growth and job creation in both rural and urban areas. But the spread of modern supply chains can also be a challenge to food security (Reardon et al. 2003). The experience of Asia offers the best evidence and diversity of these complex relationships. Quantifying the linkages and interactions in Figure 7 is complicated at best, but many of them are reflected in the changing role of rice in production and consumption in the region. The changing role of rice has been used as a 'storyline' to carry the analysis of structural, agricultural, and dietary transformations as they foster improvements in food security.

Traditionally, farmers were connected to consumers by a number of marketing steps, often locally by small traders operating with minimal capital and primitive technology (Reardon and Timmer 2007, 2012). A summary of the various components of the food system is illustrated in Table 3. Modern supply chains increase the efficiency of product flows from top to bottom – from inputs to farmers to retail outlets to consumers. At the same time, diversification of diets is causing a rapid shift from the left column – starchy staples, which are the main foods of the poor – to the livestock products, fats and oils, sweeteners and fruits and vegetables demanded by more affluent consumers, in the right-hand column. The goal of modern supply chains is to reduce the number of transactions between the farmer and the consumer as a way to reduce costs and increase the efficiency of the marketing system. Four important trends emerge from this process.

First, within a particular commodity system, such as for rice or maize, the different levels in the marketing system are increasingly connected by market and non-market forces. Suppliers of technology in the private sector cannot expect effective demand for inputs unless farmers are able to sell surpluses into the market. Successful efforts to reduce the transactions costs of incorporating small farmers into modern supply chains can simultaneously pay dividends by making these same farmers more accessible to modern input suppliers.

Second, emphasis on marketing starchy staples as the primary source of food security has shifted to the 'diversified foods' sector. This shift reflects Bennett's Law (Bennett 1954). Diversification of diets tends to improve the nutritional quality of the diet, although more processed foods and industrialized meat production raise nutritional, environmental, and food safety concerns.

TABLE 3:
Modernizing food supply chains

	Food grain economy (starchy staples)	Non-staple commodities (fruits and vegetables, meat/ dairy, processed foods)
Farm inputs/supplies	Smaller area possible Higher yields, stress tolerance Consumer quality	More value/hectare, but what role for small farmers (what 'assets' do they need to stay in?)
Farm production (management and knowledge)	Very knowledge-intensive for good management practices; Access to inputs by farm size	Knowledge-intensive; can there be effective extension for new technologies? Role of farm assets
Procurement/logistics and wholesalers	Less rural consumption as workers leave; more transportation and storage; greater production instability with climate change	High transaction costs of dealing with small farmers; issues of quality control and product traceability
Procurement/logistics and wholesalers	Milling technology How to add value; branding?	Large share of consumer food expenditure is spent in this box
Retail/consumer welfare and health dimensions	Supermarkets as suppliers of food grains? Increased price stability through private actions? Problems of access by the poor?	Modern supply chains are funnelling consumer demand back up the system. The food system is less supply driven.

Source: Reardon (2010). Reprinted with the permission of the author.

Third, this increasingly diversified, market-driven food economy is more reflective of supply chain dynamics and consumer demand than in the past. The food marketing system is more sensitive to rapid income growth and somewhat less sensitive to population growth. Population growth is slowing quickly in most of Asia, and income growth continues at a rapid pace. In such environments, understanding how demand for individual items responds to income growth will be necessary for effective planning of investments – by both the public and private sectors – all the way back the chain to input supply. Other factors that shape consumer demand for food will also be important, such as advertising, age structure, urbanization, and globalization of tastes.

Fourth, as consumers increasingly use supermarkets as the source of their purchased food staples, some surprising implications arise for food security and how to manage it using public sector initiatives. Traditionally, staples have been purchased in small retail shops with multiple grades and varieties available. Prices fluctuated according to local supply and demand conditions and often changed daily during periods of instability. The concentration of purchasing power into a handful of supermarket chains raises the possibility that procurement officers for food staples will encourage (force) their suppliers to maintain large enough stocks so that supplies will be reliable and that prices can be kept reasonably stable. Indeed, it is easy to imagine supermarkets, especially in East and Southeast Asia, where unstable rice prices are a threat to food security, beginning to compete for customers with a promise of 'safe, reliable rice supplies, at a stable, fair price'. Rice price stability could become a private good rather than the public good it has been historically (Timmer 1989, 2010). When most food is purchased in supermarkets, the debate over how to provide food security – even in settings where volatile food prices can threaten it – will be transformed. We are a long way from that situation in 2015, but supermarkets are increasingly important as a supplier of basic food staples, and hence food security, in developing countries.

From a long-run perspective, these changes are simply part of the process of economic growth and are 'the natural course of things', to quote Adam Smith's observation in the eighteenth century.¹⁰ The structural transformation causes entire societies to undergo the wrenching changes associated with agricultural modernization, migration of labour from rural to urban areas, and the emergence of urban industrial centres. As part of this process, both effect and cause, the demographic transition moves a society from an equilibrium of high birth and death rates to a 'modern' equilibrium of low birth and death rates. The centre of gravity moves from rural to urban areas. The structural transformation has taken as long as three centuries in United Kingdom and the United States (and is still continuing), and as little as a century in Japan and its East Asian followers. The process takes a long time. That said, modern food supply chains are changing very rapidly. With that rapid change comes new challenges to managing rapid structural transformation on behalf of reduced poverty and enhanced food security.

¹⁰ The full citation runs as follows. 'Little else is requisite to carry a state to the highest degree of opulence from the lowest barbarism than peace, easy taxes, and tolerable administration of justice; all the rest being brought about by the natural course of things'. Lecture by Adam Smith in 1775, cited in E. L. Jones (1981: 235). The perspective here also draws heavily on Jones' Growth Recurring, published in 1988.

Modern supply chains and the marketing sector: Complements or substitutes?

The primary functions of the marketing sector are inherently 'co-ordination' tasks. They require an adroit combination of public and private investments if they are to be carried out efficiently because there are substantial 'public goods' dimensions to a smoothly functioning marketing system. Historically, these investments have been made very gradually as farmers evolved from subsistence activities toward a more commercial orientation. Now that commercial activities are the norm, even in economies where efficient marketing networks have not had time to emerge, policy makers are actively seeking new models and approaches to speed the creation of these networks. Supermarkets may already be performing this function, with little input from the public sector. This is an example where private supermarkets are supplanting the public sector in the (sub-optimal) provision of public goods.

The agricultural sector as a whole is likely to become much more diversified over the course of the agricultural transformation, when compared with a representative individual farm, but significantly less diversified than food consumption patterns. This increasing specialization of farms (decreasing diversification) is consistent with greater diversity at more aggregate levels because of the commercialization of agriculture.

Commercialization of agricultural systems leads to greater market orientation of farm production; progressive substitution out of non-traded inputs in favour of purchased inputs; and the gradual decline of integrated farming systems and their replacement by specialized enterprises for crop, livestock, poultry and aquaculture products. The farm level determinants of increasing commercialization are the rising opportunity costs of family labour and increased market demand for food and other agricultural products. Family labour costs rise due to increasing off-farm employment opportunities, while positive shifts in market demand are triggered by urbanization and/or trade liberalization (Pingali and Rosegrant 1995: 171–72).

Likewise, patterns of food consumption become more diversified than patterns of domestic agricultural production because of the rising significance of international trade, i.e., globalization.

The growing roles of commercialization and globalization in connecting diversity of production at the farm level with diversity of consumption at the household level spawn new problems, however. In particular, increased commercialization requires that farmers learn how to cope with a type of risk that is of little concern to subsistence farmers: the risk of fluctuating prices. At the same time, specialization in crop production increases their risk from yield fluctuations. Mechanisms for coping with risk, including contractual arrangements with supermarkets, thus play a crucial role in understanding the commercialization of agriculture and the government's role in it. The interplay among price fluctuations, increasing reliance on international trade, specialization of farmers in production for the market in response to profitable new technology, and continued failure of market-based mechanisms for risk management in rural areas accounts for much of the policy interest of governments in the process of rural diversification as a way to manage rapid structural transformation. Such diversification is impossible without a modern food marketing system.

Most countries want to speed up the gradual process of regional specialization and the development of efficient marketing systems, but have found that government investments alone are inadequate. Well-developed, low-cost marketing systems require sufficient supplies of the specific commodities being marketed to justify the full investments needed to capture any economies of scale to the system. Achieving this balance is a simultaneous process, which historically has meant the gradual evolution of both the supply and demand side of the market. Supermarkets are internalizing this co-ordination process and speeding the rate of specialization. A private marketing system that is closed to outside parties will expand in a co-ordinated way to stimulate specialized production in a region, but it will be less of a public good. The lower costs generated by specialization can confer very significant competitive advantages on regions that are both low-cost producers of a commodity and have an efficient marketing system that has adequate volume to capture the economies of scale implicit in the forward and backward linkages.¹¹

The increasing dominance of modern supply chains raises concerns for both the efficiency and equity of price formation, as more and more transactions are internalized by supermarket procurement officers. Such transactions are not open and transparent, and hence concern will grow over the shift in market power toward

¹¹ This perspective on regional specialization has been generalized and formalized in Krugman's work on economic geography, see Krugman (1993).

a few, large buyers, and over the likely exclusion of disadvantaged suppliers from these arrangements. Second, however, and partially offsetting the first concern, supermarkets can also internalize consumers' desires for price stability and hence can manage procurement contracts with stability in mind. Finally, supermarkets in developing countries will tend to be as competitive as in rich countries because much of the competition is provided by trans-national corporations themselves. Fears about monopoly control and market power seem to be ill-founded. The market for the food consumer's dollar is highly contestable, even when only a small handful of players are able to survive the cost competition.

Macro economic and growth issues

Most effects of modern supply chains in developing countries are likely to play out at the firm and sector level, but macro economic effects will not be trivial, especially as lower food costs translate into greater real purchasing power for consumers. By passing on lower costs, or improving food quality and convenience, supermarkets can actually speed up the structural transformation as well as the agricultural and dietary transformations that are part of it (Timmer 1988).

There will also be significant efficiency effects. The mantra of supermarket procurement officers is to 'drive costs out of the food marketing system'. Although these 'costs' are also someone's income, especially farmers and traders in the traditional agricultural marketing chain, lowering food marketing costs not only allows lower consumer costs, but they also free up productive resources that can be used in more profitable activities. This is the process by which total factor productivity improves, and this improvement, including in the food system, is the basic long-run source of economic growth (Timmer 2002).

A final growth effect may in the long run be the most important, the technology spillover effects that result from the use by supermarket managers of imported information technology and modern management techniques honed in the fierce competition of food markets in rich countries. Most of this technology arrives as part of foreign direct investment, which has been the main vehicle of rapid penetration by supermarkets into developing countries (Reardon et al. 2003; Reardon and Timmer 2007, 2012). It is often proprietary, and supermarket owners go to great lengths to keep it internal to the company. But like most technologies, the knowledge that these tools and techniques exist is the key to rapid emulation, as local managers trained by the first wave of foreign supermarkets leave to establish their own companies and consulting firms. Thus the spillovers from introducing modern information technologies and management techniques can occur fairly rapidly and have widespread effects across the entire economy, not just in food retailing.

Modern supply chains will affect not only the efficiency of the food marketing chain, but also the distribution of benefits from the value added in the process. In general, it is very difficult to say whether these distributional changes will be positive or negative – that is, whether income distribution will improve or not.

There are two important offsetting effects. On the negative side, rapid supermarket penetration into traditional food marketing systems can quickly displace family-run, often informal retail shops, traders in traditional wet markets, and small-scale wholesalers. The people displaced usually earn relatively low incomes and will have to make significant adjustments to find new livelihoods. The distributional effect is likely to be negative and can be substantial if these small-scale food marketing firms are numerous and widely visible. Their imminent demise can also generate significant political resistance to the spread of supermarkets, an effect already seen throughout Asia, but with historical antecedents in the United States, Europe, and Japan.

The impact of supermarket penetration on the farm sector has tended to be the most vocal issue. Experience suggests that small farmers can rapidly lose access to supermarket supply chains and thus be cut off from the growing 'value added' component of retail food baskets (Reardon et al. 2009). These farmers might fall further into poverty. But this experience is not uniform. There are circumstances in which small farmers have gained profitable access to modern supply chains. Keeping a significant number of small farmers in the supply chain of supermarkets in the short to medium run is likely to be essential for poor countries to reap widespread social benefits from the rapid domination by modern food supply chains. The impact on the traditional food marketing sector will be small relative to this impact on small farmers.

Potential social benefits also have positive distributional effects. The extraordinary spread and speed of supermarket penetration suggests that affluent consumers find them time-saving and convenient. Low-income consumers do not benefit differentially, at least initially. But lower real food costs across the board (corrected for quality, safety, and convenience, all of which consumers value) have an impact of greatest importance to the poor. Efforts to slow the penetration of supermarkets on behalf of small farmers and traditional agents in the food marketing system need to keep this widespread consumer benefit in the calculus. At the same time, significantly more evidence is needed on whether poor consumers have access to these benefits (Asfaw 2007; Michelson 2013; Umberger et al. 2015).

The fate of small farmers has been a source of policy concern well before the supermarket revolution gained speed in the early 1990s in Latin America, but there is no question that the issue is squarely on the policy agenda. In the short run, finding income opportunities for small farmers is essential, but in the longer run, the structural transformation requires that they need to have other options, including migration to urban jobs.

Managing transformations via policy approaches to food security

Policy makers need to be careful not to 'choose winners' or 'reward losers'. The process of economic development is dynamic and unpredictable, full of 'creative destruction' (McCraw 2007). There will be winners and losers in the process, but only innovation and technical change can raise living standards in the long run.

Thus, the drivers of change in modern food systems may now be multinational corporations rather than domestic marketing boards, the policy levers may be nutritional education and emphasis on activity levels in schools to prevent childhood obesity, and agricultural choices may be more influenced by quality standards and relationships with procurement officers than price policies and extension agents. These changes require that policy analysts also have a broader perspective – and a broader set of skills – than before.

The food system is more consumer-driven than before. The marketing system is even more important as the efficient vehicle for transmitting consumer desires back to farmer opportunities. But there are fewer players in the new marketing system. However, the old problems – building human capital through education, improving the institutional environment for risk management, and stimulating technical change while managing its consequences – remain front and centre on the agenda.

The central role of the structural transformation has been understood for some time: the long-run, integrated modernization of the agricultural, industrial and service sectors underlies economic growth. The convergence of labour productivity in the agricultural and non-agricultural sectors, as that productivity increases over time, provides higher standards of living in both sectors.


The 'endpoint' of the structural transformation – the full integration of factor markets between rural and urban areas – is now within sight in the richest transition countries, but remains a challenge to poor- and middle-income countries. A 'failed' structural transformation, where many poor rural households move to slums in cities because productive work is no longer available on their farms or there are too many mouths to feed from the small amount of land controlled by the household, has been characteristic of many countries in sub-Saharan Africa as well as several in South Asia (Badiane 2011; Binswanger-Mkhize 2012). Failed structural transformations are always accompanied by failed agricultural transformations.

Historically, the structural transformation has been the only sustainable pathway out of poverty. I have made that argument forcefully, but I am not alone. Most of the early development economists and economic historians took this process as an historical inevitability. I studied under Alexander Gerschenkron and co-taught development economics with Hollis Chenery. From this intellectual perspective, it is very hard to understand how a sustainable escape from hunger, into modern economic growth and food security, can be accomplished without these transformations taking place in a more or less orderly fashion. The next section addresses the tensions along this path of transformation, including the possibility that the transformations are failing altogether.



3

Tensions along the transformation path: What needs to be managed?



Policy challenges can arise almost anywhere along the path of even the most successful structural transformation and many of them will be quite specific to the time and place where a problem occurs. In this sense, each country must find its own path, and solve its own problems along the way. Still, comparative economic history is rich with examples of common problems during the structural transformation and four are presented here: (1) the widening gap between labour productivity in rural and urban areas as rapid industrialization takes place; (2) the difficulties in feeding rapidly growing cities and the nature of supply chains – domestic or global – that develop to meet that task; (3) coping with periodic food crises that stem from rapid spikes in urban food prices; and (4) the most difficult problem of all, how to manage when structural transformation itself is failing. Each of these ‘management problems’ could easily be the subject of an entire book. Indeed, how to measure and manage the growing gap in labour productivity between sectors occupies much of *A World without Agriculture* (Timmer 2009a), and so it will be discussed only briefly here. Still, important new evidence has been developed since the empirical work in that monograph, with hopeful implications for successfully managing a structural transformation.

3.1 Mind the gap

In the early stages of the structural transformation in all countries there is a substantial gap between the share of the labour force employed in agriculture and the share of GDP generated by that work force. As shown earlier in Figure 1, this gap narrows with higher incomes. This convergence is also part of the structural transformation, reflecting better integrated labour and financial markets. The role of better technology and higher productivity on farms as a way to raise incomes in agriculture is controversial. Most of the evidence suggests that gains in farm productivity have been quickly lost (to farmers) in lower prices and that income convergence between agriculture and non-agriculture is driven primarily by the labour market (Gardner 2002; Johnson 1997).

Moreover, in many countries this structural gap actually widens during periods of rapid growth, as was evident in even the earliest developers, the now-rich OECD countries. When overall GDP is growing rapidly, the share of agriculture in GDP falls much faster than the share of agricultural labour in the overall labour force. The turning point in the gap generated by these differential processes, after which labour productivity in the two sectors begins to converge, has also been moving ‘to the right’ over time, requiring progressively higher per capita incomes before the convergence process begins.

This lag inevitably presents political problems as farm incomes visibly fall behind incomes being earned in the rest of the economy. The long-run answer, of course, is faster integration of farm labour into the non-farm economy (including the rural,

non-farm economy), but the historical record shows that such integration takes a long time. It was not fully achieved in the United States until the 1980s (Gardner 2002), and evidence presented in Timmer (2009a) suggests the productivity gap is increasingly difficult to bridge through economic growth alone. This lag in real earnings from agriculture is the fundamental cause of the deep political tensions generated by the structural transformation, and that lag is growing more extreme. Historically, the completely uniform response to these political tensions has been to protect the agricultural sector from international competition and ultimately to provide direct income subsidies to farmers (Lindert 1991). We now understand that the political economy of this process is driven by the structural transformation itself.

Most empirical analysis of the structural transformation has focused on two variables – agriculture’s share in employment and in GDP. The ‘gap’ between the two has often been recognized, yet it has received little systematic analysis.¹² This study, by contrast, makes the gap an important element in understanding the political economy of structural transformation. In the following pages we focus analysis on that gap – defined for purposes here as the difference between the share of agriculture in GDP and its share in employment. This definition consciously causes the GAP variable to be negative in sign for virtually all observations, a visual advantage in Figure 1, which shows the gap approaching zero from below.

One advantage of using the difference in shares rather than their relative values is that the GAP variable then translates easily into a ‘sectoral Gini coefficient’ that indicates the inequality of incomes (labour productivity) between the two sectors.¹³ The negative of the GAP variable is equal to the Gini coefficient for agricultural GDP per worker compared with non-agricultural GDP per worker. This ‘sectoral Gini coefficient’ accounts for 20–30 per cent of the variation in the overall Gini coefficient for this sample of countries. The rural-urban income gap is a substantial component of a country’s overall income inequality and can change rapidly. In China and India, for example, the increase in this gap since the early 1990s has generated serious political pressures.

Widening rural-urban income gaps

A worrisome aspect of the rural-urban income gap is that it actually tends to get larger during the early stages of economic growth. The turning point in the relationship, as calculated from a regression explaining the size of the GAP variable as a function of logarithm of per capita income and per capita income squared, only occurs at per capita levels of GDP above US\$9000 (where the terms of trade variable is not included). By way of comparison: per capita GDP in 2000 was US\$5940 in Mexico, US\$6185 in Uruguay, US\$7700 in Argentina, US\$10,300 in Greece, and US\$10,940 in South Korea. The fact that labour productivity in the non-agricultural sector actually increases more rapidly than in the agricultural sector until this turning point is reached, thus exacerbating rural-urban income differences, has much to do with the political difficulties poor countries face during a rapid structural transformation.¹⁴

It is highly revealing that the turning point should come at a lower per capita income level when the terms of trade variable is included in the statistical analysis. Individual countries use agricultural price policy as one way to manage the structural transformation by influencing their domestic terms of trade. This policy instrument helps the growth process to integrate agricultural labour into the rest of the economy, at least in terms of relative productivity.¹⁵ On the other hand, political efforts to influence the domestic terms of trade often run into powerful counter pressures from global commodity markets, and thus require large subsidies or trade barriers to make them effective. One possible advantage of higher food prices in world markets since 2007 might be less pressure on policy makers to protect their agricultural sectors from the forces of rapid structural transformation, a point discussed below.

Changes over time

One overarching question about the structural transformation is whether it has been a uniform process over time, or whether the very nature of economic growth, and its capacity for integrating ‘surplus’ agricultural workers into the non-agricultural sector, has been changing over the course of history. There are two ways to address the issue. The first is to examine the short-run record of growth using the current sample of countries, with data from 1965 to 2000. That is the task of this section. The second, pursued in the following section, is to examine the long-run record of the early developers to see how their patterns of structural transformation might differ from the modern record.

¹² The work by van der Meer and Yamada (1990) is an exception.

¹³ See Annex Table A-6 in Timmer and Akkus (2008) for details and an algebraic proof of this relationship.

¹⁴ All the income data used in the analysis here are in ‘real’ US dollars using market exchange rates and deflated to a constant 2000 basis.

¹⁵ On average, only about 20 per cent of the overall variance in the terms of trade is common to all countries on a year-to-year basis, the rest is unique to each country.

The short run: There are a number of ways to slice the modern record (the 1965-2000 period) of structural transformation into smaller segments. Our goal is to see if there are any systematic patterns over time in either turning points or slopes – and the answer to both questions is a yes. The clearest pattern occurs for the turning points in the gap relationship when the regression includes the terms of trade variable. These turning points are as follows:

1965-74:	US\$ 1109
1975-84:	US\$6379
1985-94:	US\$7880
1995-2000:	US\$15,484

Unmistakably, the turning point for the gap in labour productivity between the agricultural and non-agricultural sectors has been steadily rising since the mid-1960s. That is to say, the global economic growth process in our own era has become progressively less successful at integrating low-productivity agricultural labour into the rest of the economy. Complaints that the agricultural economies of poor countries are not well integrated into the growth of the rest of their economy are justified. The reasons for this still need to be understood, but the facts that need to be explained are clear enough.

It is possible, of course, that these calculated results stem from a serendipitous choice of time periods rather than from some deep change in the structural transformation itself. But breaking the data into just three time periods instead of four, presents an even more striking pattern:¹⁶

1965-79:	US\$1043
1980-90:	US\$19,300
1991-2000:	US\$223,044

Such results are strongly suggestive of a failure of modern economic growth processes to integrate the agricultural sector of poor countries into the rest of their economy despite relatively successful aggregate growth records (Ravallion, Chen, and Sangraula 2007).

Perhaps the most striking evidence that the turning point is becoming harder to reach is presented in Figure 8, which shows a nine-year moving average of the calculated turning points for each sub-sample, starting with 1965-73 and ending with 1992-2000. Although there are ups and downs that seem to be associated with cycles in the global economy, the broad upward movement in this trend is striking. Indeed, by the latter years in the sample, even rich countries were no longer guaranteed a place on the converging side of the GAP relationship.

A widening sectoral income gap – as differences in labour productivity between urban and rural areas become larger – spells political trouble. Rural households that feel left out of the growth process can vote governments out of office (India) or stage protests that threaten civil order and central control (China). It is no wonder that policy makers feel compelled to address the problem, and the most visible way is to provide more income to agricultural producers. The long-run way to do this is to raise their labour productivity and encourage agricultural labour to migrate to urban jobs, but the short-run approach – inevitable in most political environments – is to use trade policy to affect domestic agricultural prices (Olson 1965; Lindert 1991). In low-income economies, agricultural protection is a child of growing income inequality between the sectors during the structural transformation.

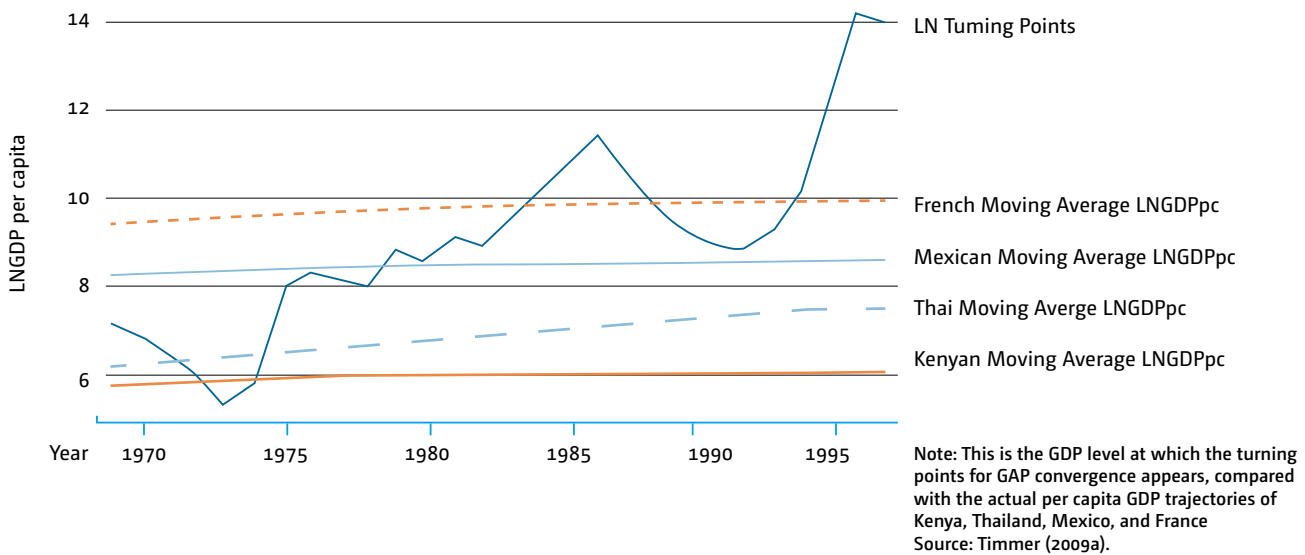
Long-run patterns from 1820-1985: Concerns about the distributional impact of globalization are not new. The world economy experienced an earlier round of globalization from 1870 to the First World War, and there may be lessons from the currently developed countries that participated in that process. Their economies were experiencing rapid economic growth (by the standards of the time) and facing challenges from the growing integration of labour and capital markets across countries (Williamson 2002). Thanks to recent work by economic historians, it is possible to examine the nature of these challenges empirically. The results are striking.



The global economic growth process in our own era has become progressively less successful at integrating low-productivity agricultural labour into the rest of the economy.

¹⁶ These periods might be said to correspond, respectively, with the early period of 'classical' economic growth, the decade of experience with structural adjustment, and the decade when forces of globalization are thought to have taken hold.

FIGURE 8:
Nine-year moving average of per capita GDP level



First, the patterns from the early developers seem remarkably similar to those for the full sample of countries from 1965 to 2000. Although the small sample size (nine countries with just four observations for all but the United Kingdom) means the coefficients are measured with considerable error, they are still significant by most standards, with the same pattern of signs and magnitudes as for the full sample of contemporary economies (see Timmer and Akkus 2008).

Second, the tendency for the GAP share variable to widen in the early stages of development does not seem to be a feature of just late-developing countries. To the contrary, the pattern seems equally strong in the early developers. The turning point is in the range of US\$1000, depending on exact specifications, and all of the sample countries had reached the turning point early in their development. The United Kingdom passed its turning point before 1800, the continental European countries reached it by the mid-1900s, and Japan followed early in the twentieth century. These growth patterns suggest that the early experience for these advanced countries was much more similar to the international growth patterns of the 1960s and 1970s than to those of the past several decades.

Indeed, virtually the entire growth experience of modern developed countries has been spent on the convergent path of sectoral labour productivity. This is in sharp contrast to currently developing countries which are mostly at income levels per capita where sectoral labour productivity is diverging.

The contrast between Asia and the rest of the world

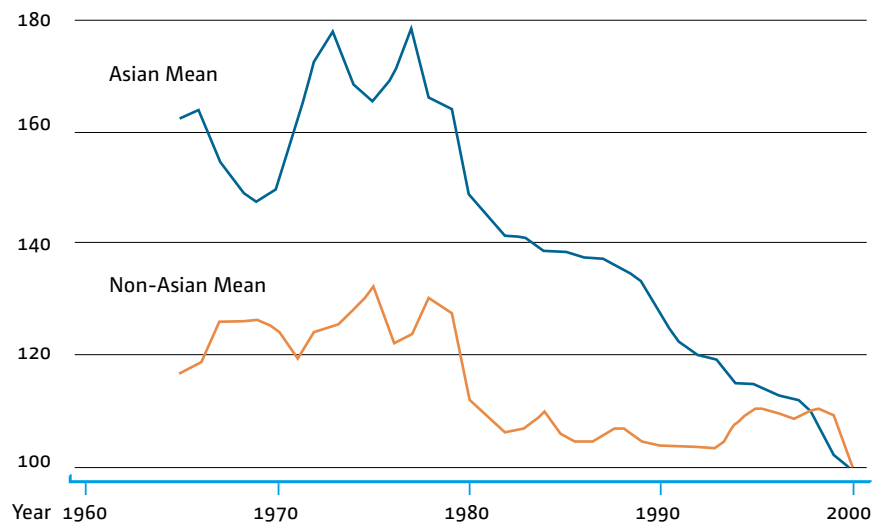
In explaining the GAP share, a comparison of Asian experience with that of all other countries is quite revealing. At first glance, the 13 Asian countries included in our sample seem to have a more or less similar pattern of structural transformation between 1965 and 2000 as the 73 non-Asian countries. Since the Asian sample includes some of the fastest growing countries during that time period (Japan, Korea, Malaysia, Thailand, and Indonesia), it is reassuring that there is in fact a common, long-run pattern of structural transformation. Statistical analysis, however, reveals that there are significant differences in the patterns as well (see Annex Tables A-7 to A-9 in Timmer and Akkus 2008). In particular, Asian countries have a very different pattern of agricultural employment change with respect to per capita incomes than non-Asian countries. This difference seems to be accounted for by policy measures designed to manage the tensions that arise during rapid structural transformation.

Asian economies tend to employ disproportionately more farm workers in the early stages of development. More critically, the impact of the agricultural terms of trade is positive and statistically significant for the Asian sample, whereas it is negative and statistically significant for the non-Asian sample. In this, the Asian pattern contrasts with the overall sample as well.

The impact is fairly clear – Asian countries were able to use the agricultural terms of trade as a policy instrument for keeping labour employed in agriculture, a pattern not seen in the rest of the countries in the sample. Average economic growth in the Asian sample was faster than in the rest of the countries, and the rapid decline in the share of GDP from agriculture reflects this rapid growth. The coefficient on the agricultural terms of trade is three times larger in the Asian sample than in the non-Asian sample, reflecting the heavier reliance on that policy tool to mitigate the consequences of rapid growth: a widening gap in labour productivity between the agricultural and non-agricultural sectors.

The implication is that Asian countries provided more price incentives to their agricultural sectors over this time period as a way to prevent the movement of labour out of agriculture from being ‘too fast’. Certainly the pattern of movements in the agricultural terms of trade for the two sets of countries is strikingly different, with Asian countries seeing a long-run decline at half the pace of the non-Asian countries (see Figure 9).

FIGURE 9:
Agricultural terms of trade for Asia and non-Asia separately (2000 = 100)



Source: Timmer (2009a).

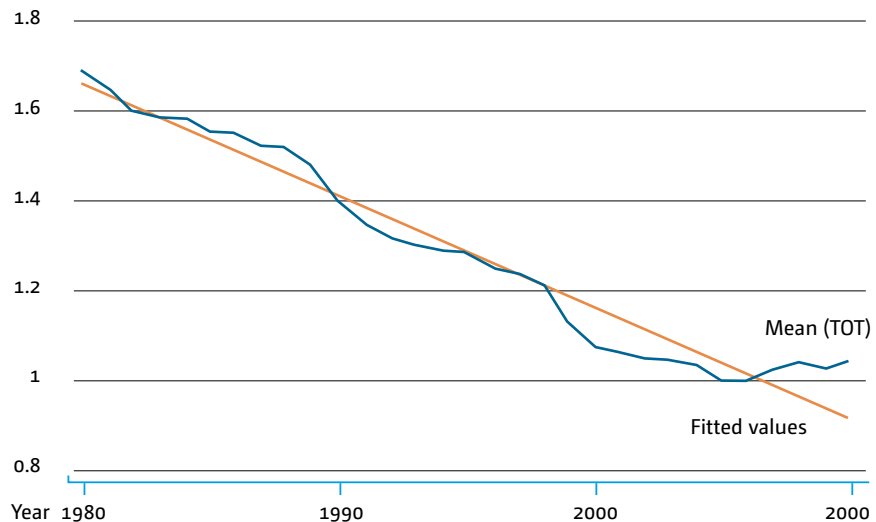
The net effect of these forces on the gap between labour productivity in the two sectors is that the turning point in the GAP relationship (after which labour productivity in agriculture begins to converge with labour productivity in non-agriculture) is sharply lower in the Asian sample. The turning point for the Asian countries is just US\$1600, whereas it is over US\$11,000 for the non-Asian countries – over six times higher. This difference underscores two distinctive features of the Asian economies – their more rapid growth and the greater role of agricultural productivity in that growth (Timmer 2005b).

The reasons for these differences have been the source of considerable debate. An explanation that resonates with the empirical results reported here is that Asian countries were more concerned about providing ‘macro’ food security in urban markets and ‘micro’ food security to rural households because of large and dense populations farming on very limited agricultural resources. Political stability, and with it the foundation for modern economic growth, grew out of an approach to the provision of food security that connected poor households to improved opportunities. (Timmer 2004, 2005a).

Did the world food crisis change things?

Many Asian countries used domestic price policy to keep the agricultural terms of trade more favourable for their farmers, and thus kept political tensions from rapid structural transformation under control. Domestic policy interventions were necessary because global food prices had been steadily declining since the early 1980s (see Figure 10). Openness to those declining food prices, although very beneficial to the poor, was a real challenge to domestic farmers. The lack of successful agricultural transformation in many countries might thus be linked to the low profitability of agriculture, at least in world markets. Have things changed?

FIGURE 10:
Agricultural terms of trade,
global average, 1980-2010



Source: Author's research, with the assistance of Selvin Akkus Clemens.

Figure 10 also shows that there was a significant 'regime change' in global food markets in the mid-2000s. For the first time since the early 1970s, average agricultural terms of trade were rising instead of falling. Openness to these higher food prices could be harmful to poor consumers, especially in the short run. But much more widespread agricultural dynamism also seems to have resulted in those countries that had lagged for decades. It is far too early to tell if the tide really has turned, and faster productivity growth in agriculture – made possible by sharply higher incentives – gets transmitted into successful structural transformations in sub-Saharan Africa and South Asia.

The drop in commodity prices in late 2014 and early 2015 might signal the end of this boom. But the evidence from the increase in global agricultural terms of trade is promising in one respect: the gap in labour productivity between agricultural and non-agricultural labour is no longer so difficult to close. Using the new data set that generated the results in Figure 10, it is possible to calculate the turning point when the gap begins to close. That turning point had been moving rapidly to higher incomes in the earlier data set, which ended in 2000. The new data set starts only in 1980 but now extends to 2010. Having the extra decade, with its reversal in the downward trend in agricultural terms of trade, reveals a startling result. The new turning points are as follows:

1980-89:	US\$15,493
1990-99:	US\$97,838
2000-10:	US\$5668

As before, the turning point was moving to sharply higher income levels in the 1980s and 1990s. But in the first decade of the twenty-first century, not only did that trend stop, the level of the turning point returned to income levels easily within reach of transition economies. The 'villain' in the story of increased difficulty in integrating agricultural and non-agricultural sectors in developing countries was not globalization or even bad domestic policies (although they may have been players as well). The real driver was the rapid fall in global food and agricultural prices and the difficulties created for domestic policy makers as they tried to manage a smooth structural transformation. Without incentives to raise agricultural productivity, the sector stagnated. In turn, without the stimulus from a dynamic agricultural sector and rising labour productivity, the rest of the economy stagnated as well. A new window of opportunity has been opened by the world food crisis in 2007-08. It remains to be seen whether the window remains open and whether the opportunity is broadly seized.

3.2 Who feeds the cities?

Almost by definition, cities need to be provisioned from outside their walls, boundaries or even their suburbs. For centuries, cities have attracted surplus labour from the rural economy and made it more productive, asking only that the remaining farmers

also raise their productivity so that everyone could be well fed. Marketing systems, processing centres and urban retail establishments all evolved to move food from the farm in the countryside to the urban table. Along the way, this food marketing system itself became a source of productive employment. But the structural transformation has traditionally been seen as a rural to urban story. We are now in the midst of a vast sea change in that paradigm. With over half of the world's population now living in cities, they are a major source, perhaps the major source of economic dynamism, even in developing and transition economies. But they still need to be fed. Where will the food come from to feed the cities?

There are two ways to address the question. First, will a country's own farmers provision their urban colleagues, or will foreign farms (and companies) do most of the urban provisioning? The popularity of 'self-sufficiency' campaigns suggests there is a deep political desire not to be too dependent on foreigners for food. But second, different components of the urban diet may have quite different answers. The United States can be self-sufficient in meat (although it is not, in fact) but not in coffee, tea or cocoa. Indonesia can be self-sufficient in rice (although it is not, in fact) but not in wheat or dairy products. The complexity of the urban diet thus makes asking questions about its provisioning also complicated.

The role of modern supply chains

These are inherent questions about the marketing system. Its transformation of food supply chains has already been discussed above as one of the main elements in the overall structural transformation. The important role of urbanization features in Figure 7, but the question now is how the cities get fed, as opposed to how much demand they can provide for rural output and labour. It is, as just noted, a very complicated question.

Again, recent experience in Asia provides fertile ground for attempting an answer. Asia is urbanizing rapidly and is developing modern supply chains to provision the cities. Where the food comes from for these supply chains and what happens to it along the way is the subject of this section.¹⁷

It is helpful to think of a modern supply chain as a circuit along which demand flows downstream to upstream and food products and labour flow upstream to downstream. The 'circuit' is driven along by three forces: (1) urban food demand pulls, and the intermediation-supply chain communicates that demand to rural areas and delivers the flow of food products; (2) profits from farming and income from non-farm employment of rural households (mainly local but also from migration) fund the investments by farmers in technology change and by the rural supply chain off-farm components (distribution and processing); (3) this demand and investment funding would be stillborn unless there is a supply response – of services to the supply chain and rural economy (like credit and water) in the factor markets, and of farm output. Now that the urban food economy is the majority of the national food economies of Asia, there is growing realization that impetus for change comes from the downstream pull of urbanization and diet change, and more broadly from the great turning of the 'wheels of commerce' which drive modernization of rural-urban supply chains and distribution more generally.

The national food economies of Asia depend overwhelmingly on domestic food supply (for 95 per cent of their food, while imports are a mere 5 per cent); they are dominated – two-thirds to three-quarters – by urban demand; the prices to consumers are highly influenced by conditions in the supply chains beyond the farm gate (for some 50-70 per cent of the cost of food), and they are highly diversified beyond rice. A single figure suffices to sum up these points: the rice farming segment, on which Asian food security debates focus, constitutes 10 per cent of the total value of food in the Asian economy.

Rapid urbanization is occurring in Asia, but population shares underestimate the importance of urban populations in the overall food economy. Urban residents typically have lower shares of food expenditure in total household expenditure compared with rural residents, but have sufficiently higher incomes that urban consumers spend more on food per person than do rural consumers. India exemplifies this: by 2006, 29 per cent of the population was in cities, but they accounted for 43 per cent of overall expenditures on food consumption.

¹⁷ This section draws from Reardon and Timmer (2014).

The processed food sector has grown quickly in the past several decades; this growth is mainly in the first-stage high value added and the second stage processed food subsectors, such as milled and second-stage processed cereals, dairy, processed meat and fish, and condiments. These trends are driven by increases in income, urbanization, women increasing their participation in labour markets outside the home and wanting to save time cooking, improvements in packaging and processing technologies, and eventually by diversification of the variety of processed foods, abetted by modern retail.

Although each segment of the food supply chains of Asia is transforming, the overall supply chain itself is restructuring. It is at once 'lengthening geographically' and 'shortening inter-mediationally'. The former implies that food markets are integrating over districts in a zone and zones in a state and states in a country; it also implies 'de-seasonalization' of the market, such as Reardon et al. (2012) show for the potato market in India, Bangladesh, and China. This lengthening represents the increase in the 'merchant catchment area' of the cities as each grows in population and thus food market reach; this was demonstrated for Europe and China in the middle ages and renaissance period by Braudel (1979) and one sees it in Asia today. Inter-mediational shortening by contrast implies dis-intermediations ('fewer hands in the chain'): this is not just cutting out village traders, but retailers starting to buy directly from large processors, processors from farmers in emerging contract farming, and large retailers and large processors procuring ingredients via specialized wholesalers.

These geographically longer supply chains carry risks for cities. A long supply chain may decrease seasonality of the food supply, but can expose the city's food supply to climate shocks (such as floods along the route) and energy cost shocks (that weigh more heavily on supply chains with higher transport costs to begin with). These shocks can be mitigated by investments such as: (a) more energy efficient equipment; (b) greater scale economies to outweigh energy costs; (c) greater storage capacity such as larger distribution centres with greater cold storage area; (d) redundancies in supply chain facilities to handle outages.

Food safety (and bio-terrorism) vulnerability also increases with longer supply chains and more massive scale of operation, especially obvious for perishable products. The rapid climb in the urban consumption of perishables, combined with changes in supply chains, exacerbate that vulnerability. It is unlikely that Asian cities will opt out of investments to modernize supply chains and go 'backward' to short local supply chains that are sharply seasonal and more expensive (and possibly more energy using) per ton/mile of food supply. Rather, what seems to be a probable continuation of supply chain transformation, combined with these frightening and costly vulnerabilities, imply large investments in cold chain, diversity of routes, scale, and so on – all of which will magnify and further hasten the structural transformation toward larger scale enterprises.

The efficient feeding of cities in the new millennium will involve many actors and many food sources. For the next several decades the main commodity staples – rice, wheat, maize and other staples such as roots, tubers and secondary cereals – are likely to be supplied via fairly traditional supply chains, although with modern packaging and branding increasingly important in supermarkets. These staples will mostly be produced 'locally', i.e. within the country where the city is located, but imports will be a more efficient source of cereals in some cases. In many cases imports will provide feed grains, dairy products, even fresh fruits and vegetables. Modern supply chains will dominate the provision of processed foods, products that require cold chains, and products that are intensive in their need for a modern management information system because of food safety issues. There will be a growing, but tiny, role for urban agriculture. Some fresh greens can be grown in backyards or even on the tops of restaurants, local processing of meats and dairy products, and production of artisanal foods for wealthy urban consumers will be niches in the urban food chain. But cities will not feed themselves.

Policy dimensions of feeding cities

It is often hard to see the role of public sector policies and investments in such a complex and rapidly changing system. The story here has focused on describing the rapid changes and identifying the key drivers that link them together. Policy has been in the background, although public investments in infrastructure, especially

rural roads, communications systems, power grids and irrigation have been essential ingredients. Still, the impact of policy has also been pervasive, if somewhat unnoticed.

First, despite the role of local supplies filling local demand, the openness of economies to international trade, investment, and global price signals has been essential to productivity growth on the farm and along the entire supply chain. Both Indonesia and India clearly suffer from an over-emphasis on self-sufficiency in basic foods and an under-emphasis on being competitive on their farms and in their markets. Providing stability to domestic food systems is a worthy goal, but local self-sufficiency campaigns have a poor track record even on this score.

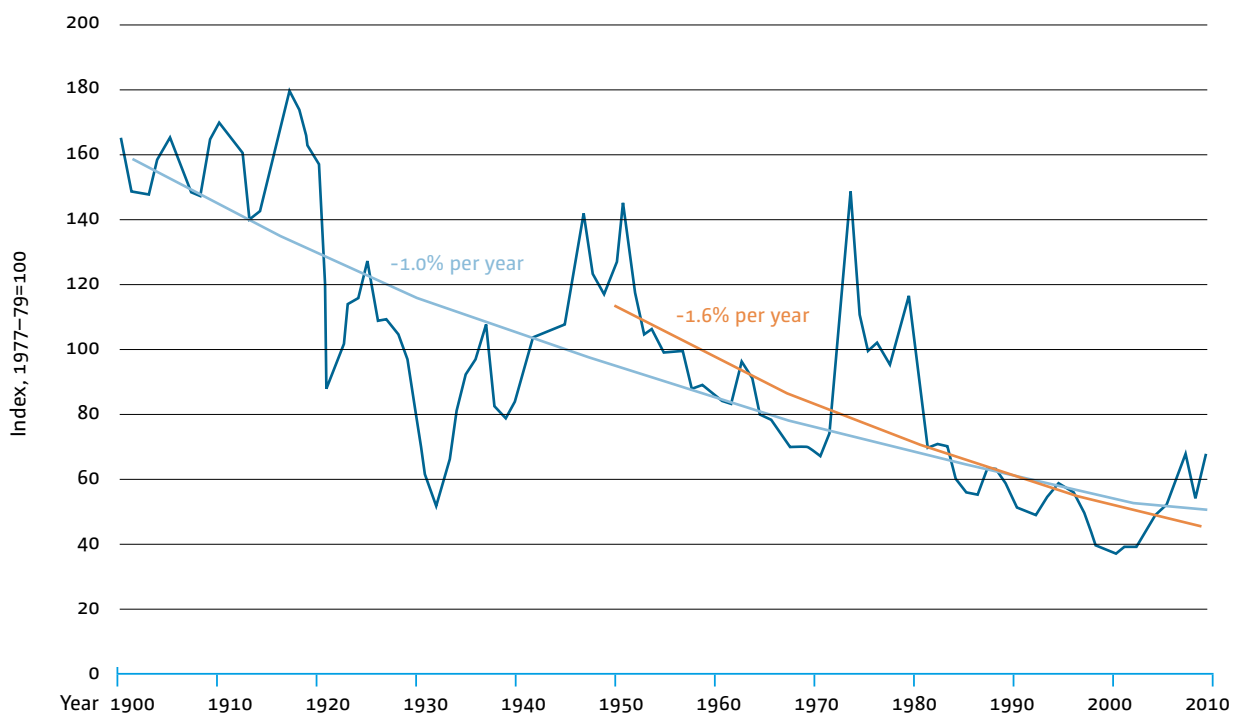
Second, the public sector budget allocated to agriculture and the food system is not a reliable guide to effective public support. In particular, subsidies for 'private' goods such as fertilizer and power contribute little to productivity growth in the longer run. For this, public goods such as agricultural research and development, high-quality public education reaching to the PhD level to train local researchers and analysts, and transparent regulation of financial and commodity markets to provide equal access and greater stability are far more important.

Finding the appropriate balance between an effective public role and an efficient private role in the modernization of agriculture narrowly and the entire food system more broadly has always been a difficult challenge. It requires careful analysis and a technocratic capacity, even within the most vigorous of democratic governments, to do the 'right' things and not do the 'wrong' things. The political economy of this is, of course, tricky (Timmer 2012). But finding this balance has always been the essential ingredient in starting this dynamic set of transformations rolling and keeping them on a path of inclusive economic growth.

3.3 Managing volatility

Volatile food prices and repeated crises divert the attention of policy makers from managing the long-run dimensions of structural transformation and sustained food security (see Figure 11).

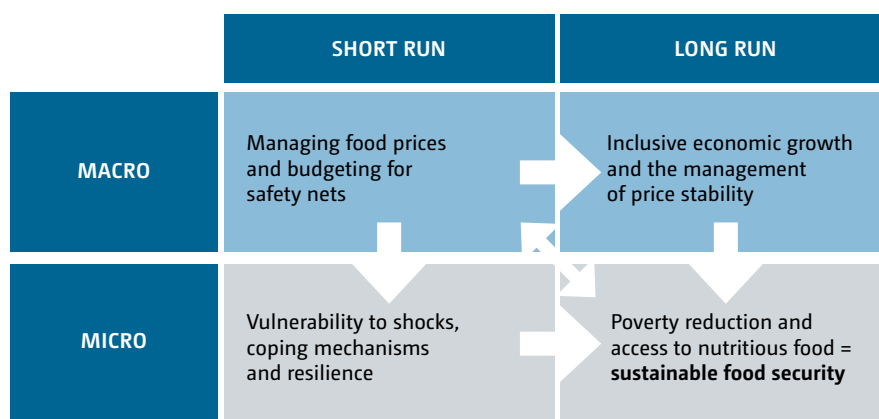
FIGURE 11:
Grilli and Yang Global Agricultural Price Index (adjusted for inflation by the US GDP price deflator)



Two things are striking in the long-run price history depicted in Figure 11. First, there is a pervasive downward trend in real (i.e. deflated) agricultural prices – a decline of 1.0 per cent per year for over a century, a downward trend that accelerated to 1.6 per cent per year after 1950. The sharp dip in prices below trend between 1995 and 2002 was especially problematic as the low agricultural prices made it almost impossible to justify investments in raising agricultural productivity. Second, however, the figure shows how extreme the price volatility has been over the past century. Sharp peaks in the early part correspond to wartime shortages, but the major spike in the early 1970s and the smaller spike in 2008 had other causes.

Whatever the causes, coping with food price volatility requires the attention of policy makers in economics, finance and planning ministries, not just food and agriculture ministers. Managing macro crises – and in most poor countries a food crisis is also a macro crisis – takes serious resources that have high opportunity costs. A framework for understanding these costs is shown in Figure 12.

FIGURE 12:
Basic framework for understanding food security issues



Source: Timmer (2011).

Consider a very simple model of food security that focuses on the short run versus the long run, and on the macro level (of policy makers) versus the micro level (of household decision makers). The policy objective in this simple model is for all households to have reliable and sustainable access to nutritious and healthy food. Thus ‘food security’ is achieved by ending up in the bottom right box of the matrix where a successful structural transformation has reduced poverty and allowed access to nutritious food for all. The starting point, however, is the upper left box of the matrix, where policy makers deal primarily with macro level issues in the short run. To the extent they are concerned about the welfare of poor households, the best they can do in the short run is stabilize food prices and send transfer payments – via safety net mechanisms – to those households most affected during a food crisis when prices rise sharply.

When the global economy is reasonably stable, and when food prices are well behaved, policy makers at the national level can concentrate their political and financial capital on the process of long-run, inclusive growth, i.e. on managing the structural transformation. Keeping the poor from falling into irreversible poverty traps is easier and less costly in a world of stable food prices, and the poor are able to use their own resources and entrepreneurial abilities to connect to long-run, sustainable food security for themselves.

In an ideal world, policy makers could use economic mechanisms under their control to shift households directly to the long-run objective, (the lower right box) where sustainable food security is achieved. In return, policy makers would receive political support for this achievement, hence the two-way diagonal arrow connecting the upper left and lower right boxes. The diagonal arrow reflects a technocratic view of the world in which policy makers take informed actions on behalf of public objectives and are rewarded when they succeed.

In fact, market economies, and politics, do not work that way. Policy makers at the macro level must implement long-run measures to stimulate inclusive, pro-poor economic growth, and sustain that growth for decades in order to have a measurable impact on poverty, via the small vertical arrow connecting the upper right box to the lower right box. These long-run measures to support the process of structural transformation are reflected in the broad arrow from the upper left to the upper right, but it is hard to concentrate the political and financial resources needed to make this arrow an effective mechanism to stimulate economic growth if most policy attention, and fiscal resources, are being devoted to short-run crises.

Simultaneously, and creating tensions for the policies favouring long-run growth, policy makers must also find enough resources, and efficient transfer mechanisms, to ensure that the poor do not fall into irreversible poverty traps during times of economic crisis, including food crises. These transfers can impose substantial fiscal costs and hence challenge the necessary investments for long-run growth and structural transformation. Design and implementation of these transfers involve human and political capital that also have real opportunity costs to the growth process. Thus a focus on the broad downward arrow is necessary to ensure the continued viability and participation of poor households, but these activities have opportunity costs in terms of economic growth.

However, with success in achieving the objectives in the upper right and lower left boxes, market forces gradually – over decades – bring the poor above a threshold of vulnerability and into sustained food security (connecting macro to micro and short run to long run). The country has then managed the ‘escape from hunger’ that Fogel documented for Europe and America in the late eighteenth and early nineteenth centuries, and which a number of Asian countries have managed in the twentieth century (Fogel 1991, 1994; Timmer 2004, 2005a).

By contrast, a world of heightened instability – in global finance and the world food economy – forces policy makers to concentrate their resources in the upper left box, where they are trying to stabilize domestic food prices and keep the poor from slipping deeper, irreversibly, into poverty. During food crises, vulnerable households often deplete their human and financial capital just to stay alive. This is the world of poverty traps and enduring food insecurity. We are also trapped in short-run crisis management, both macro and humanitarian. Donors such as USAID and the World Bank can be trapped in crisis mode as well as governments, and end up spending their human and financial resources on emergency relief rather than longer-run development strategies and investments that support structural transformation. Important as crisis management is, it clearly comes at the expense of significant progress out of the short-run box on the upper left, both to the right and from top to bottom. From this perspective, instability is a serious impediment to achieving long-run food security. In a world of greater instability, induced by climate change, by new financial arrangements, even by the pressures from new political voices, food security is likely to suffer. What can be done?

A policy focus on the short run to cope with volatility

At a policy level, the focus needs to be on the time horizon over which policies and investments must be designed and implemented. By their very nature, some of the most important investments needed to guarantee food security and a successful structural transformation have very long gestation periods and pay-off horizons. Rural infrastructure, including irrigation facilities, schools, and health centres, basic agricultural research, and development, even the basic institutions of effective governance, all take decades to design, build, and deliver benefits. A good policy idea in 2015 might, with effective political support, become a new policy initiative by 2017. Implementation could come within a few years, with effects visible in the field within a decade. Discouraging as this process sounds for those seeking immediate reductions in poverty and solutions to hunger, in the world of agricultural development and structural transformation, reducing poverty and ending hunger, this is the short run. This lecture has emphasized the importance of an historical perspective. Doing things right takes time. As Food Policy Analysis argued three decades ago, ‘crash programmes tend to crash’ (Timmer, Falcon, and Pearson 1983: 288). Only policies that recognize this basic reality have a chance of working.

The important policy agenda in the short run is coping with food price volatility and the increased frequency of food price spikes. Three basic approaches to coping with the impact of high food prices once they hit world markets are domestic price

stabilization; increasing supplies available in local markets; and providing safety nets to poor consumers. All of them must be managed by individual countries themselves. Donors and international agencies, however, can play a substantial role in co-ordinating activities and providing resources, both financial and technical assistance.

Three policy approaches for a volatile price environment

The first approach is for individual countries to use market interventions to stabilize their domestic food prices. Such stabilization requires some capacity to isolate the domestic food market from world markets and can be implemented only through government actions (although private traders can handle most of the actual logistics).¹⁸ Such isolation runs directly against the spirit and, for many countries, the letter of World Trade Organization (WTO) agreements. But it is a very widespread practice. Demeke, Pangrazio, and Maetz (2009) count 36 countries that used some form of border intervention to stabilize their domestic food prices during the 2007/08 crisis.

Such policies can have a large impact on the level of food insecurity, even at a global level. India, China, and Indonesia stabilized their domestic rice prices during the 2007/08 food crisis by using export bans (or at least very tight controls), thus protecting well over 2 billion consumers from sharply higher prices. The policies pursued by these three countries demonstrate the importance of understanding local politics in policy formation, especially food policy. Although the end results were similar – food prices remained stable throughout the crisis – the actual policies pursued in each country were quite different (Slayton 2009; Dawe 2010a).¹⁹

India, Indonesia, and China are big players in the global rice market, even if their actual trade is limited. As Dawe (2010b) emphasizes, there is a case to be made simply in terms of aggregate global welfare that stabilizing domestic rice prices in these large countries using border interventions might be both an effective and an efficient way to cope with food crises, even after considering the spillover effects on increased price volatility in the residual world market. Dawe points out that unstable supply and demand must be accommodated somewhere, and passing the adjustment to the world market may be both equitable and efficient in a second-best world where fast-acting and well-targeted safety nets are not available. One important advantage of successful price stabilization efforts in Asia is that they also stabilize price expectations among the many participants along the entire rice supply chain, and thus prevent the disastrous hoarding behaviour that can generate extreme market shortages and severe price spikes, as emphasized in Timmer (2010, 2012).

The second basic approach to coping with a food crisis is to stimulate additional supplies through fast-acting programmes. Nearly all countries tried to do something along these lines during the 2007/08 crisis, whether by subsidizing fertilizer to get a quick production response or encouraging planting of short-season crops, even urban gardens. If the high prices for food seen in the crisis actually get to farmers, they have strong incentives to search out these options themselves, but government assistance in gaining access to inputs or proper seed varieties can also help. In Asia, the short-run response of rice farmers to high prices was surprisingly vigorous, partly because of the availability of short-duration rice varieties and irrigated farming systems with multiple-cropping potential (Slayton 2009). In Vietnam, for example, which has three distinct cropping seasons for rice, production increased 6.3 per cent in 2007 and 5.3 per cent in 2008, compared with average annual increases of just 3.3 per cent per year between 2005 and 2011. All of this increase in production, a total of 1.2 million metric tons was put on the export market.

Countries can also hold emergency food stocks as part of a broader strategy for providing food security to their citizens. Expectations of higher and more volatile food prices in the future should lead authorities to invest in larger food stocks than in the past. The 'design rules' for adding to and disposing of these stocks, and their day-to-day management to avoid large storage losses, will be essential to making emergency food stocks a sustainable and cost-effective approach (Timmer 2014). Clear rules on management of public stocks minimize the displacement of private storage.

One crucial element of these rules will be to use international trade in the commodity as part of the provisioning mechanism, thus avoiding the extraordinarily high costs that can come from a strategy of total self-sufficiency. Even in countries as large as Indonesia, India, and China, where a high degree of food self-sufficiency is required simply because of the limited size of world grain markets, some interaction with

¹⁸ Isolation from the world market does not, of course, guarantee more stable prices. Indeed, for most countries, open borders to world markets lead to greater price stability, as local shortages and surpluses can be accommodated through trade. But completely open borders mean a country is exposed to world market shocks as well as domestic instability. Most large countries, at least for rice in Asia, find such openness to be politically impossible. An excellent review of the African environment and possible steps to stabilize volatile food environments there is in IRAM et al. (2013).

¹⁹ The 'pass through' of price increases in world markets to the domestic economies of China, India, and Indonesia from early 2007 to early 2008 were 4 per cent, 8 per cent, and -3 per cent, respectively. In each case, however, domestic rice prices were already higher than world prices, before the crisis hit (Dawe 2010a).

these markets through a managed trade regime can lower the costs of food security. Managed trade regimes can be open and transparent, with clear rules on the nature of interventions, thus allowing the private sector to handle actual trade logistics.

The third approach to coping with a food crisis is to provide safety nets to poor consumers, either in cash or through the direct provision of food aid. This was the immediate, and almost only, response of the donor community to the food crisis in 2007/08. The safety net approach figures prominently in 'best practice' recommendations from the World Bank, FAO and the World Food Programme (World Bank 2005). The logic is clear: let high prices be reflected in local markets to signal the necessary changes in resource allocations to both producers and consumers, but protect the very poor from an irreversible deterioration in their food intake status. Efficiency is maintained, and the poor are protected.

The difficulty is that food crises are relatively short-lived events (as opposed to chronic poverty). Effective safety nets take a long time to design and implement, and they are very expensive if the targeted poor are a significant proportion of the population. Unless a well-targeted programme with adequate fiscal support is already in place when the crisis hits, it is virtually impossible for a country to design and implement one in time to reach the poor before high prices for food threaten their nutritional status. Even when a programme is in place, and can be scaled up quickly, as with the Raskin programme of rice distribution to the poor in Indonesia, operational inefficiencies and simple corruption in deliveries may mean the poor are reached only at exceptionally high cost (Olken 2006).

3.4 What if structural transformation fails?

In a book stimulated by extensive interaction with Bruce Gardner before his untimely death in 2008, Isabelle Tsakok identifies five essential ingredients for a successful agricultural transition:

This book is the result not of the search for correlations, but of the effort to identify conditions that are common to all successful transformations. It tests these conditions by looking at experience worldwide. The five conditions that survive these tests are the following:

First, a stable framework of macro economic and political stability. The central and local governments are able to enforce peace and order.

Second, an effective technology-transfer system. Research and extension messages reach the majority of farmers.

Third, access to lucrative markets. The majority of farmers face expanding markets of paying customers. To them, investing in agricultural and rural production is good business.

Fourth, an ownership system, including a system of usufruct rights that reward individual initiative and toil. It is feasible for farm/rural families to gain monetarily for risk taking and hard work.

Fifth, employment-creating non-agricultural sectors. As agriculture becomes more productive, it must shed labour, which unless absorbed in non-farm jobs that pay as well as agriculture would simply constitute exporting farm poverty to other sectors.

While these may seem obvious as stated, what is not obvious is how some governments have been able to maintain them over decades. How governments have succeeded in maintaining them has varied from country to country. However, there is a common thread. Underlying all five conditions is sustained government investment in and delivery of public goods and services over decades (Tsakok 2010: xxi-xxii).

The story so far has mostly been about countries that have been able to deliver the Tsakok conditions. But what happens when they fail? The answer depends to a large extent on why they fail, and there are at least three basic possibilities – a poor resource base, weak institutions, and/or the problems stemming from being a 'latecomer' in a world of increased global competitiveness.

The resource base and agricultural productivity

Development specialists and economic historians have known for a long time that

some ecological and geographical settings are more suitable for rapid growth in agricultural productivity than others (Djurfeldt et al. 2005; Jones 1981; Diamond 1997; Hayami and Ruttan 1971). The sharp difference in starting points for agricultural development in Sub-Saharan Africa and in Asia provides a focus for Jones's cogent summary of why development has lagged on the continent.

If we cast around for continents and cultures to set aside European experience and turn first to Africa, we find that the general level of development and the size and density of population lagged well behind in the historic period... There were towns of some size in West Africa and stone buildings of moderate skill in Zimbabwe and in the chain of fortifications across southern Africa... But no wheel, no plough, and no stable combination of powers that could erect a common front against Arab or European slavers ... (Jones 1981: 153-55).

Weak institutions lead to poor governance and bad policy choices

It is hard to disentangle the emergence of strong institutions that foster growth in agricultural productivity from the presence of a good environment for such growth, although a substantial wing of economic history and modern development economics is engaged in that search.²⁰ Still, agricultural development specialists have identified the key linkages from weak institutions to poor governance, and from there to bad policy choices (North 1959; Bates 1981; Bates and Block 2013; Mellor 2013). Because a successful agricultural transformation is hostage to poor governance and bad policy, these linkages matter (Tsakok 2010).

When the high yielding varieties hit Asia they were preceded by a long history of development of agricultural institutions and an immediately prior period of foreign aid assistance on a large scale to the key institutions of research, extension, and finance. Concurrently large foreign assistance went to higher agricultural education to train the large numbers of personnel to staff those institutions and a rapidly growing private sector as well. Thus, the institutional structure for quickly modifying and adapting through applied research, extending knowledge farmers, and financing the inputs was well-established. The new high yielding varieties walked into a very hospitable institutional environment...

In Africa, there was a similar, early period of foreign assistance to institutional development in a few countries e.g. Michigan State in Nigeria, Oklahoma in Ethiopia developing quite good agricultural universities and through them research and extension. But by the time independence had been generalized and a green revolution could be thought of, foreign aid was already turning away from agriculture, away from the non-poor small commercial farmer who accounts for the bulk of growth, and most importantly away from national scale development of institutions by governments and towards small scale unintegrated private sector and NGO efforts with little national impact ... The abandonment of assistance to higher agricultural education was most striking and most damaging. As a result the institutional structures, particularly the central public sector component is still way short even now of the Asian standard when the green revolution struck. Even now there is little sign of a massive effort (Mellor 2013: 5).

Bates and Block (2013) note that significant progress in building institutions which support the rural economy has been made in Africa since the spread of democracy, and Radelet agrees:

... local actions, courageous leadership and smart policies have been the central drivers of Africa's progress, with foreign assistance playing a supporting role ... Development is hard. Businesses, governments, aid agencies and small farmers all sometimes succeed and too often fail. Those involved must constantly strive, experiment and learn (Radelet 2013: A32).

Globalization and agricultural competitiveness

The notion that nations compete with each other is highly controversial. Michael Porter's hugely influential book explains how nations can compete more effectively, but many trade economists feel that companies compete, not nations (Porter 1990; Neary 2003). The general issue cannot be resolved here. Porter's concept of 'competitive advantage' is broader, but less concrete, than trade economists' notion of comparative advantage. It does seem clear that governments can provide a more

²⁰ See the ambitious book by Acemoglu and Robinson (2012) for a summary of the methodological issues in asserting causality as well as a powerful argument that the quality of resulting institutions largely determines the path of welfare gains from economic growth.

or less supportive environment for both the private sector and public institutions to support smallholder farmers and the rural economy. The outcome affects farm productivity and the competitiveness of agricultural commodities in both local and world markets.

The challenge to 'latecomers' in the development process has been stressed in an empirical analysis of rural transformation, built on an extensive new statistical data base, conducted by Bruno Losch and his colleagues in the RuralStruc Project with the support of Agence Française de Développement (AFP) and the World Bank (Losch, Freguin-Gresh, and White 2012). Their analysis and conclusions are especially sobering for much of rural Africa, which they see trapped in highly traditional agrarian structures. These societies face mounting pressures from local demographics and global competition for both rural and urban goods.

In 2050, North America and Europe combined will account for only 15 per cent of the global population. Asia will remain the world's most populous region, but the relative weights of the populations of Sub-Saharan Africa (SSA) and Europe will be reversed compared with 1960 (10 per cent for SSA and 20 per cent for Europe in 1960, and the reverse in 2050). This major population realignment will exacerbate existing inequalities in access to resources.

Meanwhile, despite continued urbanization, 2.8 billion people will still live in rural areas in 2050. Rural populations will still be massive and will still earn their living primarily from agriculture. Regional differences in urban dynamics will strongly affect the distribution of rural populations: South Asia and sub-Saharan Africa will together account for nearly two-thirds of the world's rural population, and uniquely, in SSA the rural population will continue to grow.

These trends are of major importance because they challenge the prospects for development in much of the world. Agriculture is more than just the production of food. Because agriculture is the core activity and main source of livelihood for billions of rural people, its evolution will shape the process of economic, social, and environmental change. The situation is especially challenging in SSA, where the lack of economic diversification – reflected most notably in the region's anemic rate of industrialization – limits options for employment outside agriculture and the informal sector. ...

Today, the situation for developing countries in the early stages of structural transformation is drastically different [from the conditions facing Europe, North America, Latin America and Asia]. Sub-Saharan Africa – the last region of the world to embark on the structural transformation process – faces the challenges of an incipient economic transition and an unachieved demographic transition in the context of a global open economy and under the constraints of climate change (Losch et al. 2012: 1-4).

This perspective of a challenged, even failed, structural transformation in sub-Saharan Africa, is also the topic of Badiane's address to the Stanford Symposium Series on 'Global Food Policy and Food Security in the 21st Century' (Badiane 2011).

Different outcomes of the structural transformation

The central role of the structural transformation has been understood for some time. The convergence of labour productivity in the agricultural and non-agricultural sectors – even as that productivity increases over time – provides higher standards of living in both sectors. Historically, the structural transformation has been thought to be the only sustainable pathway out of poverty.

But development paths since 1990 have not been so supportive of that broad historical judgment. Consider Figure 13, which is reproduced from a paper by Bruno Dorin and colleagues at Montpellier (Dorin, Hourcade, and Benoit-Cattin 2013). There are other possible pathways of structural transformation, several of which do not lead out of poverty. Indeed, much of Asia seems to be headed into a 'Lewis Trap' with a growing income disparity between agricultural and non-agricultural workers. Sub-Saharan Africa is moving steadily toward smaller farms rather than the (modestly) larger ones needed for a successful structural transformation.

Many countries are not following the standard, historical path of structural transformation. The 'middle-income trap' seems to have captured a number of

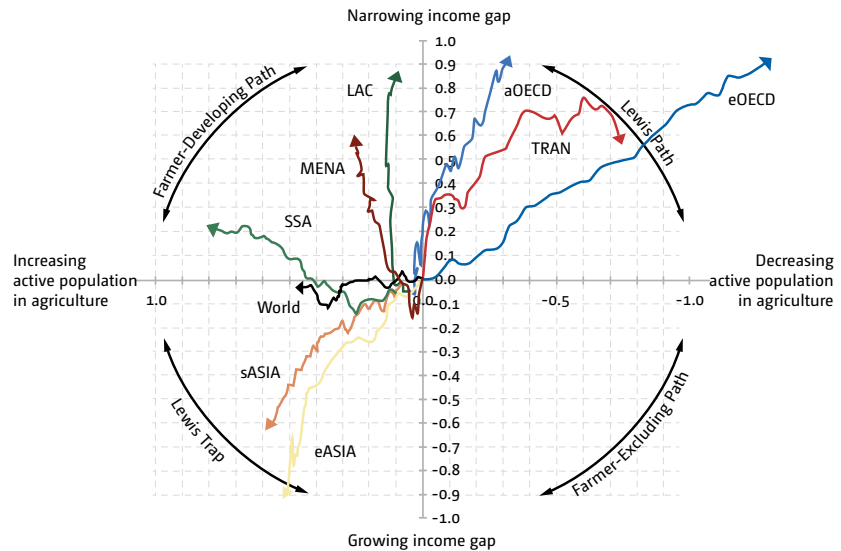
countries in Asia and Latin America. After initial periods of rapid growth and convergence with rich economies, these countries have slower growth and are no longer converging. To break out of this trap, governments need to help farmers on very small plots raise their incomes. Do they move to the city or do they raise productivity on their tiny plots of land? What can governments do so that this process moves quickly and smoothly, with a minimum of hardship on households that are already barely getting by? And how can all of this be accommodated by the need to have a 'green' revolution in agricultural production techniques so that food supplies become more sustainable?

FIGURE 13:
Diverse paths of agricultural and structural transformation

Note: The figure represents the cumulative annual growth rates from 1970 (=0) to 2007 of:

- the active population in agriculture (x-axis)
- the income differential between agricultural and non-agricultural workers measured with the Labour Income Ratio (LIR, equation 4) in 1990-US\$.

Source: Dorin, Hourcade, and Benoit-Cattin (2013).
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These issues were raised directly by Ousmane Badiane in his analysis of Africa's agricultural problems, its structural history, and the possible ways forward (Badiane 2011). The task is 'getting agriculture moving' (the title of Art Moshier's influential little book from the 1960s, Moshier 1966), but also 'getting industry moving'. Badiane understands that part of the failure of Africa's agriculture is because of an even more depressing failure of its industrial sector.

While some parts of Asia were coping with the middle-income trap, and despite significant signs of economic growth on the African continent, Asia continued to pull away. The structural transformation in East and Southeast Asia has continued to proceed rapidly, with absolute levels of population in rural areas beginning to decline (South Asia continues to lag in this process). This fact has important implications for the startling finding that the structural transformation in Africa has been 'backward' – that is, it has lowered labour productivity rather than raising it. Migration of labour has been from relatively high productivity farming activities to very low productivity jobs in the informal rural and urban service sectors (Badiane 2011).

This 'push' of labour out of agriculture into the service sector has important implications for the nature of the development strategy that should be pursued. In the classic 'labour surplus' model developed by W. Arthur Lewis, and the basis for much of Asia's strategic approach, low productivity ('surplus') labour is pulled out of agriculture and employed at higher productivity in a rapidly growing industrial sector. Wages are low in both sectors until the surplus labour runs out (the Lewis 'turning point'), and these low wages permit the industrial sector to make large profits that are reinvested in expanding factory capacity, which leads to more industrial employment.

If the Badiane story is right, the surplus labour in Africa appears increasingly to be in the informal service sector. A strategy of raising labour productivity on farms, thus freeing up food and labour for the industrial sector, will not have the same impact it had in Asia, because there are few high-productivity jobs in that sector in Africa. Raising productivity in the informal sector would seem to be a much trickier task, with no obvious technological innovations available that would match the Green Revolution in its broad-scale and general equilibrium impact – micro finance schemes and ready access to mobile phones are not the answer. These concerns are similar to those raised by the RuralStruc research programme, jointly hosted by the World Bank and the French development agency (Losch et al. 2012).

4

The political economy of managing structural transformation



As has been emphasized repeatedly in this study, managing structural transformation involves integrating two different time horizons – the short run of price volatility and food crises and the long run of inclusive economic growth and poverty reduction. Governments cannot survive to manage the long-run process unless they can also successfully cope with short-run challenges from the food economy.

The empirical regularities of behavioural economics, especially loss aversion, time inconsistency, other-regarding preferences, herd behaviour, and framing of decisions, present significant challenges to traditional approaches to managing short-run food price volatility. The formation of price expectations, herd behaviour that leads to hoarding, and the welfare losses from highly unstable food prices all depend on these behavioural regularities. At least when they are driven by speculative bubbles, market prices for food staples (and especially for rice, the staple food of over 2 billion people), often lose their efficiency properties and the normative implications assigned by trade theory. Theoretical objections to government efforts to stabilize food prices thus have reduced saliency, although operational, financing, and implementation problems remain important, even critical. A new theoretical underpinning to political economy analysis is needed that incorporates this behavioural perspective, with psychology, sociology, and anthropology all likely to make significant contributions.

4.1 A macro food policy perspective

Folk wisdom holds that ‘an ounce of prevention is worth a pound of cure’ – prevention is 16 times better than coping. Preventing food crises requires two separate, but integrated, approaches – a market-oriented approach to economic growth and structural transformation, and a stabilization approach to policy initiatives that prevent sharp price spikes for staple foods. Both approaches require a behavioural perspective, and neither can work without the other.

The pathway of structural transformation is long and hard. It is easy to get side-tracked or to miss the path altogether. The endpoint – an agricultural sector that is a small share of a large economy – is easily confused with a development strategy that squeezes agriculture from the start. Such a strategy has always been a catastrophe. Because of the unreliability of market prices in the short run as signals for long-run investments, both governments and private firms, easily miss the importance of investing in higher agricultural productivity, better food safety standards or social responsibility (Timmer 2009b).

Changing income distribution is an important part of the problem. Even if the structural transformation goes smoothly, most rural households find growth in their incomes lagging behind growth in urban incomes. Changing relative incomes in rural and urban areas drive political dynamics, and the nearly universal tendency to increase agricultural protection during a successful structural transformation is easily understandable from the viewpoint of behavioural economics, thus explaining much of the ‘empirical’ political economy of food prices.²¹

²¹ See Lindert (1991) for a summary of the empirical regularities in agricultural policy that cannot be explained by standard neoclassical economics. These include a bias against both imports and exports, an urban bias in poor countries when farmers are a majority of the population, and a rural bias when urban consumers are a majority of the population.

Successful structural transformations have always been primarily a market-driven process. Markets process billions of pieces of information on a daily basis to generate price signals to all participants – no other form of institutional organization has evolved that is capable of the necessary information processing required for individuals and firms to make efficient allocation and investment decisions, and thus to raise long-run productivity. Without reasonably efficient markets, we are all doomed to poverty.

The dilemma, of course, is that markets sometimes (or often, depending on political perspective and analytical training) fail at tasks that society regards as important, such as poverty reduction, nutritional well-being, or food price stability, even employment generation. We now understand that these failures are not just for technical reasons – externalities, spillovers, monopoly power, or asymmetric information, for example – but also have deep behavioural roots, based in loss aversion, widespread norms of fairness, and the regularity of ‘other-regarding preferences’. Fixing them is not easy unless these root causes are incorporated into the policy analysis, design and interventions (an example is in Thaler and Benartzi 2004). That said, a number of behavioural regularities are well documented, and building them into policy design simply requires paying attention. Norms of ‘fairness’ for example, are easy to build into food subsidy schemes – even when they conflict with economists’ sense of efficiency. The Raskin programme of rice distribution to the poor in Indonesia, for example, has struggled with the ‘losses’ to rice distributed by village leaders on the basis of a ‘fairness’ mechanism rather than a ‘poverty’ mechanism. Knowing that such an approach was inevitable from the start would have significantly improved the performance of this programme.

These are lessons not just for food security, but more broadly for many firms involved in the development process. Firms that cannot rely solely on market signals to provide accurate guidance on pricing levels, quality standards, or investments to promote social responsibility, for example, will need input from a diverse array of ‘micro’ specialists in medicine, psychology, sociology, and anthropology, and from ‘macro’ specialists in history, climatology, geography and ethics. It is far from clear how these inputs can be co-ordinated and evaluated, but the need for a broader science of evaluation is clear.

Beyond market failures, there are several problems with the process of structural transformation in the short and medium term. A health and nutrition transition seems to accompany structural transformation, but with lags and significant sectoral differences. Not all of the transitional impact is positive: significant increases in obesity, and accompanying chronic diseases, are linked to both the higher incomes and larger urban populations that come with successful structural transformation, as evidence from China and India is making apparent (Webb and Block 2012).

Technical change, which is stimulated by high food prices, has paradoxically been the long-run mechanism for generating low food prices and better nutrition for the poor. There is considerable debate over the impact of cheap food, a processing-oriented commercial food sector, and urban lifestyles, on the rising tide of obesity. But again, the temporal disconnect between the poor losing access to food in the short run because of high prices, and a positive long-run technological response, requires public understanding and intervention, in the nutrition arena as well as in preventing food crises. By necessity, the poor live in the short run, but must place their hope for an escape from poverty in long-run forces that are mediated by efficient markets. The time inconsistent behaviour of most individuals and policy makers means this dilemma is very difficult to resolve.

4.2 Preventing food crises through understanding and action

Food crises have important short-run and long-run consequences for the welfare of the poor. Poverty traps and irreversible effects from childhood malnutrition (learning, stature, mortality) stem from even temporary loss of access to food. Markets are usually not the best mechanism for preventing these problems in the first place, or alleviating them once they happen. Markets are crucial in the medium to long run as the institutional vehicles for raising productivity of poor workers, but sudden spikes in food prices that cut off these workers from access to food supplies reflect serious market failures. Price stability is not a routine market outcome.

A policy dialogue on these issues over the past quarter century has shown significant progress. First, the need for rapid growth in agricultural productivity, with substantial

participation by small farmers where they are a significant part of the production structure, is increasingly recognized by macro policy makers as a key element in the overall development strategy. Finance ministers, with their hands on fiscal policy and public investment allocations, central bankers, with their hands on exchange rates and money supplies, and heads of planning agencies, with their hands on strategic approaches and sectoral resource allocations, understand now their own stakes in a healthy rural economy (Timmer 2015).



Failure to think through the nature of incentives being set up by policy initiatives is almost a sure way to guarantee an unsuccessful outcome.

In return, food and agricultural planners increasingly understand that real wages in rural areas depend fundamentally on real wages in the urban economy. Real food prices for farmers and consumers are conditioned by the rate of inflation and by exchange rates. Investments in rural infrastructure require budget allocations. Trade policy has direct and indirect effects on rural incentives. The need for a 'macro food policy' has never been clearer.

As always, this macro food policy must encompass consumption, production, marketing/trade and the macro economy (with new roles for financial markets as they connect to commodity markets). Analytically, modelling all of these dimensions is intractable, which is why the way forward continues to be on the intuitive rather than the quantitative front. In the policy business, 'three facts beat a theory' is true most of the time, but a really compelling story wins every time.

How can this intuitive understanding be built? The answer involves a combination of theory, history, quantitative analysis and experience. Different analysts will bring different combinations to bear, and differences in individual temperament, training and hands-on opportunities probably mean that a variety of combinations can work. But no single component alone will make for effective policy analysis and advising.

Analytical understanding

A 'vision' of an interconnected food system is the starting point for a deeper analytical understanding of how it works and, especially, how it would respond to external shocks, technical change, and policy initiatives. Building a vision is an intuitive and pedagogical process. Some analysts see the interconnections most clearly in the context of general equilibrium theory, now a standard tool in all macro economists' kits. Others find the equilibrium of ecological systems a guidepost. Whatever the underlying framework, understanding how markets process billions of pieces of information on a daily basis to generate price signals to all participants is absolutely crucial to building this food policy vision. Markets cannot solve all of society's problems, and sometimes make them worse. But no other form of institutional organization has evolved that is capable of the necessary information processing required for individuals and firms to make efficient allocation and investment decisions, and thus to raise long-run productivity. Without reasonably efficient markets, we are all doomed to poverty.

The dilemma, of course, is that markets often fail at tasks that society regards as important, such as poverty reduction or food price stability. Fortunately, relative simple analytical tools and models are available that cast light on these market failures and point the way toward appropriate government interventions to solve them. Not all market failures are susceptible to successful government interventions – effective risk-sharing mechanisms would be high on the list – but historical experience demonstrates that public action against poverty and food price volatility can be effective in both the short and long run.

Mechanism design

The key to effective public action is to get the 'mechanism design' right. That is, policy initiatives must worry about the incentive structures set up so that they are compatible both with respect to government budgetary and bureaucratic capacity and with respect to self-interested behaviour on the part of market participants who are exposed to the results of policy changes. This may seem an arcane and theoretical point (and worthy of the Nobel Prize in Economics in 2007), but failure to think through the nature of incentives being set up by policy initiatives is almost a sure way to guarantee an unsuccessful outcome.

Equally, policy design needs to be clear on whether the initiative is meant to be a temporary palliative for the problem at hand, or a long-run cure. There is nothing wrong with palliatives, especially if they build support for longer-run approaches that solve the problem. But it is important not to confuse palliatives with cures. Thus, bridges between short-run approaches and long-run impact become the essence of successful food policy design and implementation.

These bridges will be built from 'real' policy instruments, not 'theoretical' ones. The distinction lies in understanding how realistic the assumptions are that underlie the expected behavioural responses to policy initiatives. A policy that assumes poor people have unimpeded access to financial markets to hedge risks will fail. But equally, a policy that assumes poor people will not change their consumption behaviour in the face of price subsidies will also be challenged by unexpected results.

In the end, food policy initiatives must stress the importance of economic growth that includes the poor, and rising labour productivity for unskilled workers. Without these long-run economic dynamics working reasonably smoothly, food policy becomes an exercise in permanent, and expensive, palliatives.

4.3 Knowing what not to do: The political economy of unintended consequences

Good intentions do not inevitably lead to good outcomes. The concern for appropriate mechanism design is one reflection of this potential disconnect, but that concern is primarily a technical one. A broader concern is at issue here – the potential (indeed, likely) disconnect between political rhetoric and effective public action. The problem is that political rhetoric can generate expectations that cannot be met, with subsequent loss of credibility (and hope). Since credibility is often crucial to successful implementation of government policies, especially in short-run price stabilization activities, this loss is potentially serious.

In the original Food Policy Analysis (Timmer, Falcon, and Pearson 1983), we tried to dodge this issue by noting in the preface that it was 'beyond the scope of this book to structure meaningfully the political issues of food policy'. Understandable as that stance may have been at the time, when the economics of food policy were also poorly developed, the intervening three decades has amply demonstrated the primacy of politics in the design and implementation of food policy, a point deepened by our new understanding of the behavioural foundations of this political primacy. Unfortunately, there is no equivalent to Food Policy Analysis in the political science literature, perhaps because 'all politics is local' (to quote a famous American congressional leader, Tip O'Neil).

Without clear guidelines, then, on how to implement effective food policies, the best that can be done is to review what those policies need to accomplish. A way must be found to link short-run political imperatives with long-run economic realities. Democratic societies have the best historical track record at building and maintaining this link, but the deep institutions needed for democracies to fulfil this task take time to build.

A way must be found to make markets work to deliver long-run growth. No alternative exists to organizing economies around market-based transactions if societies are to reach their goals of greater material welfare and broad political freedom. Markets produce both. But markets also fail in important social tasks. Responsible governments must find a way to prevent those failures through careful regulation and to fix them when innocent workers and consumers cannot participate in the promises of market outcomes.

Thus finding a way for governments to deliver effective and efficient safety nets as both a moral and political imperative – to allow markets to deliver on these promises – becomes the essence of policy-making. Governments, like the poor, live in the short run. Their vision and strategic design for inclusive, long-run growth must survive the day-to-day challenges of managing power. 'Stability' would seem to be essential to building this bridge between short-run political imperatives and long-run performance – stability in food prices, in the macro economy, in the political arena. Within a reasonably stable environment, competitive politics then offer a mechanism for the political economy of food security to meet these challenges.

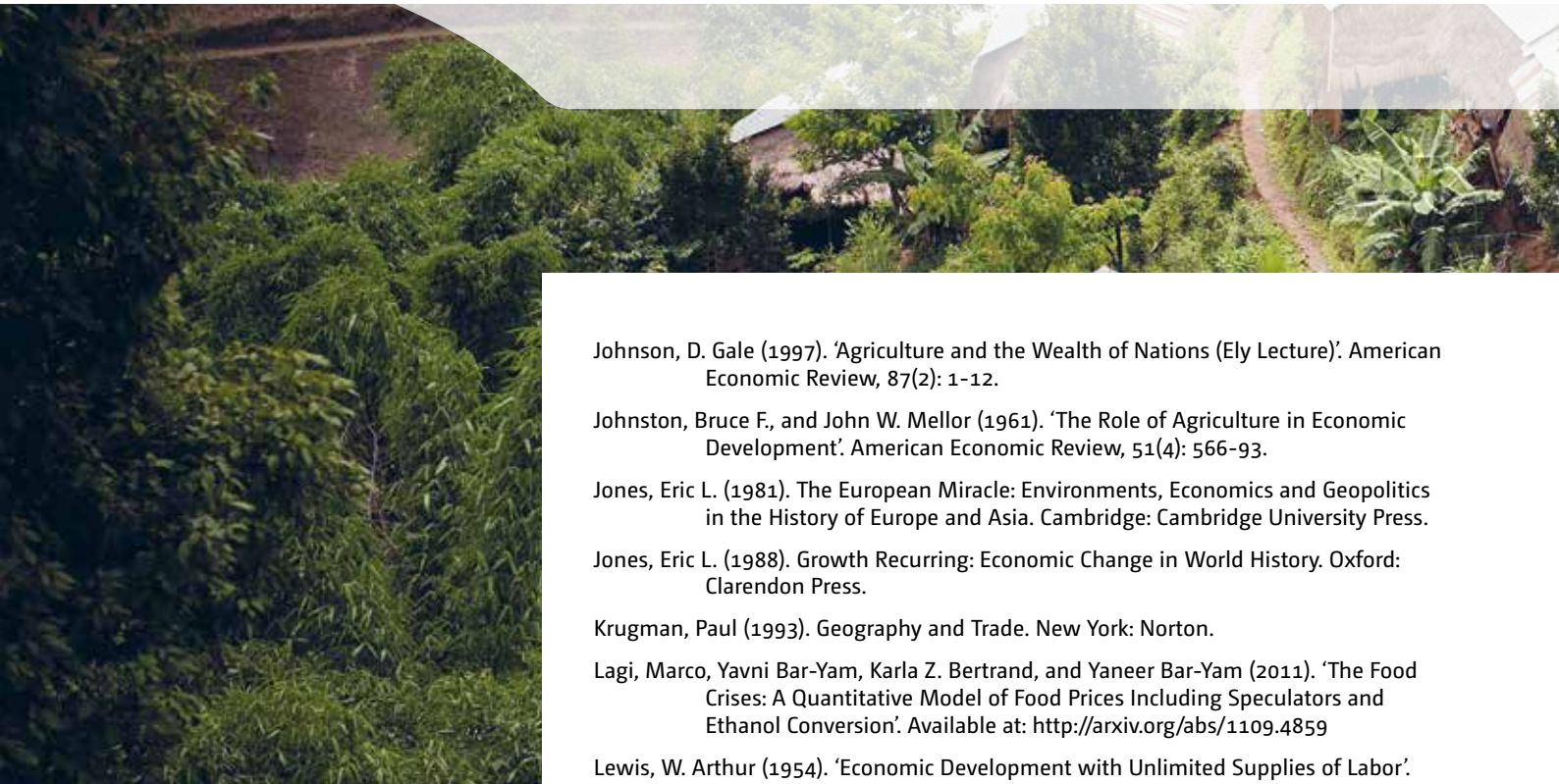


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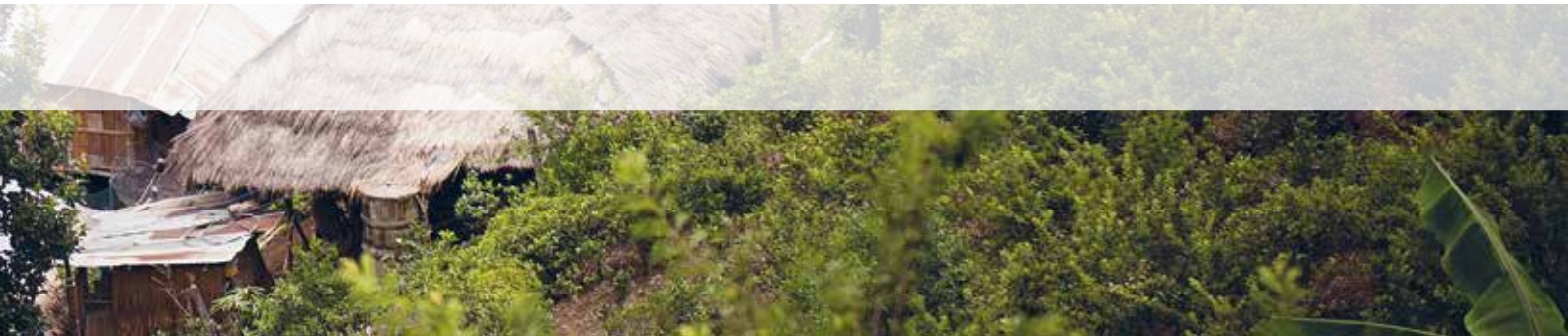
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