

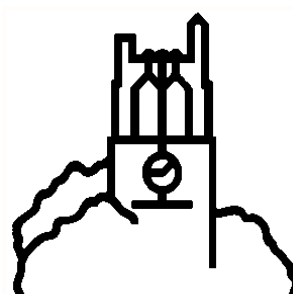
# MSU International Development

## Working Paper

### **Impact on Employment and Migration of Structural and Rural Transformation**

by

**David Tschirley and Thomas Reardon**



**Department of Agricultural, Food, and Resource Economics  
Department of Economics  
MICHIGAN STATE UNIVERSITY  
East Lansing, Michigan 48824**

**MSU International  
Development  
Working Paper 144  
June 2016**

*MSU Agricultural, Food, and Resource Economics Web Site: <http://www.afre.msu.edu/>  
MSU Food Security Group Web Site: <http://fsg.afre.msu.edu/index.htm>*

MSU is an affirmative-action, equal-opportunity employer

## **MSU INTERNATIONAL DEVELOPMENT PAPERS**

The Michigan State University (MSU) International Development Paper series is designed to further the comparative analysis of international development activities in Africa, Latin America, Asia, and the Near East. The papers report research findings on historical, as well as contemporary, international development problems. The series includes papers on a wide range of topics, such as alternative rural development strategies; nonfarm employment and small scale industry; housing and construction; farming and marketing systems; food and nutrition policy analysis; economics of rice production in West Africa; technological change, employment, and income distribution; computer techniques for farm and marketing surveys; farming systems and food security research.

The papers are aimed at teachers, researchers, policy makers, donor agencies, and international development practitioners. Selected papers will be translated into French, Spanish, or other languages.

Copies of all MSU International Development Papers, Working Papers, and Policy Syntheses are freely downloadable in pdf format from the following Web sites:

MSU International Development Papers

<http://fsg.afre.msu.edu/papers/idp.htm>

<http://ideas.repec.org/s/ags/mididp.html>

MSU International Development Working Papers

<http://fsg.afre.msu.edu/papers/idwp.htm>

<http://ideas.repec.org/s/ags/midiwp.html>

MSU International Development Policy Syntheses

<http://fsg.afre.msu.edu/psynindx.htm>

<http://ideas.repec.org/s/ags/midips.html>

Copies of all MSU International Development publications are also submitted to the USAID Development Experience Clearing House (DEC) at: <http://dec.usaid.gov/>

**IMPACT ON EMPLOYMENT AND MIGRATION OF STRUCTURAL  
AND RURAL TRANSFORMATION**

by

**David Tschirley and Thomas Reardon**

June 2016

Tschirley is Professor, International Development and Reardon is Professor. Both are in Agricultural, Food, and Resource Economics (AFRE), Michigan State University.

**ISSN 0731-3483**

© All rights reserved by Michigan State University, 2016

Michigan State University agrees to and does hereby grant to the United States Government a royalty-free, non-exclusive and irrevocable license throughout the world to use, duplicate, disclose, or dispose of this publication in any manner and for any purposes and to permit others to do so.

Published by the Department of Agricultural, Food, and Resource Economics and the Department of Economics, Michigan State University, East Lansing, Michigan 48824-1039, U.S.A.

## **ACKNOWLEDGMENTS**

The authors gratefully acknowledge financial support from International Fund for Agricultural Development and from the United States Agency for International Development (USAID), through the Food Security III Cooperative Agreement (GDGA-00- 000021-00) between Michigan State University and the United States Agency for International Development, Bureau for Food Security, Office of Agriculture, Research, and Technology.

The authors gratefully acknowledge critical review by Hans Binswanger and anonymous external reviewers. They also wish to thank Patricia Johannes for editing and formatting assistance.

The views expressed in this document are exclusively those of the authors.

## EXECUTIVE SUMMARY

This paper examines how global drivers of employment change might play out in the developing world over the next two- to three decades. It first considers exogenous trends that have effects on employment: demographic trends, and trends in industrialization and automation. It then examines responses that might offset the impacts of these challenging trends. Finally, it proposes a country classification to organize discussion of policy and programmatic responses.

The paper finds that the widely discussed *youth bulge* is largely confined to Sub-Saharan Africa (SSA), and is a *bulge* only in comparison to other areas of the world: youth labor market entrants are falling (albeit slowly), not rising, as a share of the existing labor force in SSA. The paper also finds that migration in the sense of movement of people from urban to rural areas has declined in importance and now accounts for well under half of total urban population growth in all regions. It appears unlikely that such movement will ever play the same role it played in the urbanization of the early western industrializers.

The main threat to inclusive employment in developing countries is the worldwide trend towards employment deindustrialization, driven by automation and opening to global trade. Automation is driven by the confluence of, and extremely rapid development in, computerization, robotics, and Big Data. We conclude that the global erosion of low-skilled jobs, driven by these processes, is likely to continue. This presents special challenges for poor countries with abundant, and in some cases, growing labor forces with little skill. Consequently, patterns of transformation observed in the past, whereby low-skilled labor left agriculture to low skilled but higher paying positions in industry will be hard to replicate.

A diversified approach to assisting low skilled laborers, therefore, is needed. Labor-intensive manufacturing will remain for some time in the portfolio of opportunities open to low-skilled workers, though at lower levels than in the past. It should be encouraged wherever possible through improvements in the business environment, investment in transport and communications, and openness to trade. Open regional trade will be especially important for many countries, especially those that have industrialized least, but exports to world markets should also be pursued whenever possible. Jobs in the service sector will increase, and much of this work will be informal. Informality should therefore be embraced as a reality of the current economic landscape, common to nearly all countries. Workers in the informal sector should have assistance to function well, through legal protections against harassment, investment in skills, and provision of infrastructure. The gap between jobs that provide social benefits and those that do not should be reduced through expanded public provision of a basic package of benefits for all. While this will be expensive, it can be justified if the benefits are genuine public goods such as health, pensions, and education. The role of the state under such an evolution of employment becomes strengthening of the fundamental capabilities of its populace, providing a broad cushion of benefits to address public goods, and strengthening the business environment through conducive policy and infrastructural investment. The policy environment should include, but not be limited to, selected elements of industrial policy, tailored to the institutional capacities of the countries implementing them.

## TABLE OF CONTENTS

ACKNOWLEDGMENTS .....	iii
EXECUTIVE SUMMARY .....	iv
ACRONYMS .....	vii
1. INTRODUCTION .....	1
2. CHALLENGES FROM EXOGENOUS SHOCKS: FIRST-ROUND EFFECTS ON EMPLOYMENT .....	3
2.1. Demographic Trends: The Youth Bulge, Urbanization, and Migration.....	3
2.1.1. The Youth Bulge.....	3
2.1.2. Urbanization.....	5
2.1.3. Migration.....	6
2.2. (De)industrialization and Automation: Implications for Rural Livelihoods and Employment.....	7
2.2.1. Patterns of Deindustrialization.....	8
2.2.2. Effects on Employment.....	9
2.2.3. Implications for Developing Countries.....	11
3. OPPORTUNITIES AND ENDOGENOUS STRATEGIES: OFF-SETTING FORCES AND SECOND-ROUND EFFECTS .....	14
3.1. Opportunities for Rural Livelihoods and Employment.....	14
3.2. Challenges for the Poorest to Avail of These Opportunities.....	15
4. POLICY AND PROGRAMMATIC RESPONSES TO PROTECT THE VULNERABLE AND IMPROVE RURAL EMPLOYMENT .....	18
4.1. Country Classification for Thinking about Employment Prospects.....	18
4.2. Prospects and Policy Approaches by Country Type .....	21
4.2.1. Failed and Nascent Industrializers .....	22
4.2.2. Successful Industrializers.....	24
4.2.3. Premature Deindustrializers.....	25
4.3. What if Today's Technology Really is Different? .....	25
APPENDICES .....	26
REFERENCES .....	30

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Summary Data on Classification Scheme for Assessing Employment Prospects.....	20
A1. Country Indicators by Classification Scheme .....	28
A2. Country Indicators for Core Countries by Classification Scheme .....	29

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. Share of Youth (0-15 Years) in Population, by Region, 1950-2040 .....	4
2. Youth Entering Labor Markets as Percent of Existing Labor Force, by Region, 1950-2013 .....	4
3. Percent Urban Population, by Region, 1950 to 2013 and Projected to 2040 .....	5
4. Classification Scheme for Employment Analysis .....	19
A1. Lagging SEA and Rest of SEA .....	27
A2. Lagging LAC and Rest of LAC .....	27



## ACRONYMS

CEP	Centre for Economic Performance.
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GGDC	Groningen Growth and Development Center
IFAD	International Fund for Agricultural Development
LAC	Latin America and the Caribbean
MSU	Michigan State University
NBER	National Bureau of Economic Research
OECD	Organisation for Economic Co-operation and Development
RNFE	Rural Non-Farm Economy
SEA	Southeast Asia
SSA	Sub-Saharan Africa
SMEs	Small-medium Enterprises
UN	United Nations
USAID	United States Agency for International Development
USD	U.S. Dollar

## 1. INTRODUCTION

Prospects for remunerative and stable employment have become a worldwide concern over the past decade, as acute in the developed world as in many areas of the developing world. In the developed world, the focus has been on the polarization of the job market and the “disappearing middle”—the well documented decline in jobs in the middle-skill, middle-income portion of the jobs distribution, with a related broad decline in manufacturing jobs, a rise in service jobs, and a concentration of the latter in the low- and high-ends of the skill- and wage distribution (see Autor and Dorn (2013) and Feng and Graetz (2015) for U.S.; Goos, Manning, and Salomons (2010) for Europe).

In the developing world, the challenge of providing jobs for the tens of millions of youth in Africa’s youth bulge has caught the programmatic attention of nearly every development agency in the world, spawning innumerable attempts to improve and apply local labor market assessments and develop training and skills-matching programs to channel youth into remunerative employment.

Meanwhile and so far largely separate from these initiatives on youth employment, a broader analytical focus has emerged on the process of *premature deindustrialization* in the developing world. This focus started with Dasupta and Singh (2006) and has been most fully pursued recently by Rodrik (various years) but with contributions from others, e.g., Bogliaccini (2013) and Tregenna (2011). In the midst of the extended economic boom in much of Asia, and new-found optimism regarding Africa’s growth prospects (Miguel ; Young 2012; McMillan and Harttgen 2014), this literature documents the profound worldwide decline in manufacturing employment and examines its implications for structural transformation and related poverty reduction in the developing world.

These two narratives—the developed world’s disappearing middle and the developing world’s premature deindustrialization—come together around two drivers: the rise of global trade and the increased pace of automation. Though authors disagree on the relative importance of the technological and trade explanations, there is broad agreement that both factors work together to drive the decline in manufacturing employment: technology drives reductions in cost and demand for labor, and global trade spreads these effects through the world economy.

Among those that emphasize the technological explanation, there is intense and rising concern that *this time might be different*, that the confluence of robotics, exponentially expanding *Big Data*, and ever-advancing computing power may push automation so far into jobs previously the preserve of human beings that increasing shares of the world’s population will be unable to find remunerative employment.

If true, this dynamic would have far reaching but still poorly understood implications for economic and social policy (Brynjolfsson and McAfee 2011a and 2011b; Brynjolfsson and McAfee 2014; Autor 2014; Ford 2015). A fundamental observation is that the pursuit of broad, remunerative employment cannot be separated from the drive to reduce poverty.

The now industrialized countries rose out of poverty by pulling people from agriculture into low-skill—but still far better paying—industrial employment; as incomes continued to rise, most moved into higher-skill, higher-wage jobs, many in the service sector. Some Latin American countries moved along a similar path in the last century; and most recently some

Asian countries have done the same.<sup>1</sup> Yet many countries throughout the developing world have made little progress in this transition, and these suffer from the highest rates of poverty. Understanding how the future mix of job opportunities might differ from the past is central to identifying if and how future paths of economic transformation might differ, and to designing economic and social policies to ensure inclusive development for all.

This paper examines how these factors might play out in the developing world over the next two- to three decades. It starts, in section two, by documenting two sets of exogenous trends (or shocks) that have first round effects on employment: demographics, especially the number of youth entering the labor market and rural-to-urban migration; and trends in industrialization and automation. Section three examines possible responses to these shocks—opportunities and endogenous strategies—that might offset the impacts of the first-round shocks. Section four proposes a country classification framework for anticipating how these exogenous shocks and endogenous responses might play out in different countries, and uses this framework to discuss policy and programmatic responses to protect the vulnerable and improve rural employment.

---

<sup>1</sup> The significant differences between the two continents in *how* they trod this path—the policies they used to industrialize—will be touched on later in the paper.

## 2. CHALLENGES FROM EXOGENOUS SHOCKS: FIRST-ROUND EFFECTS ON EMPLOYMENT

This section addresses two questions: (1) What are the main demographic trends in the developing world over the coming 25 years? and (2) In light of global trends in industrialization and automation, what are the expected consequences for rural livelihoods, rural-urban migration, and employment?

### 2.1. Demographic Trends: The Youth Bulge, Urbanization, and Migration

#### 2.1.1. *The Youth Bulge*

Population growth is by far the highest in Sub-Saharan Africa (SSA): the continent and every region within it except Southern Africa<sup>2</sup> show current growth over 2.6%, while no other region exceeds South Asia's 1.29%. Thus, all other areas of the world are experiencing half or less the rate of population growth seen in SSA.

One result of this pattern is that SSA has seen a much slower decline in the share of youth in its population (Figure 1). For this analysis we classify countries by region, and by level and recent growth of per capita GDP:<sup>3</sup>

- Sub-Saharan Africa (excluding South Africa);
- Lagging Latin America and the Caribbean (LAC) (Guatemala, Haiti, Nicaragua);
- Rest of LAC (Brazil, Chile, Colombia, Cuba, Dominican Republic, Mexico, Peru);
- Lagging Southeast Asia (Cambodia, the Philippines, Vietnam);
- Rest of Southeast Asia (Indonesia, Malaysia, Thailand);
- South Asia (Bangladesh, Bhutan, India, Nepal);
- Rest of Asia (China, Iran); and
- Near East and North Africa (Egypt, Morocco, Sudan, Tajikistan, Tunisia, Turkey, Uzbekistan, Yemen).

In all areas of the world other than SSA and Lagging LAC (Guatemala, Haiti, and Nicaragua), the share of youth in the population began declining in the mid-1960s and proceeded rapidly from that point. The decline in China was most pronounced.

Lagging countries of LAC, along with SSA, began to see this share fall only around 1990, more than 20 years later than the rest of the world. Yet the decline has been far more rapid in Lagging LAC than in SSA: by 2013, SSA's youth share had fallen slightly and only back to levels last seen in 1950. Based on United Nations (UN) projections, SSA's youth share will continue to fall at an increasing pace, though not as rapidly as in Lagging LAC. SSA thus faces a much steeper challenge than other areas of the world in absorbing youth into its labor force.

Directly driven by the above patterns, the youth bulge has been falling in every region of the world since 1990 (Figure 2).<sup>4</sup> However, this fall has been very slow in SSA, and from the highest base.

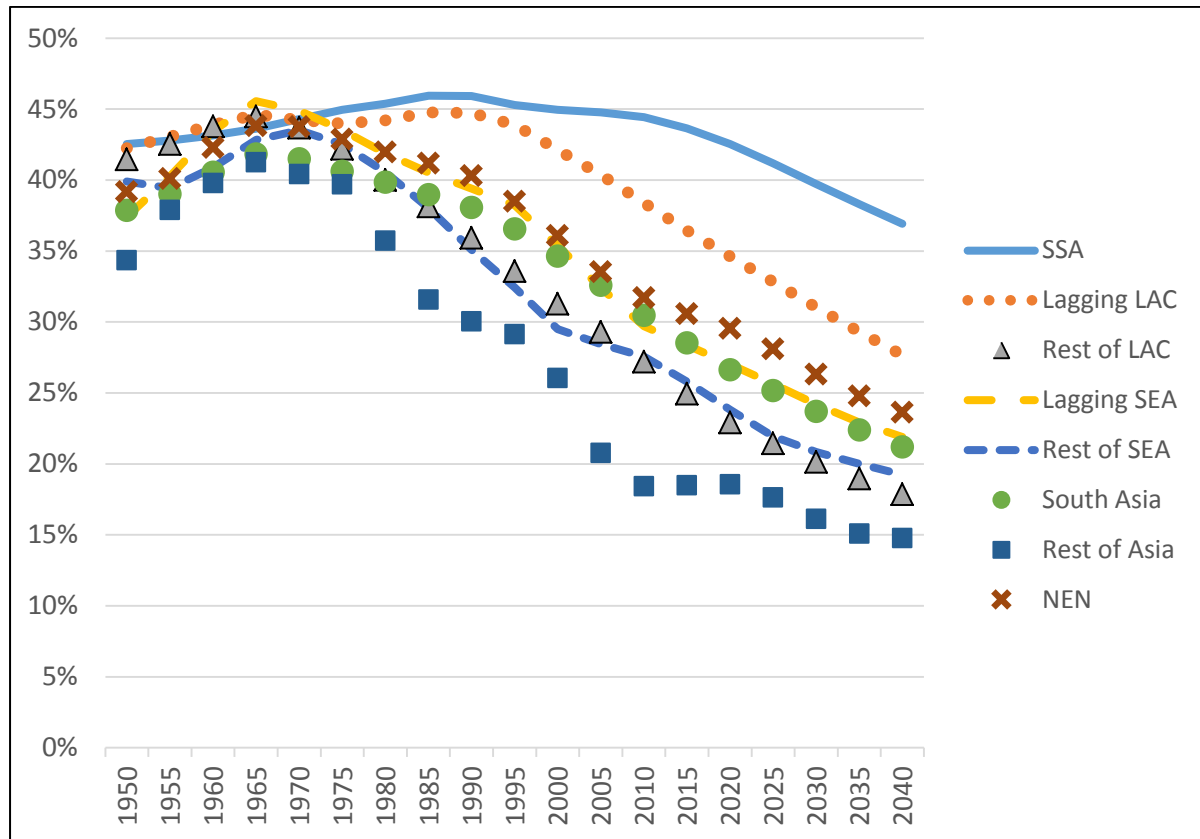
---

<sup>2</sup> The UN defines Southern Africa as Botswana, Lesotho, Swaziland, Namibia, and South Africa.

<sup>3</sup> See annex figures A1 and A2 for classification of Southeast Asia (SEA) and Latin America and the Caribbean (LAC) into *lagging* and *other*.

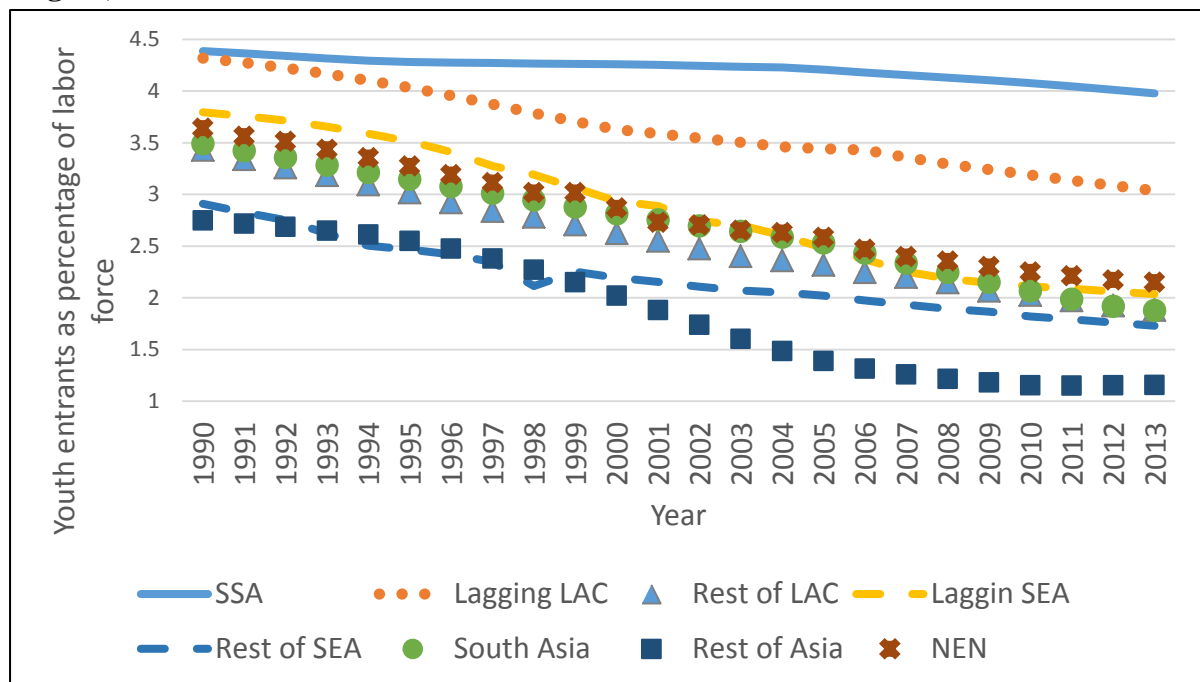
<sup>4</sup> We measure the youth bulge as the number of youth entering the labor market expressed as a share of the existing labor force.

**Figure 1. Share of Youth (0-15 Years) in Population, by Region, 1950-2040**



Source: United Nations Population Division, <http://www.un.org/en/development/desa/population/>.

**Figure 2. Youth Entering Labor Markets as Percent of Existing Labor Force, by Region, 1950-2013**



Source: United Nations Population Division, <http://www.un.org/en/development/desa/population/>.

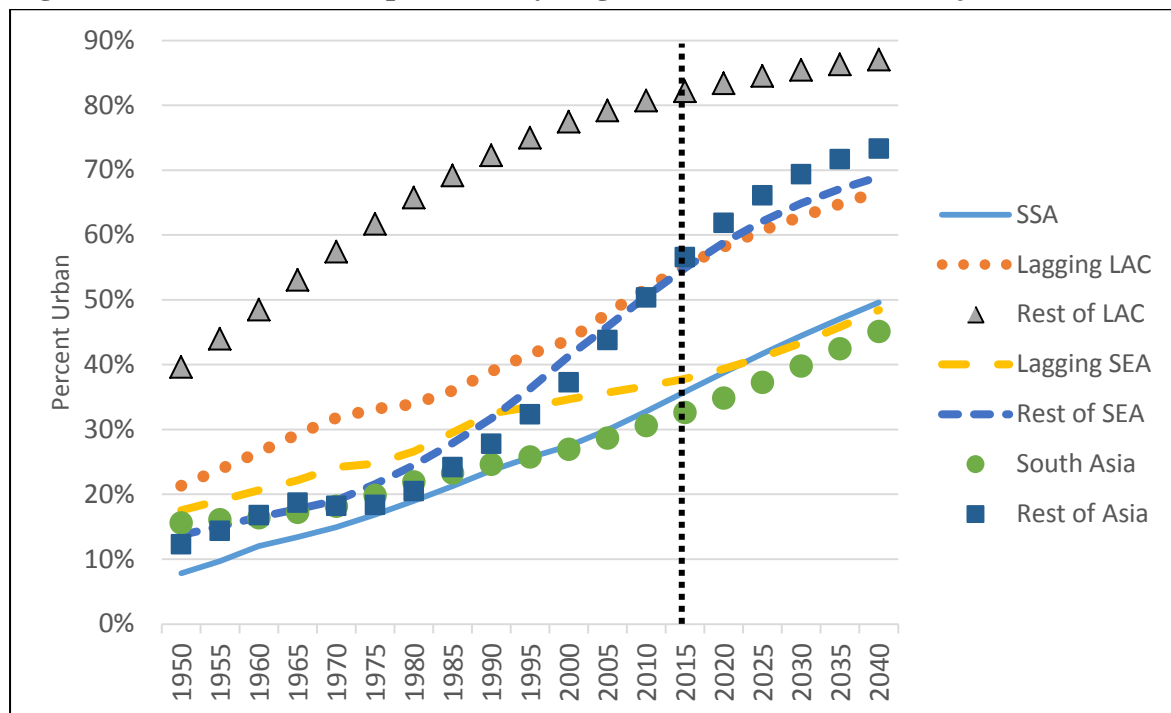
For example, while all other regions had to absorb youth equal to 2.8% to 3.8% of their existing labor force every year in the early 1990s, Lagging LAC and SSA each had to absorb about 4.5%.; by 2013 this figure had fallen sharply to 3% in Lagging LAC, but only marginally in SSA, to 4%.<sup>5</sup> In every other region of the world, this measure was 2.2% or less by 2013. The youth bulge, then, is largely confined to SSA, and is a bulge only in comparison to other areas of the world, since youth labor market entrants are falling in SSA, not rising.

Three key points stand out regarding the relative youth bulges in SSA and lagging LAC. First, the bulge in principle can help competitiveness of countries in labor-intensive sectors by dampening rises in wages, thus potentially attracting investors in search of low cost labor to supply world markets. Second, however, the bulge is a challenge in that it raises the probability of excess supply of labor, which may lead to negative socio-political outcomes including political instability. Third, the bulge imposes very large investment costs on governments if they are to build the capacities in youth that are needed to increase their productivity and make them an attractive source of labor for investors.

### 2.1.2. Urbanization

Populations have urbanized rapidly in all regions (Figure 3). At present, Sub-Saharan Africa, lagging South-East Asia and South Asia urban populations are between 30 and 40% of total populations. This group will stay together and reach close to 50% urbanization by 2040. The rest of Asia has joined lagging Latin American countries at around 55% and this group will move to around 70% urbanization by 2040. The rest of LAC that is not lagging will increase its urbanization rate slowly within the 80%-90% range.

**Figure 3. Percent Urban Population, by Region, 1950 to 2013 and Projected to 2040**



Source: United Nations Population Division, <http://www.un.org/en/development/desa/population/>

<sup>5</sup> The figure assumes that the share of 15-year olds entering the job market in each country is equal to the labor force participation rate of the 15-24 year old age group in that country.

Two points stand out regarding the pattern of urbanization. First, urbanization has occurred not just in mega cities but also in intermediate cities/town; Christiaensen and Todo (2015) show that in most developing countries, population in cities and towns of less than 1 million has grown at least as fast in percentage terms as population in larger cities. Decentralized urbanization is generally considered good for the prospects of rural populations to incrementally work their way out of poverty through off-farm employment (Christiaensen, De Weerd, and Todo 2013).

Second, movement of people from urban to rural areas has played a smaller role in the developing world over the past 50 years than it did in the early industrializing countries. Instead, urban natural increase has played the largest role. This change has been driven by several factors. First, urban death rates today are lower than they were in the past. Additionally, urban birth rates have declined more slowly in Africa than in the rest of the world (Jedwab, Christiaensen, and Gindelsky 2015). As a result, urban natural increase now accounts for about half or more of urban growth in Africa, Latin America, and Asia. Furthermore, while rural-urban migration accounts for the rest, some share of this migration is actually reclassification of formerly rural households as urban due to growth in the size of their settlement. Thus, movement of rural households to urban areas in all regions of the developing world now accounts for well under half of total urban population growth.

Urbanization is a two-edged sword for employment prospects. On the one hand, cities are a locus of industrial structural transformation that challenges those selling non-skilled labor and low quality cottage manufactures from rural self-employment (Reardon, Stamoulis, and Pingali 2007).<sup>6</sup> On the other hand, urbanization creates economies of agglomeration and low entry-barrier service sector jobs for rural commuters, migrants, and urban workers (World Bank 2009).

### *2.1.3. Migration*

Rural-urban migration (and international migration) represents a set of economic opportunities that are distributed unevenly over rural households with respect to conditioners such as distance from the city, pre-migration income, and education. Note that migration employment can be a permanent move from the rural area, a seasonal move, or a commuting arrangement into the urban area. We first discuss the opportunities and then the conditioners.

*Opportunities:* First, opportunities from migration can be for direct employment in urban areas, other rural areas, and foreign countries. In all cases, remuneration tends to be positively correlated with distance of migration, with relatively low returns to migrating to another rural area (like migrant farm laborers), higher for migration to cities (and positively correlated with the size of the city), and higher still for movement to foreign countries. Given the destination, remuneration is generally correlated with the formality and skill level of the job (if a wage job) or the investment requirement if the migrant enters into self-employment.

Second, migration remittances can, like rural nonfarm employment, create indirect employment in the (sending) rural areas from investment linkages, creating multipliers in investment in farming (Taylor 1992 for Mexico) and in rural nonfarm activity (Taylor 1999).

---

<sup>6</sup> As shown by Haggblade, Hazell, and Reardon (2007), the importance of this negative effect on rural employment will vary across countries. Overall, the figures suggest that manufacturing is a small share (less than one-quarter) of RNFE (rural nonfarm employment), especially in SSA, so that the competition effect from urban areas is not likely to have major impacts in rural areas.

In a first round, these non-farm activities in the sending areas can be own-employment, or employment of third persons in those businesses, as well as induced employment in spin-off activity from that first round.

Third, migration can influence the sending locality's farm labor market directly by reducing sending-family labor to agriculture or by increasing labor hiring to replace migrants. In addition, where local credit markets function poorly, migration income can fund investment in mechanization (Taylor 1992 and Reardon, Crawford, and Kelly 1994 for Africa). Such investment displaces labor or in some cases (irrigation pumps) augments the productivity of and demand for labor on other tasks.

Alternatively, the labor shortage that out-migration creates can induce investment in machines; the latter tends to develop into machine rental markets, changing the labor market long-term (for the Philippines, see Takahashi and Otsuka 2009). Of course the causality can be reversed: mechanization can release labor that migrates, as Binswanger (1986) showed for India.

Fourth, remittances can have differential effects according to the distance of migration, which is correlated with the remuneration and thus remittances. Wouterse (2011) found in Burkina Faso that migration within West Africa had little effect on sending-area agriculture and local rural nonfarm employment, but that inter-continental migration stimulated livestock accumulation while reducing grain farming and local nonfarm activity.

*Challenges and Conditioners of the Employment Effects of Migration:* First, migration is a function of incentives and capacities of would-be migrants. On the one hand, the incentives to migrate are a function of the rural-urban wage differential net of transport or transaction costs. On the other hand, a would-be migrant's ability to act on the incentive is a function of capacities, such as initial skills, investment capital in land and non-land assets, predetermined migration networks, and so on.

Empirical work has shown that migration effects and participation are often concentrated because the capacity to migrate is concentrated (Reardon and Taylor (1996) in Burkina Faso; Winters, de Janvry and Sadoulet (2001) for Mexico). The essence is that those with the least capacity migrate least, and that the distance and the remuneration of the migration are correlated with prior assets. This finding links back to the "migration is unequalizing in the sending locality" school initiated by Lipton (1980) and empirically tested much since. Empirical work such as Corral and Reardon (2001) showed that even in places like Nicaragua where migration is thought to be widespread, only a small share of rural households (and the better-off before migration) undertake it; or Taylor et al. (2005) showed that poorer migrants (still often better-off than non-migrants) migrate internally in Mexico while richer rural households migrate or send migrants to the U.S.

## **2.2. (De)industrialization and Automation: Implications for Rural Livelihoods and Employment**

The main threat to meeting the inclusive employment challenge in developing countries is the worldwide trend towards employment deindustrialization, driven by automation and, especially in developing countries, opening to global trade. The centrality of formal-sector manufacturing to this challenge is based on two characteristics that make it especially effective in supporting the structural transformation of economies. First, it exhibits *unconditional convergence* in labor productivity (Rodrik 2015); that is, labor productivity in



manufacturing tends to rise over time to world standards regardless of the broader economic conditions under which it takes place. Thus, manufacturing workers in, say, Bangladesh, see their wages begin to rise, once the Lewis Turning Point is reached, ultimately towards world levels for that skill level, despite the poor condition of the surrounding economy. Though others have claimed to show such convergence for formal sector services (Kinfe Michael and Morshed 2015), this literature is less established.

In either case, formal-sector manufacturing also spurs growth in formal services; and formal-sector wage work regardless of sector tends to be more stable than informal-sector or self-employment and to provide social benefits that further enhance the financial stability of the households engaged in it. It should be clear that such stable employment brings important social, political, and development benefits.

Falling shares of employment in formal manufacturing (and related formal-sector services) push labor coming off the farm into informal- and self-employment, most typically in the service sector. A key question—quite aside from concerns about their instability—is whether these types of employment can generate the same growth in labor productivity (and thus incomes for workers) that is typically delivered by formal manufacturing. We touch on this issue throughout this paper, but for now we note that the evidence suggests the answer is very likely to be “no”.

We first define terms and review patterns, and then discuss implications for developing countries.

### *2.2.1. Patterns of Deindustrialization*

Two types of deindustrialization are distinguished. Employment deindustrialization refers to a declining share of employment in the industrial sector, while value-added deindustrialization is a declining share of industry in an economy’s total value added. Historically, manufacturing has accounted for about 90% of industrial employment, since manufacturing has tended to be more labor intensive than other industrial sectors such as mining or other natural resource based activity<sup>7</sup>.

Employment- and value added deindustrialization can and do diverge: automation causes the former to start much earlier and progress faster than the latter. Value added deindustrialization is in part a natural result of structural transformation as incomes grow past a certain point and consumer expenditure shifts from manufactures towards services—just as it shifted towards manufactures from food earlier in its growth. Despite this, value-added deindustrialization has not been as rapid as employment deindustrialization; in developed countries, for example, industry has largely maintained its share in real value added while its employment share has fallen sharply (Rodrik 2015).

Premature deindustrialization is defined relative to the path and speed of that phenomenon in developed countries historically. In developing countries in general, deindustrialization is starting at lower peak levels of those shares, and at lower per capita incomes, than occurred among currently developed countries. For example (Rodrik 2015) shows that historically in Organisation for Economic Co-operation and Development (OECD) countries, the industrial share in national employment peaked around 30%, when income levels were about \$14,000 (in 1990 USD). Today in the developing world, countries such as Brazil and India have seen the share of industrial employment in total national employment peak at 13%-15% when

---

<sup>7</sup> Figure calculated from Groningen Growth and Development Center (GGDC) database.

incomes were at \$5,000 or less, with industrial employment shares now declining. India and some African countries appear to have peaked at incomes of \$700.

Automation is picking up rapidly in pace and is spreading its influence from low-skill jobs now progressively up to higher-skill jobs. This impact starts first in manufacturing then, nascent now, but set to grow, in services. The progression is from routine manual activities for manufacturing to routine service activities (e.g., scanners in supermarkets) to more complex services (e.g., legal case reviews, which are already starting to be automated). This progression is driven by the merging of robotics, digital technology, and Big Data. The is based on massive and exponentially growing databases on consumer behavior and machine performance that are fed by use of the internet and cell phones and, set to explode in volume over coming years, *the internet of things* in which machinery, appliances, and even clothes become linked to the internet. Together with the continued unfolding of Moore's Law, which predicts that computing power will double every 18 months—and thus increase 1,000 times in 15 years, a million in 30 years, and so on—these technologies allow increasing use of computing power to solve problems and carry out tasks until recently thought to be the domain of human beings (Brynjolfsson and McAfee 2011a and 2011b; Brynjolfsson and McAfee 2014; Autor 2014; Ford 2015).

Even as employment deindustrialization plays out across the world, agrifood systems in developing countries are modernizing. This modernization has been driven by urbanization and rapid income growth, resulting in a diet transformation (Monteiro et al. 2013; Popkin 2014; Zhou et al. 2015; Tschirley et al. 2015a; Tschirley et al. 2015b) featuring very rapid growth in demand for food through markets (consumption commercialization, Reardon et al. 2015), and for processed and perishable foods. The latter could see market demand growth in Africa of 7-10 times over the next three decades (Tschirley et al. 2015b), driving a rapid rise in the share of value added taking place off the farm.

### 2.2.2. *Effects on Employment*

The dynamic discussed above could have three types of effects on employment. First, it could change the composition of employment. Second and closely related, it could affect the quality of employment, by which we mean wage rates, their stability or reliability, and whether they include social benefits such as retirement savings and health care. Finally, it could raise or lower the overall level of employment. We consider each in turn.

*Composition of Employment:* This dimension relates to the labor market polarization referred to in the first paragraph of this paper. The empirical record is strong on this issue, showing three changes (Autor and Dorn 2013; Feng and Graetz 2015). First, jobs in the middle-skill, middle-wage portion of the distribution have declined sharply. Second, jobs on the high-skill and low-skill ends of the distribution have risen in number. Finally, the increase in low-skill jobs has been generated by a sharp worldwide (not just in advanced economies) decline in jobs requiring routine manual tasks—the traditional manufacturing job—together with a larger rise in the number of low-skill service jobs.

The widespread concern is that continued advances in processing speed and robotic dexterity will have two effects. The first is that they will reverse the recent increase in low-skill service jobs and drive overall declines in low-wage jobs. Examples of automation of low-skill service jobs include the ubiquitous ATM machines replacing bank clerks, the now widely deployed retail checkout scanners, and the near disappearance of secretaries in many offices due to

computerization. Since late 2014, Lowe's Home Improvement Stores in California are trialing OSHbot, a robotic shopping assistant with the potential to dramatically reduce the on-floor human sales force in the chain (as Rachel King noted in the Wall Street Journal article on October 28, 2014). Many other such robotic assistants, including for homes and offices, are in advanced stages of development. Frey and Osborne (2013) estimate that 47% of all jobs in the U.S., and 70% of low-skill jobs, are at risk of loss through automation over the next 20 years. He explicitly suggests that the polarization seen so far will become a truncation at the bottom end: "Our model predicts a truncation in the current trend towards labour market polarization ... as technology races ahead, low-skill workers will reallocate to ... tasks requiring creative and social intelligence. For workers to win the race, however, they will have to acquire creative and social skills" (Frey and Osborne 2013). The second concern is that the already discussed incursion of automation into some high-skill, non-routine service jobs will also advance rapidly.

Two categories of jobs may be less vulnerable to automation: middle skill service jobs requiring creativity and judgment (see Frey above), and that are specific to a place—largely skilled trades such as plumbing, electrical, equipment repair, and so forth—and high-skill jobs requiring abstract procedures that can be complemented by computing power (Autor 2014; Brynjolfsson and McAfee 2014; Frey and Osborne 2013).

Autor (2014) develops an argument for the persistence of middle skill jobs by noting that jobs typically require the execution of several tasks that are not easily unbundled without negatively affecting overall quality. Some of the tasks involved in a job may be complemented by computing power—thus continue to be done by humans—while others can be substituted by it and are thus done by computer, increasing human productivity. As a result, such jobs will persist and will feature intensified human-computer interaction in their execution.

*Job Quality:* Evidence in the U.S. and Europe is also clear in this regard. Two sets of evidence are relevant. The first is the job market polarization discussed above, in which middle-skill, middle-wage jobs and low-skill manual jobs have both declined. The former are the type of stable, middle-class jobs (thus the missing middle in the current debate) that in years past often included social benefits and generated social- and economic stability for those holding them. The latter are the traditional manufacturing jobs that also previously provided stable employment and sometimes-strong social benefits. In their stead, some new jobs have emerged in the high-skill service sector, but most have been in low-skill service jobs. The latter tend to be part-time, often have unstable schedules, and rarely include social benefits.

The second set of evidence pertains to the declining share of labor in total income. A fixed labor share of income has been such an empirical regularity that it became a fundamental feature of macroeconomic models at least 60 years ago. Yet Karabarbounis and Neiman (2013) present evidence on four key results that defies this feature. First, labor's share in national incomes has declined globally since 1975, across developed- and developing economies; of 46 countries with significant trends in the share, over 80% were negative, including most OECD countries and others such as China, India, and Mexico. Second, this decline is not limited to certain sectors and is not explained by movement of labor across sectors: six of the eight tested sectors with significant trends had negative trends, and these within-sector effects dominated cross-sector effects in explaining the declines. Third, Karabarbounis and Neiman (2013) link this decline to the sharp drop in the price of investment goods since 2000, "likely associated with the computer and information

technology age”, leading to substitution of information technology for labor. Finally, they link their results to rising inequality, concluding that the model implies “meaningful changes in the distribution of income when households have heterogeneous assets ... or skills”.

*Employment Levels:* Whether these dynamics have effects on employment levels depends on whether the (embodied capital) technologies are primarily substitutes or complements for labor.

On the one hand, we note that the ways in which technology can be complementary (thus having a neutral or even positive impact on employment) are more difficult to identify than the ways in which it can be a substitute, for a simple reason: one sees the jobs being lost but has to imagine the new jobs that could emerge (Autor and Dorn 2013; Autor 2014). As a result, “journalists and expert commentators overstate the extent of machine substitution for human labor and ignore the strong complementarities that increase productivity, raise earnings, and augment demand for skilled labor” (Autor 2014). This dynamic helps explain the long history in the industrialized world of periodic false alarms about machine and computer displacement of labor; in each case, previously unimagined jobs have emerged and employment has continued to grow, though sometimes with a lag.

In a similar vein, Feng and Graetz (2015) cite historical evidence of labor market polarization—a *hollowing out* of the middle of the wage distribution similar to that seen today in the U.S. and Europe—in two previous periods of momentous technological change: the rise of the steam engine in the mid-1800s, and the rise of electricity in the early 1900s. In neither of these instances did overall employment decline in the long term.

On the other hand, Beaudry et al. (2013) note a sharp decline beginning in 2000, following many years of steady increase, in the demand for skill in the U.S. labor market. The result is a progressive “de-skilling” of the workforce, with more educated workers taking lower skill jobs, pushing those jobholders to lower levels of the skill ladder, who in turn displace the even less skilled holding those jobs. The authors link this declining demand for skill to the decline in the U.S. labor market participation rate since 2000. Two implications follow. First, these results put into question the ability of higher quality education and technical training alone to ensure robust employment in the new economy. Second, together with compelling evidence on the realized and likely future decline in demand for low-skill jobs, Beaudry’s results can be taken to suggest declines in overall employment over time.

Summarizing, the evidence suggests three conclusions regarding the employment effects of global deindustrialization. First, the composition of jobs in developed countries is shifting to a mix heavier in low quality employment, driven in large measure by the intersection of computational power, big data, and robotics. Second, the low-skill service jobs that have been a key engine of job growth in these countries over the past two decades are under increasing threat of automation. Third, there is intense concern but no agreement on the fundamental question of whether 21<sup>st</sup> century technology, unique in its ability to automate cognitive tasks, will also, and for the first time, drive a long-term decline in employment. If it does, a wide range of policies—economic, social, educational, and others—will need to be fundamentally re-engineered over coming decades.

### *2.2.3. Implications for Developing Countries*

We note that the processes discussed above are playing out most directly in the countries and sectors broadly adopting these technologies. These include developed countries and the

modern sectors of some developing countries such as China. The effects, however, are felt globally and in all countries through their impact on the patterns of global investment and global trade.

We see the following implications for developing countries. First, countries with cheap labor may get less help from the domino effect of international firms seeking new sources of cheap labor (such as happened in textiles from Japanese rural industrialization based on cheap rural female labor in the 1930s to its movement to Korea and then China and now Bangladesh and possibly Myanmar). Thus, the positive side of Africa's youth bulge—plentiful, low-cost labor potentially attracting manufacturing investment—may be less valuable as time goes on.

Second, this pattern could have important negative implications for female employment. The International Labour Organization reports that more than one-third of manufacturing employment in developing countries is female, and nearly one-half in some Asian countries (Barrientos, Kabeer, and Hossain 2004). This is especially the case in export manufacturing, and especially during the early phases of such manufacturing. This pattern is driven in part by competitiveness in the world market and the push for flexible labor—part-time, temporary, and casual—which historically characterizes female employment.

There also exists a broad pattern of women receiving lower pay than men in manufacturing. Since much of this work is low-skilled and repetitive, it is also the type that is most likely to decline as automation proceeds. Barrientos, Kabeer, and Hossain (2004) cite many studies showing that female employment declines as automation proceeds and as the skill—and wages—of remaining workers rise. They note that this is not necessarily due to inability to obtain the skill but rather to employer preference for males in such positions, to avoid paying maternity and childcare benefits.

A related issue arises from off-shoring and re-shoring and automation. The world news increasingly features stories about re-shoring—U.S. and now even Chinese manufacturers that had previously off-shored their production in search of low cost labor, returning at least a portion of their production to their country. While off-shoring was driven by the pursuit of low-cost labor, re-shoring is a result primarily of: (a) the falling importance of labor in total cost, which is a result of automation; (b) the resulting rising importance of other cost and productivity factors, including network effects in highly automated production. This suggests that countries that have suffered significant deindustrialization may, depending on the extent to which they have developed their *fundamental capabilities* (Rodrik 2015), have very limited ability to attract back the manufacturing jobs that they lost. These fundamental capabilities include human capital, technology, infrastructure, and strong institutions that could ensure robust growth under adverse external circumstances.

Domestic agrifood system modernization in developing countries is a two edged sword for wage employment or self-employment. On the one hand, the modernization challenges rural employment by supplying products and services from efficient urban firms out to rural areas, competing with local goods (Reardon, Stamoulis, and Pingali 2007). Yet as noted above, manufacturing tends to be a small share of rural non-farm employment, so this effect should on average be small. Modern firms also have stricter requirements for quality, volume, and timing consistency, all of which create entry barriers for farmers and any firms wishing to provide first-stage processed raw material to urban-based processors.

Urban-based food manufacturing and food service businesses require cheap labor flows from rural areas in their initial labor-intensive phase; how much of this labor flows into informal self-employment and how much into wage employment depends largely on the importance of

urban food manufacturing and food preparation (which have a higher share of wage employment) relative to urban marketing and other services (which tend more towards self-employment; see Tschirley et al. 2015a).

Very rapid growth in market demand for perishable and processed foods in urban areas of developing Asia and Africa means that food manufacturing and restaurants/street vendors will be among the fastest growing sectors over the coming decades (Reardon et al. 2015; Tschirley et al. 2015a, 2015b), likely accounting for 7%-8% of all new jobs over the next 15 years. Marketing, transport, and other services—currently more informal than food manufacturing and food preparation—are expected to account for about 10% of new job growth. Together, the post-farm food system is likely to account for 15% to 20% of all new jobs over this time frame; farming should provide about one-third, with the rest—nearly half—coming from non-food sectors.

Barrientos, Kabeer, and Hossain (2004) cite work showing that women can have high shares of employment in the post-farm segments of high value supply chains. Jaffee, Henson, and Rios (2011) show the same for export horticulture in Kenya. As demand for these products grows locally, this can be an opportunity for female employment.

One might think that small rural firms, whether those currently in operation or those that could form in response to emerging demand, can hide from the challenges posed by more modern urban firms. Yet steadily integrating markets and reducing transaction costs are *de-protecting* rural areas (Reardon, Stamoulis, and P. Pingali 2007). Note that less than 10% of rural population is located in remote areas beyond several hours of cities (Barbier and Hochard 2014). Rural population densities also tend to be highest in areas closer to urban markets. Therefore, most rural people are close to transforming markets as a challenge or help; the greatest challenge is for the rural self-employed manufacturers. The dilemma is that workers, households, or firms that are far from markets can allow transaction costs to protect them, but those same costs keep them from selling to growing markets and emerging from poverty.

### **3. OPPORTUNITIES AND ENDOGENOUS STRATEGIES: OFF-SETTING FORCES AND SECOND-ROUND EFFECTS**

This section addresses two issues: (1) the offsetting forces and processes that may create opportunities for improved rural livelihood and employment, and (2) the potential contribution of agricultural and rural non-farm employment for overall employment and rural livelihoods.

#### **3.1. Opportunities for Rural Livelihoods and Employment**

Offsetting forces and processes are the set of employment (wage and self-employment) strategies undertaken by rural people. We rank these strategies roughly from least expandable in inclusive form to most expandable in inclusive form. By inclusive we mean activities available not just to the strong (workers with skills and self-employed with capital assets) but also the weak and vulnerable (workers with low skills and self-employed with low capital base). We also assess the potential contribution and challenges to them.

A first candidate, limited in volume and inclusivity, has been a growth path of natural-resource exploitation such as energy, mines, and forests. This has been typical of countries in all regions that have oil, those with large hinterlands with forests, and those with mineral resources. Each region has examples, though Africa is particularly rich in them.

A second candidate, also limited in volume and inclusivity, is services around natural resources and cultural resources; to wit, tourism. This is a major source of service-sector employment in some areas, and of multipliers to local communities. It is not, however, a broad based opportunity because tourist places by definition are special/particular and geographically reduced in scope.

A third candidate, limited in volume and inclusivity except for the short-range form, is temporary migration by rural household members. We class this as non (directly) inclusive because, as discussed in 2.1.3 even in rural zones renowned for their migrant-sending, the share of households sending migrants is small.

A fourth major candidate for rural livelihoods and jobs, this one broad in volume and inclusivity (perhaps 50-60% of rural incomes), has been agriculture itself, whether from own-farm or farm wage employment. The small share of farming employment that is wage labor typically is performed by the poorest persons in the communities. However, there are several important caveats to the ability of agriculture to absorb more labor, as discussed in the challenges subsection below.

A fifth source of income and employment for rural people, also broad and major, is Rural Non-Farm Economy (RNFE) from services and manufactures (Haggblade, Hazell, and Reardon 2007). RNFE forms 30-50% of rural incomes on average (with some countries having more than that). It is much more important on average than farm wage labor and extra-local migration employment. RNFE is based either in fully rural areas or by rural households commuting to local rural towns (this constitutes half of RNFE in India but less in Africa).

RNFE is expected to expand and change in composition over time, with several points to note. First, much of RNFE development, especially in poorer areas and in early stages when it is heavily production-linkage based, is closely tied to the development of the off-farm components of the agrifood system (agricultural services, processing, distribution/logistics). These off-farm components are developing very quickly (driven by urbanization,

diversification of diets, and increased processed food in the diet), with start time and speed and depth correlated roughly with GDP/capita and urbanization. This is mirrored on the demand side by rapid diet change that requires handling for perishable foods and processing.

Note however that in later stages there is a development of services and manufactures beyond production linkages with local farming; (see Haggblade, Hazell, and Reardon 2007 and Reardon, Berdegúe, and Escobar 2001). Reviews of evidence on RNFE show that the trends are from self-employment to wage employment, from manufactures to services, and from hinterland to villages or rural towns and near highways (Reardon, Berdegúe, and Escobar et al. 2001 for Latin America; Haggblade, Hazell, and Reardon 2007 in general).

The distribution of RNFE of the *low barriers to entry* type is denser in areas with better agriculture or nearer to cities and both. In those areas a U curve of reliance on RNFE tends to prevail, with the horizontal axis being household assets. The challenge is that in unfavorable areas the share diagram tends to be monotonically rising, indicating that poorer households have a harder time accessing RNFE (Reardon et al. 2000). This is discussed further below in terms of specific limitations. Nonfarm activity in these low potential areas is also more externally oriented as they feature fewer production- and consumption-linkage activities. This implies that there may be geographic poverty traps (Ravallion 1997) and asset poverty traps in RNFE.

Self-employment micro-enterprise, especially in manufactures, blossoms where there is economic space for it—after privatization of parastatals (such as in Zimbabwe, Rubey 1997), in the initial phases of demand for processed foods (see Snyder et al. 2015 for the case of Dar es Salaam), and most vigorously in high potential rural zones and in rural areas close to cities and peri-urban areas.

### **3.2. Challenges for the Poorest to Avail of These Opportunities**

An over-arching challenge for the poor in general and for women is what Reardon, Berdegúe, and Escobar (2001) call the *meso paradox* and the *micro paradox*. This is a key message of this paper and explains in general most of the challenges faced by the rural poor in general and for women to enter all five of the employment options noted above.

The meso paradox is their observation that the zones needing income diversification the most (incentive) are least able to generate it (capacity); that is, hinterland zones and zones with poor agro-climates, tend to be poorer and to suffer more risk. These zones thus feature weak generation of investable surpluses and effective demand for goods and services beyond the most basic. These zones need new employment sources but have a hard time investing in them, maintaining them, or indeed, locally demanding them. This paradox is at work across zones within countries, across countries within regions, and across regions.

The micro paradox is parallel to this at the household level. Rural households in both favorable regions and hinterland or low potential regions have a strong incentive to work off-farm to manage risk or alleviate poverty, but often face idiosyncratic market failures (such as for credit) and asset poverty that keep them from entering the labor market. This challenge can be exacerbated if the individual is a woman and could face gender bias or be further limited by a preponderance of unremunerated home chores such as fetching wood and water, child care, washing, and cooking. These households may not even be welfare poor in income but rather just be investment poor (Reardon and Vosti 1995), meaning that they do not have the needed assets or a market to convert the assets they do have into assets of the needed form (such as labor sold to buy start up equipment for a self-employment enterprise).



A logical extension of the paradoxes above is that the asset-rich are much better able to take advantage of many of the opportunities of employment discussed above, so that there is elite capture. That capture is positively correlated with the investment requirements or entry barriers to the activities.

To start mines or forest operations that have enough scale to be competitive, one needs to purchase digging equipment and chain saws and hire crews; hence forestry and mining employment tends to be concentrated, not broad, except where it is informal or artisanal, but even that requires investment and is controlled by middlemen. There may be additional challenges for rural women to get these sorts of jobs that require living away from home in camps, and so on.

To migrate even domestically, let alone internationally, one often needs to speak the language of the city, to have some skill, to have enough money to afford the transport and the (often illegal) intermediaries, to have money to live while looking for a job, to have connections such as migration networks, and to have protection from the criminals that prey on migrants. This can be even more challenging if one is a woman and possibly also faces employment discrimination for construction jobs or is consigned to low paying arduous jobs; the image of lines of women carrying stones on their heads to building sights quickly comes to mind. It is thus not surprising that migration is a relatively non-inclusive channel. Migrant employment is also fraught with risk, such as changing immigration policies, informal housing crackdowns, criminality, and mechanization in the receiving area (such as sugar cane mechanization underway in Cali and São Paulo; horticultural mechanization in Brazil in response to rising wages in labor-sending areas; automation in factories in Eastern China; earth moving machines at construct sites in Dar es Salaam; and tomato harvesting machines introduced in California).

Agriculture self-employment has the obvious entry requirement of land and thus land inheritance or purchase or rental markets. These are often constrained. Moreover, labor-intensive high-value products like fish or horticulture can be important additions to employment but in some countries and situations women in particular face challenges at the family level of engaging in high value crop production.

Farm wage labor employment is a key refuge activity of the poorest, but across developing regions there has been a spurt of mechanization as rural wages have risen with industrialization and urbanization and the Lewis Turning Point is being reached in China (Zhang 2008), Bangladesh (Zhang 2010) and others. Mechanization is less apparent in Africa, as would be expected by its lower income levels, but is potentially rising fast there on the back of a rise in medium-scale farming (Jayne et al. 2015). Worldwide, the farm laborer is increasingly at risk from ever-cheaper automation, ranging from farm machines to mechanized packing houses to conveyor systems to load trucks.

The challenges to farm wage employment are offset by three things: (1) the rise of horticulture and aquaculture that are both very labor demanding per unit of land, at least in their initial phases of development—note the caveat above about women’s challenge in some places in accessing this as a producer rather than as a wage worker; (2) the emergence in some places in all the regions of middle- and large- size farms may require a lot of hired labor (as Neven et al. 2009 show for the mid-sized produce farms near Nairobi), but eventually these farms will mechanize as we see in medium/large potato farms in western Uttar Pradesh in India (Das Gupta et al. 2010); and (3) the development of nonfarm employment as well as the intensification of agriculture tighten the labor market, pushing up wages for farm wage

labor (Lanjouw and Murgai 2009 in India). Yet even here, this positive effect can be short-lived, as rising wages induce mechanization.

Rural nonfarm wage employment can be easy for the rural poor to enter, where it is abundant (such as in spinoff employment from agricultural development), and demands little in terms of transport or skills. However, it can also be subjected to challenges of several types. First, as the employing entity moves further from the rural household the rural poor would need to commute to the jobs. Rural women might be especially constrained in such commuting given their home chores and possibly cultural strictures. The ease of this is conditioned by rural transport such as rural vans. Second, the skill demanded for RNFE wage work can increase over time as manufacturers and even service firms increase their capital-labor ratios to attain scale. Reardon et al. (2012) for rice milling and Snyder et al. (2015) for maize milling enterprises showed how equipment size increased over time even in small-medium enterprises (SMEs). Finally, this increase in equipment size might itself displace labor.

In summary, rural and urban self-employment in manufacturers and services can be a promising employment source for the rural poor in the phase when SMEs are proliferating—after privatization of parastatals, and in the early stage of development of value chains for processed foods for example. However, over time, competitive forces can pressure SMEs to make investments with two effects. First, these investments serve as entry barriers for rural- and urban residents who have little savings and cannot draw on retained earnings or credit markets, making the activities less inclusive from a self-employment perspective. Second, these investments increase skill requirements for wage labor, and replace labor with mechanization. Individuals needing employment must move up the skill ladder if they wish to compete.

## 4. POLICY AND PROGRAMMATIC RESPONSES TO PROTECT THE VULNERABLE AND IMPROVE RURAL EMPLOYMENT

This section addresses the question of how policies and programs can foster inclusive rural employment in the midst of the dynamics identified above. Earlier sections reviewed worldwide trends, especially in technology, that are affecting the ability of countries to industrialize and to absorb larger proportions of their workforce in manufacturing and related formal services wage employment. While the same technological forces are at work throughout the world, they are likely to play out differently across countries. Here we propose a country classification scheme to think systematically about how these dynamics will unfold, and then suggest approaches that might be used to improve inclusive employment prospects in the developing world.

### 4.1. Country Classification for Thinking about Employment Prospects

Our categorization scheme is as follows:

- Failed industrializers: Poor countries that have yet to receive meaningful investment from international firms searching for cheap manufacturing labor, have very low manufacturing employment, and no evidence of rising shares of manufacturing in their economies.
- Nascent industrializers: Poor countries otherwise similar to failed industrializers but with indications of rising importance of manufacturing.
- Successful industrializers: Countries that have climbed the manufacturing ladder (though to a lower rung than fully industrialized countries) through a combination of policies and investments that have driven competitive advantage in world markets. In part for that reason, these countries have been able to invest in the fundamental capabilities needed to compete in the more automated manufacturing environment.
- Premature de-industrializers: countries that have seen deindustrialization due to the exposure of uncompetitive local industries to global trade, resulting in a sharp increase in the share of informal- and self-employment in total employment.

We develop two empirical approximations of the scheme. The first uses countries' real per capita manufacturing Gross Domestic Product (GDP) in 2011 and the change in the share of manufacturing in their GDP over the 20 years up to 2011. To account for countries with rapidly growing economies whose manufacturing share may have fallen only slightly, a second approach replaces the change in manufacturing GDP share with percent growth in real manufacturing value-added over the past 20 years.<sup>8,9</sup>

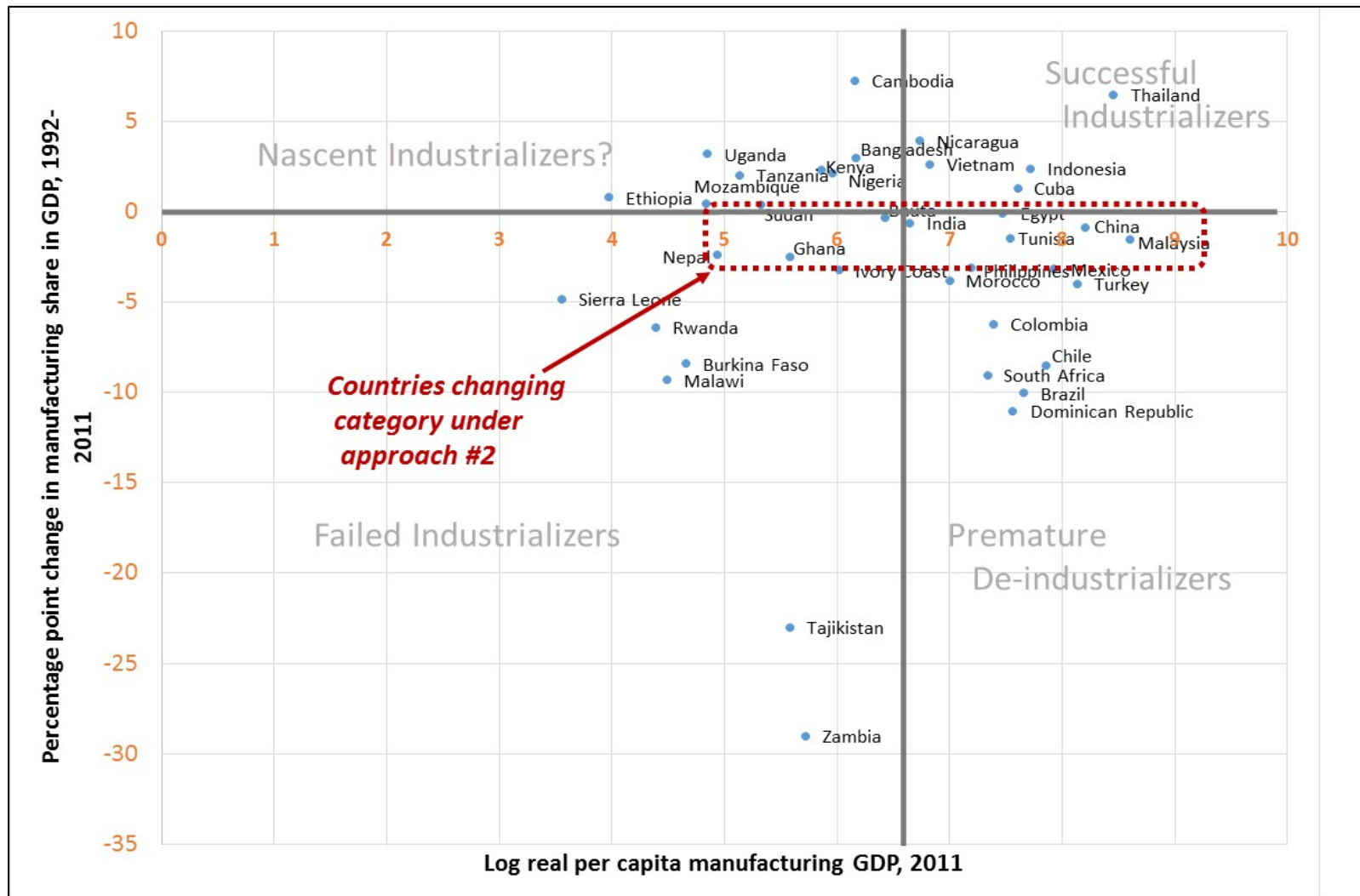
Figure 4 shows the classification based on the first approach, with change in manufacturing GDP share on the vertical axis, and 2011 real per capita manufacturing GDP on the horizontal. Countries that change category in the second approach all lie within the dashed box; all premature industrializers within this box become successful industrializers under the second approach, while all failed industrializers become nascent industrializers.

---

<sup>8</sup> The cutoff in this approach is median % rise in real manufacturing value added.

<sup>9</sup> A third approach uses the percent change in manufacturing employment shares on the vertical axis, based on data from the GGDC. This gives very similar results to the first two approaches: of the 20 countries with data for the third approach, only four change category compared to the first approach.

Figure 4. Classification Scheme for Employment Analysis



Source: Authors, as compiled by IFAD from World Bank and other sources.

Approach #1: vertical axis = % point change in manufacturing share of GDP, 1992-2011.

Approach #2: vertical axis = % change in real per capita manufacturing GDP, 1992-2011.

**Table 1. Summary Data on Classification Scheme for Assessing Employment Prospects**

	2011 Data (simple country means)					Percentage point change in mfg share in GDP, 1992-2011
	Per capita FDI	Indust. Emp. %	Per capita GDP (real)	In real mfg GDP per capita	Mfg share in GDP	
Failed industrializers	41	10.4	2,780	5.14	8%	-9.0
Nascent industrializers	60	9.0	2,515	5.37	11%	2.4
Successful industrializers	104	19.5	10,324	7.47	21%	3.3
Premature deindustrializers	261	23.9	12,958	7.61	18%	-4.6

Source: Author elaboration from IFAD data compilation for 2016 RDR.

Note: Classification variables are in bold.

Based on approach #1, Table 1 lists summary results, by category, for the two main classification variables and other related variables.<sup>10</sup> Countries are classified as follows (see Figure 4):<sup>11</sup>

- **Failed industrializers:** These are defined as countries having per capita manufacturing GDP below the median of countries in the International Fund for Agricultural Development (IFAD) data set (U.S. Dollar (USD)773), and a falling share of manufacturing in GDP between 1992 and 2011. Sample countries in this category had per capita manufacturing GDP of only USD170 in 2011, and the manufacturing share of GDP fell by an average of nine percentage points. This category is dominated by Africa, with seven of the 10 countries. Of the eight *core* countries (those not changing category), six are from Africa.
- **Nascent industrializers:** Defined as countries with per capita manufacturing GDP below the median but a rising share of manufacturing in GDP. Sample countries have per capita manufacturing GDP of USD215, and the manufacturing share of GDP rose by an average of more than two percentage points. Africa holds six of the eight core countries in this group. Cambodia is the outstanding member, with Bangladesh and Uganda also seeing substantial growth in manufacturing share. Ethiopia would likely show a meaningfully larger rise in its manufacturing share if data were from 2014, given the heavy investments (and employment creation) that have taken place since 2011 in labor-intensive production of clothing, leather goods, and other areas.
- **Successful industrializers:** Defined as countries with per capita manufacturing GDP above the median and a rising share of manufacturing in GDP. Sample countries have per capita manufacturing GDP of only USD1,750 and the manufacturing share of GDP rose on average by more than three percentage points. Asia holds three of the five spots in this group, with Cuba and Nicaragua holding the other two. Thailand is

<sup>10</sup> Annex Table A1 lists results for all countries, and Annex Table A2 lists them for only the core countries, i.e., those that maintain their category in the first approaches.

<sup>11</sup> The following countries change category in the second approach: Ghana moves from failed industrializer to nascent industrializer; Sudan moves from a nascent industrializer to a failed industrializer; and China, Malaysia, Tunisia, India, and Egypt move from premature deindustrializers to successful industrializers. The biggest movers were China and Malaysia, where rapid economic growth resulted in rapidly growing manufacturing GDP despite a small decline in manufacturing's share in GDP. All successful industrializers from the first approach remain in that category in the second approach.

the outstanding entry, with the second highest (to Cambodia) growth in manufacturing share in the entire sample together with the second highest per capita manufacturing GDP.<sup>12</sup>

- Premature deindustrializers: Countries above median per capita manufacturing GDP and falling share of manufacturing in GDP. Sample countries have per capita manufacturing GDP of only USD2,018 and the manufacturing share of GDP fell on average by nearly five percentage points. Malaysia, China, Tunisia, Egypt, and India move into the successful industrializer group under the second approach. Latin America accounts for five of the nine core members of this group, including four of the five that fall most firmly within the group: Colombia, Chile, Brazil, Dominican Republic, and South Africa.

## 4.2. Prospects and Policy Approaches by Country Type

This paper has suggested that the exponentially accumulating technological change of the past 50 years has fundamentally changed the transformation pathways available to developing countries. As employment is central to structural and rural transformation, this implies fundamental changes to the employment paths that countries can follow.

In the face of global employment deindustrialization driven by automation, employment policy across nearly all developing countries will face major challenges from two sources. A key challenge will be raising the fiscal revenue needed to fund the investment in human capital, technology, infrastructure, strong institutions that could ensure stronger growth. However, with growing informality in the economies it will be difficult to broaden the tax base. As noted in section 2.2., this narrowing derives from the fact that falling shares of employment in formal manufacturing (and related formal services) pushes labor into informal- and self-employment, which is difficult to tax. Premature industrializers, many of them in Latin America, are seeing sharp rises in informality, while informality is already high among failed and nascent industrializers. Recall again that formal services depend for their growth to a great extent on formal manufacturing, so a decline in the former makes it more difficult to grow the latter.<sup>13</sup>

The second major challenge for inclusive employment policy in today's environment is the political challenge of convincing the (relatively few) owners of the formalized means of production in such circumstances to tax themselves sufficiently to fund the investments (including social programs) needed to remain competitive in world markets. Countries with higher incomes, better fundamentals, and who have already climbed the manufacturing ladder (successful industrializers and some of the premature deindustrializers such as China, Malaysia, and perhaps others such as Brazil), will be in position to meet these challenges better than others; countries on the other end of the spectrum, nearly all in Africa, will be least able to do so.<sup>14</sup>

It's widely known that the outstanding development success stories of the past several decades have come primarily in Asia: first Japan and Taiwan followed by Korea, then China

---

<sup>12</sup> Nicaragua is perhaps a surprising entry, but has similar GDP per capita and manufacturing share of GDP as Vietnam, and in 2011 received about 40% more FDI per capita than Vietnam.

<sup>13</sup> Exported services, such as call centers, are an exception. More generally, services that can be digitized – growing now to include legal services and, in nascent but growing form, high-end activities such as medical diagnostics – can grow in the absence of local formal manufacturing. It is not clear, however, how much global employment such activities can provide.

<sup>14</sup> Lao and Myanmar might fit in this group but lack of data prevents our establishing this.

and others such as Thailand. To varying degrees, all these countries have followed a strategy of the developmental state—industrial policy featuring strategic collaboration between government and private sector to channel investment into high potential sectors while creating the conditions for success through heavy investment in infrastructure and human capacity. More recently, Latin America has observed its sharp decline and limited recovery from the financial crisis of 2008, and has tried to learn from Asia’s success and from its own mistakes during its period of infant industry protection. The strategies that are emerging—productive development policies (Crespi, Fernández-Arias, and Stein 2015)— bear a strong resemblance to the practices of Asia’s developmental states.

The literature emerging in Latin America emphasizes the need for strong institutions if the approach is to be successful. Most African countries do not currently have such institutions. Yet the flood of investment entering the continent from Chinese enterprises suggests the possibility of piggybacking on the ability of these enterprises to make such investments. This phenomenon has played a major role in the construction of large-scale transport and energy infrastructure strongly desired by African leadership but which they were unable to finance in other ways. It could boost broader development by reducing the cost of doing business through better transport and cheaper, more available, and more reliable energy supplies.<sup>15</sup> The investment has also created nearly 10 special economic zones across the continent, most of which are focused on manufacturing (Brautigam and Xiaoyang 2011). The debate about the desirability and design of new innovation policies and productive development policies is now a major part of the discussion on development policy and is relevant for assessing employment prospects for each of our country types.

A common theme across nearly all countries (with the possible exception of successful industrializers), is the high and even rising level of informality in employment. This is likely to be a long-term feature of most developing economies for many years to come. The implication is that policies and programs need to work with the informal sector, not against it, both to improve its productivity and to extend social protections to its workers, as well as the growing number of informal workers used by firms that operate in the formal sector. Pioneering work on social protection in Latin America can provide lessons for design across the developing world. Unlike in the past, these protections will have to be delinked from employment, and based instead on broad provision of basic coverage for all citizens, or targeted groups of citizens, regardless of employment status. As discussed below, the challenges to doing this will vary markedly across the types of countries in our classification scheme.

#### *4.2.1. Failed and Nascent Industrializers*

These countries face an exceptionally hard road. This is especially true for small, landlocked countries, *all* of whom are failed industrializers and account for five of the eight core members of that category: Burkina Faso, Malawi, Rwanda, Tajikistan, and Zambia. The risk for all these countries, and doubly so for the small landlocked, is that the dynamics outlined in Section 2, together with limited ability of governments to invest in their countries’ fundamental capabilities, will choke-off manufacturing growth, or cause it to reach a peak

---

<sup>15</sup> Criticisms have related primarily to the possible strategic intent of the Chinese government in these investments, and on the projects’ often worrying practices, from a Western developed country perspective, related to environment, labor practices, and human rights. See Brautigam (2011) and Brautigam and Xiaoyang (2011) for a review of these critiques.

level of industrialization that is lower, and that occurs at lower income levels, even than the low levels being seen now in other areas of the developing world.

Some optimism can be based on the rapid growth, driven by foreign direct investment (FDI), in production of apparel, leather goods, and other manufactured goods for domestic and export in Ethiopia (Kassa 2015; Allison 2013), and some other large foreign investments in Nigeria, Kenya, and Madagascar (The Economist 2014) and Uganda (Byiers, Takeuchi, and Rosengren 2015). These experiences show that, though countries will in all likelihood peak at (substantially) lower manufacturing employment than in the past, this does preclude them now achieving growth in such employment for some period of time. Yet this progress must be viewed as fragile. For example, Cambodia appears an outstanding success, rising from about a 9% manufacturing share in GDP in 1993 to over 16% by 2012. Nevertheless, this share has *fallen* since its peak of nearly 20% in 2004. Uganda, another potential cause for optimism, has also seen its manufacturing shares fall slightly since the late 1990s.

A key challenge will be raising the fiscal revenue needed to fund the investments and social protection that could ensure stronger growth. Countries with natural resource wealth (most of them in Africa: Nigeria, Botswana, Zambia, and emerging in Ghana, Mozambique, and Tanzania, among others) could potentially generate the needed revenue through taxes on that large formal activity. To do so, these countries will have to overcome the elite capture and poorly functioning institutions that tend to accompany resource booms. Botswana is a glaring exception in Africa but it's not clear that the conditions that have facilitated it—exceptionally high per capita earnings and a unique political culture—exist elsewhere on the continent.

China has notably filled some of the infrastructure investment gap in Africa (Brautigam 2011). While these investments bring the benefits discussed above and are potentially transformative if managed well and maintained, weak public sector capacity increases the chances of inadequate local learning and participation. A key question is what level of ongoing fiscal revenue these investments generate and whether this will be used to build local capacity for direct- and indirect (e.g., local service provision) participation.

Because the economies of failed- and nascent industrializers are small, regional trade and economic cooperation will be key to their chances for sustained growth. Low GDP and low urban population shares mean that growth in domestic market demand can be very high, when economic policy is right, through a combination of rapid urbanization (thus greater dependence on markets) and rapid per capita income growth. Given the current structure of these economies much of this growth will be linked to agriculture and broader agrifood systems including midstream and downstream elements (see Reardon, Berdegue, and Escobar 2001). This combination over the past 15 years in many African countries has spurred food and broader market demand growth near 10% per year in some countries. Some Asian countries have seen even more rapid growth. If buttressed by improved regional trade integration and broader regional economic cooperation to ensure larger and more stable markets, by investment that increases agricultural productivity, and by other investments and policies that facilitate a vigorous local response to local and regional demand for manufactures it is possible that such growth could fuel transformation for some time. An attractive aspect of the domestic and regional markets is that they are based on rising but still low-income consumers that may be satisfied for some time with the quality that local producers can offer.

The question for this scenario is: where will the purchasing power come from to fuel such continued growth? While the recent growth (in Africa) appears real and research shows associated sharp upticks in the contribution of structural change to growth over the past



decade (McMillan and Harttgen 2014; Fox et al. 2013), it is still not clear what is driving it.<sup>16</sup> We are thus not on solid ground in predicting whether domestic and regional demand can (continue to) fuel growth in non-farm employment.

This scenario also has a built-in limit: if incomes do continue to rise, increasing numbers of middle class consumers will begin to require the quality and safety that can be produced only with more modern manufacturing techniques. Where will the needed investment funds, and the ability to channel them into high payoff sectors, come from? These countries are the least capable, on their own, of developing and implementing effective industrial policies, which require sophistication in the public sector and a long-term commitment to pragmatic, iterative learning with the private sector about what works (Crespi, Fernández-Arias, and Stein 2015). Yet important elements of such an approach are likely to be necessary if these countries are to remain on a sustainable growth path over a course of decades. Finding ways to assist these countries in developing the capacity for such development planning, to avoid the profound government failures of the past, and generate targeted investment with high returns, must figure high on the agenda of any development agency.

RNFE is a more important source of income in failed- and nascent industrializers than in other countries. The infrastructural investment, building of more integrated regional economies, and strengthening of human capacity discussed above will all help the growth of RNFE. Two more direct approaches include the provision of micro- and small-scale credit, and provision of a range of business development services. While both can have positive effects, programs need to pay attention to cost control, as their cost per beneficiary can be high. And, as per the meso- and micro paradoxes, it is most difficult for these programs to reach the firms that most need it, resulting in benefits typically concentrated among the top-tier of poor people (not the poorest) or those already above the poverty line (Haggblade, Hazell, and Reardon 2007). Haggblade, Hazell, and Reardon (2007) also suggest that business development services are most effective when provided to a cluster of similar firms rather than individual firms.

#### *4.2.2. Successful Industrializers*

The strong likelihood for successful industrializers, and for countries such as China and Malaysia with high growth and high manufacturing shares in GDP that have slipped slightly over the past 20 years, is that they will have to invest heavily in automation to maintain their value-added share in manufacturing, thus driving continued employment deindustrialization. This outcome appears unavoidable, with the process well underway in western industrialized nations and already starting in China, where for example the country's largest manufacturer of computer parts plans to go to *fully* automated production over the next several years.

Maintaining value added shares in manufacturing would mean that these countries could, if they can solve the political problem discussed above related to taxation, generate the fiscal revenues needed to fund continued investment in the fundamental capabilities of their populations (and in social programs for those left behind).

The effects of continued labor deindustrialization in these countries could be partially offset by entrance of labor into the formal service sector (as is happening in all western industrialized countries). Indeed, a key challenge for them will be to continue evolving their developmental state approaches to manage the inevitable transition into more service

---

<sup>16</sup> It is suggested that resource rents and ODA channeled through civil servant salaries are the main drivers, but further work needs to be done to substantiate this.

employment. Yet as section 2 made clear, these jobs are also increasingly subject to automation as computing power, robotics, and Big Data continue to advance. As noted above, our difficulty is in looking around the corner and imagining the new jobs that could emerge, and *if* they will emerge, based on complementarities between humans and computers.

#### *4.2.3. Premature Deindustrializers*

Countries most firmly in the grip of premature deindustrialization—most Latin American countries plus South Africa—industrialized behind protective infant industry policies. They are now deindustrializing, driven by two factors. The first is their opening to global trade, starting in the 1980s, in which they have difficulty competing. The second factor, functionally related to the first, is less investment in these countries in fundamental capabilities—especially educational quality in science and math, and in technically driven public-private partnerships—than in the most successful Asian countries.

Furthermore, because re-shoring affects industries that are highly capital- and skill intensive, it is not clear to what extent these countries can now successfully re-shore, especially when China and others are investing in cutting edge automation. Mexico could be an emerging exception to this claim, and bears close observation as it works to bring more manufacturing back to its shores.

The size of some of the domestic markets in Latin America, and if politics permit, the even larger sizes of emerging continental trade zones, provides a potential cushion similar to what we noted for failed and nascent industrializers in Africa and Asia. These large domestic and regional markets mean that the more advanced countries of the region may be able to generate the fiscal resources needed to ramp up investment in fundamental capabilities to maintain value added shares in manufacturing. What they cannot expect is a sustained rebound in manufacturing employment; slowing the decline while raising the labor productivity of those they do employ is the best that can be aspired to in this case.

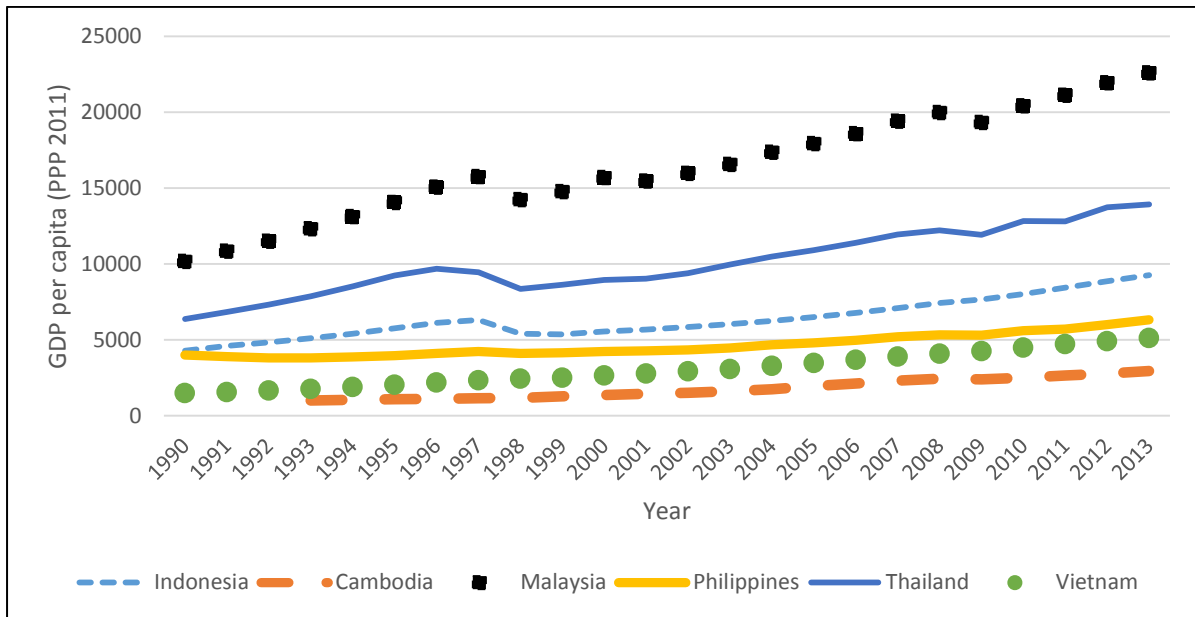
Latin America is a leader in the developing world in the design of effective and efficient social protection policies that build human capital. Continuing to improve these approaches so that social protection becomes part and parcel of investment in human capabilities will be a key feature of inclusive transformation in the region.

### **4.3. What if Today's Technology Really is Different?**

This section has implicitly assumed that the technology driving employment deindustrialization, though profoundly affecting the composition and quality of employment, will be similar to past technology in acting broadly, though perhaps with lags, as a complement and not a substitute for labor. If this proves not to be the case, and if the employment polarization so far observed becomes a broad decline in employment except in high-skill areas, then a more profound rethinking of economic and social policy will be required. In industrialized countries, the most commonly discussed policy response to such a world is some kind of guaranteed income scheme. Given the persistent operation of the meso paradox, one could imagine the need for something like this approach across countries as well as within them, with successful industrializers assisting the failed industrializers (who would likely be greater in number in a world of falling employment). The political and diplomatic challenges of moving in such a direction would be, to say the least, formidable, and the policy options have only begun to be thought about. Venturing there is well beyond what can be done in this paper.

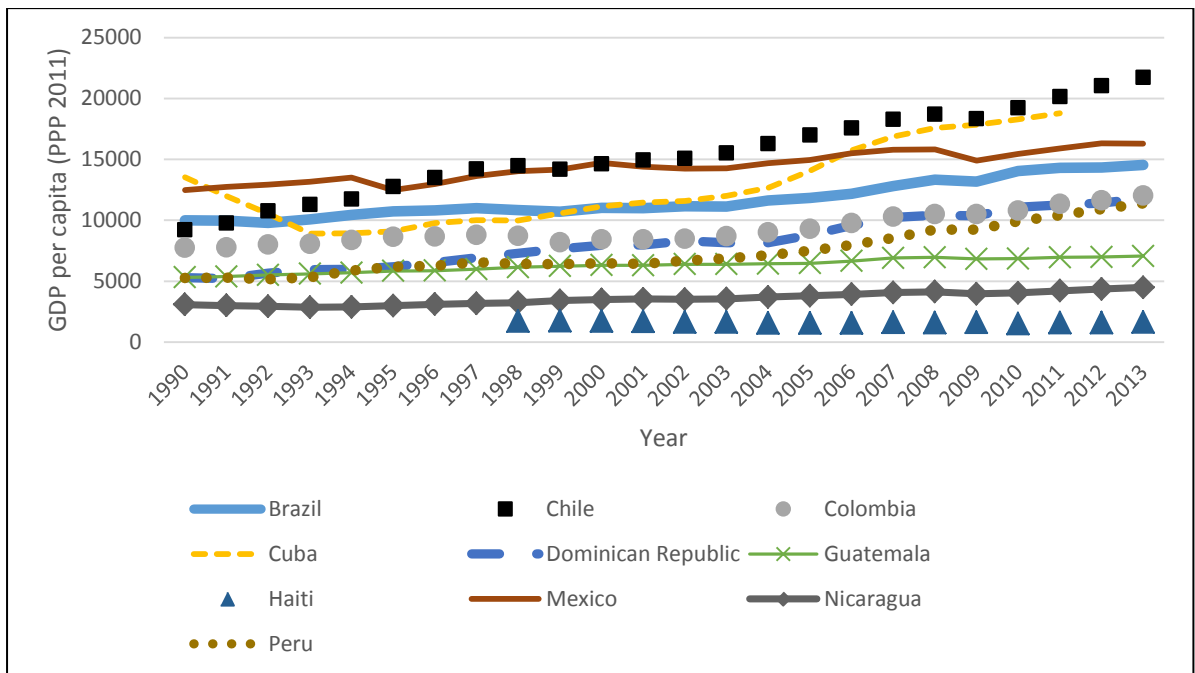
## **APPENDICES**

**Figure A1. Lagging SEA and Rest of SEA**



Source: United Nations Population Division, <http://www.un.org/en/development/desa/population/>.  
 Note: Lagging countries are Cambodia, Vietnam, and Philippines.

**Figure A2. Lagging LAC and Rest of LAC**



Source: United Nations Population Division, <http://www.un.org/en/development/desa/population/>.  
 Note: Lagging countries are Haiti, Nicaragua, and Guatemala.

**Table A1. Country Indicators by Classification Scheme**

	2011 Data					Percentage point change in mfg share in GDP, 1992-2011	Notes
	Per capita FDI	Indust. Emp. %	Per capita GDP (real)	In real mfg GDP per capita	Mfg share in GDP		
<b>Summary</b>							
Failed industrializers	41	10.4	2,780	5.14	8%	-9.0	
Nascent industrializers	60	9.0	2,515	5.37	11%	2.4	
Successful industrializers	104	19.5	10,324	7.47	21%	3.3	
Premature deindustrializers	261	23.9	12,958	7.61	18%	-4.6	
<b>Failed industrializers</b>							
Zambia	124.56	7.1	3,800	5.73	0.08	(29.05)	Ind emp = 2005
Tajikistan	13.14	17.9	2,432	5.59	0.11	(23.04)	Ind emp = 2004
Malawi	7.24		755	4.49	0.12	(9.33)	
Burkina Faso	22.10		1,582	4.67	0.07	(8.43)	
Rwanda	9.41	3.8	1,426	4.40	0.06	(6.42)	Ind emp = 2005
Sierra Leone	23.65	6.5	1,495	3.56	0.02	(4.85)	Ind emp = 2004
Ivory Coast	18.26		3,107	6.03	0.13	(3.26)	
Ghana	124.57	15.4	3,864	5.58	0.07	(2.49)	Ind emp = 2010
Nepal	2.65	13.4	2,173	4.94	0.06	(2.38)	Ind emp = 2001
Bhutan	66.03	8.6	7,167	6.43	0.09	(0.33)	
Mean	<b>41</b>	<b>10</b>	<b>2,780</b>	<b>5.14</b>	<b>0.08</b>	<b>-8.96</b>	
<b>Nascent industrializers</b>							
Sudan	57.40		3,265	5.33	0.06	0.37	
Mozambique	259.25	3.4	1,070	4.84	0.12	0.45	Ind emp = 2003
Ethiopia	10.13	6.6	1,336	3.98	0.04	0.77	Ind emp = 2005
Tanzania	38.02	4.3	1,668	5.14	0.10	2.03	Ind emp = 2006
Nigeria	32.31	11.5	5,423	5.97	0.07	2.12	Ind emp = 2004
Kenya	11.60	6.7	2,705	5.87	0.13	2.28	Ind emp = 2005
Bangladesh	9.59	14.5	2,853	6.18	0.17	2.95	Ind emp = 2005
Uganda	31.78	6.0	1,368	4.85	0.09	3.18	Ind emp = 2009
Cambodia	88.87	18.6	2,944	6.16	0.16	7.23	change in mfg share is 1993-2012
Mean	<b>60</b>	<b>9</b>	<b>2,515</b>	<b>5.37</b>	<b>0.11</b>	<b>2.37</b>	
<b>Successful industrializers</b>							
Cuba	-	17.1	18,814	7.61	0.11	1.29	change in mfg share is 1994-2013
Indonesia	93.20	21.7	9,254	7.72	0.24	2.38	
Vietnam	99.21	21.1	5,125	6.83	0.18	2.63	
Nicaragua	138.99	16.5	4,494	6.74	0.19	3.90	Ind emp = 2010
Thailand	188.77	20.9	13,932	8.46	0.34	6.48	
Mean	<b>104</b>	<b>19</b>	<b>10,324</b>	<b>7.47</b>	<b>0.21</b>	<b>3.34</b>	
<b>Premature deindustrializers</b>							
Dominican Republic	153.76	17.8	11,795	7.57	0.16	(11.04)	
Brazil	403.48	21.9	14,555	7.66	0.15	(10.06)	
South Africa	153.22	24.3	12,106	7.35	0.13	(9.05)	
Chile	1,149.74	23.4	21,714	7.86	0.12	(8.55)	
Colombia	335.22	20.9	12,025	7.39	0.14	(6.24)	
Turkey	172.39	26.0	18,660	8.14	0.18	(4.01)	
Morocco	101.82	21.4	7,087	7.01	0.16	(3.84)	
Mexico	320.21	24.1	16,291	7.93	0.17	(3.20)	
Philippines	37.24	15.4	6,326	7.20	0.21	(3.09)	
Malaysia	389.77	28.4	22,589	8.61	0.24	(1.52)	
Tunisia	97.24	33.5	10,768	7.55	0.18	(1.48)	
China	256.26	29.5	11,525	8.21	0.32	(0.90)	
India	22.48	24.7	5,238	6.65	0.15	(0.63)	
Egypt	67.67	23.5	10,733	7.48	0.17	(0.08)	
Mean	<b>261</b>	<b>24</b>	<b>12,958</b>	<b>7.61</b>	<b>0.18</b>	<b>-4.55</b>	

Source: Authors.

**Table A2. Country Indicators for Core Countries by Classification Scheme**

	2011 Data					Percentage point change in mfg share in GDP, 1992-2011	Notes
	Per capita FDI	Indust. Emp. %	Per capita GDP (real)	In real mfg GDP per capita	Mfg share in GDP		
<b>Summary</b>							
Failed industrializers	28	9.7	2,096	4.93	8%	-10.8	
Nascent industrializers	60	9.0	2,421	5.37	11%	2.6	
Successful industrializers	104	19.5	10,324	7.47	21%	3.3	
Premature deindustrializers	314	21.7	13,396	7.57	16%	-6.6	
<b>Failed industrializers</b>							
Burkina Faso	22		1,582	4.67	0.07	(8.43)	
Ivory Coast	18		3,107	6.03	0.13	(3.26)	
Malawi	7		755	4.49	0.12	(9.33)	
Nepal	3	13.4	2,173	4.94	0.06	(2.38)	Ind emp = 2001
Rwanda	9	3.8	1,426	4.40	0.06	(6.42)	Ind emp = 2005
Sierra Leone	24	6.5	1,495	3.56	0.02	(4.85)	Ind emp = 2004
Tajikistan	13	17.9	2,432	5.59	0.11	(23.04)	Ind emp = 2004
Zambia	125	7.1	3,800	5.73	0.08	(29.05)	Ind emp = 2005
Mean	<b>28</b>	<b>10</b>	<b>2,096</b>	<b>4.93</b>	<b>0.08</b>	<b>(10.85)</b>	
<b>Nascent industrializers</b>							
Bangladesh	10	14.5	2,853	6.18	0.17	2.95	Ind emp = 2005
Cambodia	89	18.6	2,944	6.16	0.16	7.23	change in mfg share is 1993-2012
Ethiopia	10	6.6	1,336	3.98	0.04	0.77	Ind emp = 2005
Kenya	12	6.7	2,705	5.87	0.13	2.28	Ind emp = 2005
Mozambique	259	3.4	1,070	4.84	0.12	0.45	Ind emp = 2003
Nigeria	32	11.5	5,423	5.97	0.07	2.12	Ind emp = 2004
Tanzania	38	4.3	1,668	5.14	0.10	2.03	Ind emp = 2006
Uganda	32	6.0	1,368	4.85	0.09	3.18	Ind emp = 2009
Mean	<b>60</b>	<b>9</b>	<b>2,421</b>	<b>5.37</b>	<b>0.11</b>	<b>2.63</b>	
<b>Successful industrializers</b>							
Cuba	-	17.1	18,814	7.61	0.11	1.29	
Indonesia	93.20	21.7	9,254	7.72	0.24	2.38	change in mfg share is 1994-2013
Vietnam	99.21	21.1	5,125	6.83	0.18	2.63	
Nicaragua	138.99	16.5	4,494	6.74	0.19	3.90	
Thailand	188.77	20.9	13,932	8.46	0.34	6.48	
Mean	<b>104</b>	<b>19</b>	<b>10,324</b>	<b>7.47</b>	<b>0.21</b>	<b>3.34</b>	
<b>Premature deindustrializers</b>							
Dominican Republic	154	17.8	11,795	7.57	0.16	(11.04)	
Brazil	403	21.9	14,555	7.66	0.15	(10.06)	
South Africa	153	24.3	12,106	7.35	0.13	(9.05)	
Chile	1,150	23.4	21,714	7.86	0.12	(8.55)	
Colombia	335	20.9	12,025	7.39	0.14	(6.24)	
Turkey	172	26.0	18,660	8.14	0.18	(4.01)	
Morocco	102	21.4	7,087	7.01	0.16	(3.84)	
Mexico	320	24.1	16,291	7.93	0.17	(3.20)	
Philippines	37	15.4	6,326	7.20	0.21	(3.09)	
Mean	<b>314</b>	<b>22</b>	<b>13,396</b>	<b>7.57</b>	<b>0.16</b>	<b>-6.57</b>	

Source: Authors.

## REFERENCES

- Allison, Simon. 2013. "Does H&M's Investment in Ethiopia Finally Signal the African Manufacturing Boom?" Daily Maverick, South Africa, August 26, 2013. Accessed on DATE at <http://www.dailymaverick.co.za/article/2013-08-26-does-hms-investment-in-ethiopia-finally-signal-the-african-manufacturing-boom/#.V2mc2qLrCJ8>.
- Autor, D. 2014. *Polanyi's Paradox and the Shape of Employment Growth*. National Bureau of Economic Research (NBER) Working Paper No. 20485. Cambridge, MA: NBER.
- Autor, D. and D. Dorn. 2013. The Growth of Low-Skill Service Jobs and the Polarization of the U.S. Labor Market. *American Economic Review* 103.5: 1553–97.
- Barbier, Edward B. and Jacob P. Hochard. 2014. *Poverty and the Spatial Distribution of Rural Population*. World Bank Policy Research Working Paper No. 7101. Washington, DC: The World Bank.
- Barrientos, S., N. Kabeer, and N. Hossain. 2004. *The Gender Dimensions of the Globalization of Production*. Working Paper No. 17. Geneva: Policy Integration Department, World Commission on the Social Dimension of Globalization. International Labor Office.
- Beaudry, Paul, David A. Green, and Benjamin M. Sand. 2013. *The Great Reversal in the Demand for Skill and Cognitive Tasks*. NBER Working Paper Series No. 18901. Cambridge, MA: National Bureau of Economic Research.
- Binswanger, Hans. 1986. Agricultural Mechanization: A Comparative Historical Perspective. 1986. *World Bank Research Observer* 1.1: 27–56. doi: 10.1093/wbro/1.1.27.
- Bogliaccini, J.A. 2013. Trade Liberalization, Deindustrialization, and Inequality: Evidence from Middle-Income Latin American Countries. *Latin American Research Review* 48.2: 79–105.
- Brautigam, D. 2011. *China in Africa: What Can Western Donors Learn?* Oslo: Norwegian Investment Fund for Developing Countries (Norfund).
- Brautigam, D. and T. Xiaoyang. 2011. African Shenzhen: China's Special Economic Zones in Africa. *Journal of Modern African Studies* 49.1: 27–54.
- Brynjolfsson, E. and A. McAfee. 2011a and b. "Where Human Workers Can Still Beat Robots (at Least for Now)." *The Atlantic*, October 24, 2011. Accessed at <http://www.theatlantic.com/business/archive/2011/10/where-human-workers-can-still-beat-robots-at-least-for-now/247259/>.
- Brynjolfsson, E. and A. McAfee. 2011a and b. "Why Workers are Losing the War against Machines." *The Atlantic*, October 26, 2011. Accessed at <http://www.theatlantic.com/business/archive/2011/10/why-workers-are-losing-the-war-against-machines/247278/>.
- Brynjolfsson, E. and A. McAfee. 2014. "The Dawn of the Age of Artificial Intelligence: Reasons to Cheer the Rise of the Machines." *The Atlantic*, February 14, 2014. Accessed at <http://www.theatlantic.com/business/archive/2014/02/the-dawn-of-the-age-of-artificial-intelligence/283730/>.

- Byiers, B., L.R. Takeuchi, A. Rosengren, et al. 2015. “Productive Employment and Transformation in Uganda.” Case Study Report. *Development Progress*. March 6, 2015. Accessed at <http://www.developmentprogress.org/publication/work-progress-productive-employment-and-transformation-uganda>.
- Christiaensen, L. and Y. Todo. 2013. Poverty Reduction during the Rural–Urban Transformation: The Role of the Missing Middle. *World Development* 63: 43–58.
- Christiaensen, L., J. De Weerd, and Y. Todo. 2013. Urbanization and Poverty Reduction – The Role of Rural Diversification and Secondary Towns. *Agricultural Economics* 44.4–5: 435–447.
- Corral, L. and T. Reardon. 2001. Rural Non-farm Incomes in Nicaragua: Patterns, Determinants, and Implications. *World Development* 29.3: 427–442.
- Crespi, G., E. Fernández-Arias, and E. Stein, eds. 2015. *Rethinking Productive Development Sound Policies and Institutions for Economic Transformation*. Inter-American Development Bank. New York: Palgrave Macmillan America.
- Das Gupta, S. and A. Singh. 2006. Manufacturing, Services, and Premature Deindustrialization in Developing Countries: A Kaldorian Analysis. UNU-WIDER Working Paper No. 2006/49. Helsinki: UNU-WIDER.
- Das Gupta, S., T. Reardon, B. Minten, and S. Singh. 2010. The Transforming Potato Value Chain in India: From a Commercialized-Agriculture Zone (Agra) to Delhi. Report of Value Chains Component of Asian Development Bank RETA (13<sup>th</sup>) IFPRI Project on Policies for Ensuring Food Security in South And Southeast Asia. Washington, DC: IFPRI.
- Economist, The. 2014. “Manufacturing in Africa: An Awakening Giant.” *The Economist*. February 8, 2014. Accessed at <http://www.economist.com/news/middle-east-and-africa/21595949-if-africas-economies-are-take-africans-will-have-start-making-lot>.
- Feng, A. and G. Graetz. 2015. *Rise of the Machines: The Effects of Labor-Saving Innovations on Jobs and Wages*. Centre for Economic Performance (CEP) Discussion Paper No. 1330. London: Centre for Economic Performance, London School of Economics and Political Science.
- Ford, M. 2015. *The Rise of the Robots: Technology and the Threat of a Jobless Future*. New York: Basic Books.
- Fox, L., C. Haines, J. Huerta Muñoz, and A. Thomas. 2013. *Africa's Got Work to Do: Employment Prospects in the New Century*. International Monetary Fund (IMF) Working Paper No. 13/201. Washington, DC: IMF.
- Frey, Carl Benedikt and Michael A. Osborne. 2013. *The Future of Employment: How Susceptible Are Jobs to Computerisation?* Oxford Martin Programme Working Paper. Oxford, United Kingdom: University of Oxford.
- Goos, M., A. Manning, and A. Salomons. 2010. *Explaining Job Polarization in Europe: The Roles of Technology, Globalization and Institutions*. Centre for Economic Performance Discussion Paper No. 1026. London: CEP, London School of Economics and Political Science.



- Haggblade, S., P.B.R. Hazell, and T. Reardon, eds. 2007. *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*. Baltimore: Johns Hopkins University Press.
- Jaffee, Steven, Spencer Henson, and Luz Diaz Rios. 2011. *Making the Grade: Smallholder Farmers, Emerging Standards, and Development Assistance Programs in Africa*. A Research Program Synthesis Report No. 62324-AFR. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.
- Jayne, T.S., Jordan Chamberlin, Lulama Traub, et al. 2015. Africa's Changing Farmland Ownership: The Rise of the Emergent Investor Farmer. Plenary paper presented at the 29th Triennial International Conference of Agricultural Economists, August 13, 2015. Milan, Italy.
- Jedwab, R., L. Christiaensen, and M. Gindelsky. 2015. Demography, Urbanization and Development: Rural Push, Urban Pull and... Urban Push? *Journal of Urban Economics* In Press, Corrected Proof, Available online 27 October 2015. Accessed at <http://www.sciencedirect.com/science/article/pii/S0094119015000601>.
- Kassa, Lucy. 2015. "Ethiopia: New Shoe and Leather Factory Invests U.S. \$35 Million in Debre Birhan." *AllAfrica.com*, April 27, 2015. Accessed at <http://allafrica.com/stories/201504272437.html>.
- Karabarbounis, L. and B. Neiman. 2013. *The Global Decline of the Labor Share*. NBER Working Paper No. 19136. Cambridge, MA: National Bureau of Economic Research.
- Kinfemichael, B. and A.K.M. Morshed. 2015. *Unconditional Convergence of Labor Productivity in the Service Sector*. Discussion Paper Series. Carbondale, IL: Southern Illinois University.
- Lanjouw, Peter and Rinku Murgai. 2009. Poverty Decline, Agricultural Wages, and Nonfarm Employment in Rural India: 1983–2004. *Agricultural Economics* 40.2: 243–263.
- Lipton, Michael. 1980. Migration from Rural Areas of Poor Countries: The Impact on Rural Productivity and Income Distribution. *World Development* 8.1: 1–24.
- Miguel, Edward. 2008. Is it Africa's Turn? Progress in the World's Poorest Region. Boston: New Democracy Forum. May-June.
- McMillan, M.S. and K. Harttgen. 2014. *What is Driving the 'African Growth Miracle'?* NBER Working Paper No. 20077. Cambridge, MA: National Bureau of Economic Research.
- Monteiro, C.A., J-C. Moubarac, G. Cannon, et al. 2013. Ultra-processed Products Are Becoming Dominant in the Global Food System. *Obesity Reviews*. 14.Supplement S2: 21–28.
- Neven, David, Michael Makokha Odera, Thomas Reardon, and Honglin Wang. 2009. Kenyan Supermarkets, Emerging Middle-Class Horticultural Farmers, and Employment Impacts on the Rural Poor. *World Development* 37.11: 1802–1811.
- Popkin, B.M. 2014. Nutrition, Agriculture and the Global Food System in Low and Middle Income Countries. *Food Policy* 47: 91–96.

- Ravallion, Martin and Jyotsna Jalanl. 1997. *Spatial Poverty Traps?* World Bank Policy Research Working Paper No. 1862. Washington, DC: The World Bank.
- Reardon, T., J. Berdegue, and G. Escobar. 2001. Rural Nonfarm Employment and Incomes in Latin America: Overview of Issues, Patterns, and Determinants. *World Development* 29.3: 395–409.
- Reardon, T., K.Z. Chen, B. Minten, and L. Adriano. 2012. *The Quiet Revolution in Staple Food Value Chains in Asia: Enter the Dragon, the Elephant, and the Tiger*. Manila and Washington, DC: Asian Development Bank and IFPRI.
- Reardon, T., E. Crawford, and V. Kelly. 1994. Links between Nonfarm Income and Farm Investment in African Households: Adding the Capital Market Perspective. *American Journal of Agricultural Economics* 76.5: 1172–1176.
- Reardon, T., C. Hu, D. Tschirley, et al. 2015. *Urbanization, Diet Change, and Transformation of Food Supply Chains in Asia*, Report for USAID. East Lansing: Michigan State University Project of the Global Center for Food System Innovation and the Food Security Policy Innovation Lab.
- Reardon, T., K. Stamoulis, and P. Pingali. 2007. Rural Nonfarm Employment in Developing Countries in an Era of Globalization. *Agricultural Economics* 37.s1: 173–183.
- Reardon, T. and J.E. Taylor. 1996. Agroclimatic Shock, Income Inequality, and Poverty: Evidence from Burkina Faso. *World Development* 24.5: 901–914.
- Reardon, T., J.E. Taylor, K. Stamoulis, et al. 2000. Effects of Nonfarm Employment on Rural Income Inequality in Developing Countries: An Investment Perspective. *Journal of Agricultural Economics* 51.2: 266–288.
- Reardon, T. and S.A. Vosti. 1995. Links between Rural Poverty and Environment in Developing Countries: Asset Categories and Investment Poverty. *World Development* 23.9: 1495–1506.
- Rodrik, D. 2011. *The Future of Economic Convergence*. NBER Working Paper No. 17400. Cambridge, MA: National Bureau of Economic Research.
- Rodrik, D. 2013. *The Past, Present, and Future of Economic Growth*. Working Paper No. 1. Munich, Germany: Global Citizen Foundation.
- Rodrik, D. 2015. *Premature Deindustrialization*. NBER Working Paper No. 20935. Cambridge, MA: National Bureau of Economic Research.
- Rubey, Lawrence and Frank Lupi. 1997. Predicting the Effects of Market Reform in Zimbabwe: A Stated Preference Approach. *American Journal of Agricultural Economics* 79.1: 89–99.
- Snyder, J., C. Ijumba, D. Tschirley, and T. Reardon. 2015. *Local Response to the Rapid Rise in Demand for Processed and Perishable Foods: Results of an Inventory of Processed Food Products in Dar es Salaam*. MSU Innovation Lab for Food Security Policy Tanzania Policy Research Brief No. 2. East Lansing: Michigan State University.
- Takahashi, Kazushi and Keijiro Otsuka. 2009. The Increasing Importance of Nonfarm Income and the Changing Use of Labor and Capital in Rice Farming: The Case of Central Luzon, 1979-2003. *Agricultural Economics* 40.2: 231–242.

- Taylor, J. Edward. 1992. Remittances and Inequality Reconsidered: Direct, Indirect, and Intertemporal Effects. *Journal of Policy Modeling* 14.2: 187–208.
- Taylor, J. Edward. 1999. The New Economics of Labour Migration and the Role of Remittances in the Migration Process. *International Migration* 37.1: 63–88.
- Taylor, J. Edward, Jorge Mora, Richard Adams, and Alejandro Lopez-Feldman. 2005. *Remittances, Inequality and Poverty: Evidence from Rural Mexico*. U.C. Davis Working Paper No. 05-003. Davis, CA: University of California, Davis.
- Tschirley, D., T. Reardon, M. Dolislager, and J. Snyder. 2015a. The Rise of a Middle Class in East and Southern Africa: Implications for Food System Transformation. *Journal of International Development* 27.5: 628–646.
- Tschirley, D., J. Snyder, M. Dolislager, et al. 2015b. The Rise of a Middle Class in East and Southern Africa: Implications for Food System Transformation. *Journal of Agribusiness in Developing and Emerging Economies* 5.2: 102–136
- Winters, Paul, Alain de Janvry, and Elisabeth Sadoulet. 2001. Family and Community Networks in Mexico-U.S. Migration. *The Journal of Human Resources* 36.1: 159–184. DOI: 10.2307/3069674.
- World Bank. 2009. *Reshaping Economic Geography. World Development Report 2009*. Washington, DC: The World Bank.
- Wouterse, Fleur. 2011. *Continental vs. Intercontinental Migration: An Empirical Analysis of the Impact of Immigration Reforms on Burkina Faso*. Organization for Economic Co-operation and Development Working Paper No. 299. Paris: OECD.
- Young, A. 2012. The African Growth Miracle. *Journal of Political Economy* 120.4: 696–739.
- Zhou, Y., S. Du, C. Su, et al. 2015. The Food Retail Revolution in China and its Association with Diet and Health. *Food Policy* 55: 92–100.