JustJobs
NETWORK

Transformations in Technology, Transformations in Work

October 2016

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Acknowledgments:

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Previous signature volumes:

Global Wage Debates: Politics or Economics? (2015)

Overcoming the Youth Employment Crisis: Strategies from Around the World (2014)

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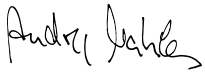
FOREWORD

Few would dispute that technology has, throughout history, altered the nature of work. But today, the pace of technological change and innovation is unprecedented. This raises the question of whether workers, organizations, governments and economies as a whole can adjust quickly enough.

In Germany, the Federal Ministry of Labor and Social Affairs has in mid-2014 created a framework for both a public and a high-level expert dialogue on the future of work – "Work 4.0" as we call it. As part of the process we scrutinize the drivers that are changing the world of work, analyze the areas in which policy responses may be required and develop concrete proposals for policy. Topics we discuss are, for example, working time and teleworking regulations, the effects of digitalization on employment and skill requirements as well as the development of the on-demand economy. Our dialogue process will come to a preliminary close with a final conference at the end of November, where we will present and discuss the conclusions we have drawn from the dialogue process.

Given the magnitude of the digital transformation, the JustJobs Network aptly selected technology and jobs as the theme of its 2016 annual flagship publication. This volume documents how different countries, at varying levels of development, are grappling with the advent of new technology and its effects on their labor markets. This timely project coincides with heated debates on the displacement of workers due to automation, the on-demand economy and innovation in many countries.

In the face of the current changes, we cannot preserve the world of work as it is, and in some respects it would be even counterproductive if we tried. But I am sure that if we manage transformation processes well and adapt our institutions accordingly, we can minimize the negative impacts and harness the potential for new and better jobs that the digital transformation offers.



Andrea Nahles
Minister of Labor and Social Affairs
Federal Republic of Germany

INTRODUCTION

Sabina Dewan and Gregory Randolph, JustJobs Network

INTRODUCTION

Sabina Dewan and Gregory Randolph, JustJobs Network

From Stanley Kubrick's 1968 film "2001: A Space Odyssey" to Marty McFly's time machine in "Back to the Future," the prospect of a future dominated by technology has captured imaginations for decades. But the time these films projected has now arrived; advanced technology is not a thing of the future. It is a fact of today. And while visions of flying cars by 2015 may have been far-fetched, 21st century technologies are transforming our lives and work in ways that would have been difficult to imagine just two or three decades ago.

Technology is upending traditional employment models, affecting both the nature of jobs and employment rates.

From the Industrial Revolution beginning in the 1700s to the advent of the internet in the 1990s, technology has had sweeping effects across the globe for centuries. But today, as if on steroids, new technologies – many enabled by the digital revolution – are advancing at an unprecedented pace and scale.

Technology is Tesla and SpaceX – big, innovative and visionary – offering positive possibilities of hybrid cars or even transportation to another planet. It is also small mobile phones and tablets that are changing interpersonal communication, giving remote farmers access to weather forecasts, enabling payments between migrant workers and their families. It is a digital transformation spurred by rapidly increasing access to the internet, which can instantly make vast amounts of data available at one's fingertips. But it is also robots and machinery – precise and productive – replacing workers across a diversity of occupations (see **Figure 1**).

How technological innovations will unfold, how they will shape and reshape the nature of work and consequently people's lives, is ultimately difficult to predict.

What we can do is understand the impact of technology on people's working lives today. Technology is upending traditional employment models, affecting both the nature of jobs and employment rates, though the effect on the latter is perhaps less pronounced at an aggregate level than many imagine.

Based on case studies from around the world, this volume by the JustJobs Network sketches the complex and evolving relationship between technological transformation and jobs. Five key themes emerge from this research.

Five key themes of this volume

1. The discourse on technology highlights the trade-off between efficiency and equity, and policy frameworks must strike a balance between the two.

On the one hand, technology enhances productivity and efficiency, but on the other, it can lead to labor substitution and increasing inequality. This is at the heart of global debates on technology's impact on jobs. While some argue that 21st century technologies are rendering workers redundant far faster than they are generating new employment, others contend that the aggregate gains in productivity brought on by technology will enable more job creation in the long run. As this volume demonstrates, the relationship between technology, productivity, and the quantity and quality of jobs is dynamic and context-specific.

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Chapter 7, for instance, examines an Indonesian government program to boost agricultural productivity through technology. It finds that the impact of a combine harvester in Indonesian agriculture hinges on where and how the machine is introduced. In parts of the country where the vast majority of workers rely on agriculture, the technology destroyed harvest time work for people without other viable employment options. It also upended a traditional model of wealth redistribution through labor-intensive harvesting, exacerbating local inequalities.

The nature of technological change today also tends to produce skill and wage polarization in labor markets. On one end of the spectrum, digitalized companies and sectors demand highly-skilled workers to operate their advanced technologies and perform high-value-added

functions like management, consulting, financial services, or other complex activities. These positions are also associated with higher wages. At the other end of the spectrum, low-wage jobs in service sectors such as hospitality and healthcare, plus simple, manual tasks that are difficult to automate, persist as well. But the "middle-skilled" segment of the labor market is increasingly hollowed out by growing levels of automation.

In South Africa, for example, capital- and technology-intensive sectors are receiving the greatest levels of investment, and highly skilled workers have seen their wages rise much faster than those with routine-intensive jobs. Cassim explores this trend in Chapter 6.

Taken together, the chapters in this volume highlight some important facts about technology and jobs.

Technological change and the diffusion of new innovations are inevitable. But the way technology is introduced and the impact that it has is shaped by policies and governing institutions. As Loungani notes in his contribution, if policy frameworks capable of managing the changes spurred by technological advances are absent, then fears about the short-run costs of technology will undermine its long-run benefits.

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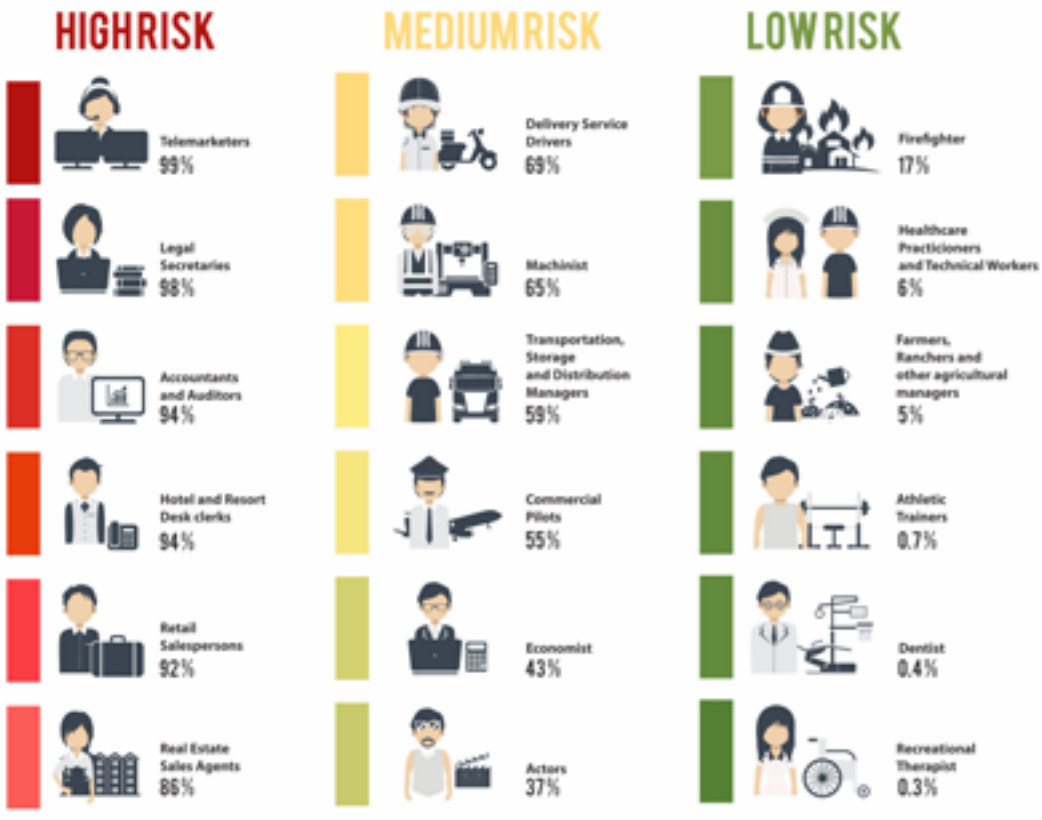
The way that policy frameworks seek to facilitate the adoption of technology must take into account context-specific social and economic impacts. A place with a diverse, robust labor market and rising wages will react differently to technological change than a non-industrialized region with few employment opportunities outside agriculture.

Beyond this, the evidence in this volume shows that technology policies must be informed by a broader strategy. For example, the sudden introduction of sophisticated technologies without a skill development policy to equip workers to use them could limit the productive potential of those technologies while incentivizing capital-intensive modes of production with little job creation potential.

Figure 1

Jobs likely to be affected by digitalization



The figures depict the likelihood of occupations being affected due to digitalization

Source: Frey and Osborne (2013).[1]

2. The on-demand economy demands new forms of regulation and worker representation. Policymakers must be proactive about harnessing its benefits and minimizing its costs.

The emergence of the "on-demand" or "platform" economy illustrates the power of technology to make it easier, faster and cheaper for consumers to access services, while also creating income-generating opportunities on a large scale in a short period of time. But it has also stirred up controversy for relying on self-employed workers who take on many of the risks of entrepreneurship without enjoying all its benefits. Workers in the on-demand economy lack the security of a guaranteed wage and are required to use their own capital and assets to earn an income, but they are constrained by the pricing and performance frameworks that the on-demand firm enforces.

The on-demand economy in developing countries hold the potential to link large pools of informal workers to government social security schemes.

Consensus is building that the innovation potential of on-demand firms must not be squashed by outright bans. Rather, the new kinds of companies and work arrangements that have evolved necessitate an evolution in policy frameworks to ensure basic standards of work quality.

The emergence of the platform economy can also serve as an impetus to strengthen social protection for a range of flexible, part-time, and self-employed workers, not only those in on-demand jobs.[2] And its wide reach and popularity can be deployed in creative ways to expand social protection coverage. For instance, Chapter 1 illustrates the potential for Indonesia's on-demand economy to link large pools of informal workers to government social security schemes.

Other proposals similarly emphasize a shared responsibility between government and on-demand firms. For example, several policy experts in the United States and Europe have called for a portable, pro-rated, universal social safety net, where companies contribute to workers' benefits based on how much they work and/or earn, and social protection follows the worker regardless of where he or she is employed.[3]

These sorts of proposals deserve more attention from policymakers. While only a small percentage of workers today earn their income through on-demand platforms, the business model is penetrating deep into sectors like transportation

and spreading quickly to other sectors like healthcare. Policymakers must be proactive about harnessing the opportunities and minimizing the costs of the on-demand economy.

3. Technology holds the promise of improving livelihoods and enabling labor market access for marginalized communities, but these effects should not be overestimated.

One of the presumed positive impacts of technology is its ability to boost the quantity and quality of work available to groups historically underrepresented in good jobs. For example, technology might enable women balancing professional and care work to telecommute. Internet-based labor platforms have been hailed for their ability to connect skilled workers in poor countries with better employment opportunities in developed economies. So-called e-governance can extend the reach of social welfare programs to workers in remote, rural locations.

The chapters in this volume document the empowering abilities of technology for vulnerable, marginalized and low-income groups, but they also demonstrate that these effects can be easily overstated.

For example, Galperin and Greppi develop a model to determine the likelihood that a worker from a developing country will be hired by an employer from a developed country through Nubelo, the largest Spanish-speaking online labor platform. They find that, after controlling for other factors, Spanish employers are more likely to hire Spanish workers than workers from Latin America, even when the task can be performed remotely.

Nazareth and Pandit document the ways in which micro-entrepreneurs in urban slums of India utilize technology to expand their customer base and boost their incomes. But they also note that the impact of technology could be much greater if those enterprises had the capital and skills to invest in more advanced technologies – for example, upgrading from a simple mobile phone to a smart phone.

In their chapter, Fanggidae, Sagala and Ningrum show that on-demand transport applications in Indonesia provide a work opportunity that 82 percent of drivers say pays better than their previous employment. Yet, the on-demand drivers are, on average, far more educated than the average Indonesian worker, suggesting that the country's poorest workers may face certain barriers to entry when accessing these tech-enabled jobs.

In examining a new "e-voucher" system aimed at enabling Zambian farmers to receive direct government subsidies for farming inputs, Mwenge finds that despite the system's many benefits, the

scheme may benefit most of those who least require government assistance. Because farmers are required to supplement the subsidy with a personal contribution, wealthier rural families can afford to enroll multiple members, biasing it against those who need the subsidy more.

These findings from specific countries and contexts demonstrate that technology alone cannot pull marginalized workers out of poverty or grant them access to high-quality segments of the labor market. This requires a broader ecosystem – skills training, soft and hard infrastructure, and deliberate efforts to lower barriers to entry. And even then, social and cultural factors will persist in shaping labor market outcomes.

Technology alone cannot pull marginalized workers out of poverty or grant them access to high-quality segments of the labor market.

4. Workers are leveraging digital technologies to empower and organize themselves.

Public discourse around technology often links digitalization to globalization and trade, and subsequently to an erosion of workers' rights, stagnant growth in wages, and the decline in labor's share of global income. While this narrative has some merit, alternative stories – of digital technology empowering workers – also exist. This volume highlights some of those stories.

In Chapter 4, Gottwald and Lin discuss how worker centers in southern China have dramatically expanded their outreach through the use of social media and messaging applications like WhatsApp. Workers must be cautious about what information they share over social media since government surveillance targets their large online communities. But these centers use new digital technologies to disseminate important information on workers' rights to a large network of factory employees, and the workers utilize the same tools to communicate the problems they face and seek help from the worker center in resolving them.

This chapter shows that the formation of online worker communities has also changed the way workers see their own struggles. Before the advent of digital technology, they approached the worker center to solve the individual problems they faced with their employers, but now they see themselves as part of a community that must take collective action to tackle a broader set of workers' rights issues.

The complex relationship between technology, work, and empowerment is also illustrated in Chapter 1, on the on-demand economy

in Indonesia. The smartphone has enabled companies like GoJek – an on-demand transportation service – to grow at a meteoric pace. At the same time, through social media and messaging applications, smartphones are enabling drivers on the platform to create informal workers' associations that stage protests when the company introduces unfavorable policies or terms.

The platform economy more generally illuminates this tension. While on-demand companies have used their innovative business models to skirt tax and labor regulations, those firms have also pooled together large groups of workers that may have otherwise worked as disconnected self-employed individuals. In other words, for certain kinds of workers, on-demand companies may have unintentionally unlocked the possibility for new kinds of worker organizations to emerge.

The way governments respond to workers' creative uses of digital technology will shape this new frontier in industrial relations.

5. New technologies require rethinking "work design" – the way labor and technology are deployed, how work is executed and the kinds of tasks and interactions it involves.

Current debates around technology and work tend to focus on how many jobs technology will create or destroy and whether technology is eroding workers' fundamental rights. But equal attention must be paid to work design.

Twenty-first century technologies will fundamentally transform the way work is designed and firms are structured. The way that transformation is managed will determine whether workers in the digital era wind up better or worse than their predecessors.

Hirsch-Kreinsen describes a work design model for digitalized industries in Germany in Chapter 3. His proposal suggests that new modes of industrial production that utilize digital technologies could promote on-the-job learning, greater levels of worker autonomy, and less hierarchical company structures. These are not only characteristics of a decent job; they are also likely to make work more varied, meaningful, and skill-oriented.

Hirsch-Kreinsen's chapter serves as a reminder to the private sector, governments, and unions that they must turn their attention to work design when attempting to shape the impact of technological transformations. New ways of producing goods and delivering services present scope for restructuring the types of tasks employees perform and the kinds of responsibilities and learning opportunities they receive. Policies can influence the organizational models that companies adopt.

The way forward

Just like the reorganization of trade into global value chains has drastically altered the patterns and geography of production, so too is technology transforming the global employment landscape. While technological innovation has been a defining feature of past epochs as well, the 21st century is witnessing the evolution and spread of technology at unprecedented speed and never-before-seen scale. Today the impact of new technologies – spurred largely by the digital revolution – extends from remote villages to large metropolises across the globe. Against this backdrop, policymakers, businesses and workers are struggling to keep up.

Technology offers tremendous benefits and opportunities to improve productivity, efficiency and even inclusivity. But it is also restructuring economic activity in ways that demand intervention. The JustJobs Network calls on governments, businesses and civil society to coordinate their response in the following ways:

1. Reform policy frameworks to manage job displacement brought on by technology and protect, train and retrain workers.
2. Develop innovative models of work design to organize and coordinate the interaction between technology, firms and workers in a digital era.
3. Embrace the new frontier in industrial relations by harnessing the potential of digital platforms to mobilize and organize large numbers of workers in new ways.

The JustJobs Network's 2016 flagship volume examines global trends, questions and policy approaches pertaining to technology and its effect on labor markets. Each chapter engages with key questions regarding the advent and adoption of new technologies in countries at different stages of economic development. The volume seeks to inject real, nuanced case studies from countries around the world into the heated global debates on automation, the on-demand economy, and other technological innovations transforming work.

Endnotes

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ON-DEMAND TRANSPORT WORKERS IN INDONESIA

Toward understanding the sharing economy in emerging markets

Victoria Fanggidae, Muto P. Sagala & Dwi Rahayu Ningrum, Perkumpulan Prakarsa

Perkumpulan Prakarsa: Welfare Initiative for Better Societies is a dynamic Indonesian think tank founded in August 2004 and based in Jakarta. Prakarsa works to cultivate and develop ideas around welfare issues through independent and rigorous research as well as active engagement with stakeholders in the pursuit of social justice and a prosperous society. Prakarsa focuses its research on four areas: welfare policies, poverty and inequality, fiscal policies, and sustainable development. Prakarsa combines research with policy analysis, engagement and communication to turn ideas into actions.

INDONESIA

21,183

GDP per person employed (constant 1990 PPP $)

22

Internet users (per 100 people)

132

Mobile cellular subscriptions (per 100 people)

0.08

Research and development expenditure (% of GDP)

7

High-technology exports (% of manufactured exports)

CHAPTER 01

ON-DEMAND TRANSPORT WORKERS IN INDONESIA

Toward understanding the sharing economy in emerging markets

Victoria Fanggidae, Muto P. Sagala & Dwi Rahayu Ningrum, Perkumpulan Prakarsa

Overview

What constitutes the on-demand or the sharing economy?[i] There is no consensus around the meaning of these terms. Although people associate the word "sharing" with a purely social or communal goal, the monetization of assets and service provision is a key feature of the on-demand or sharing economy.[1]

Proponents of the on-demand economy highlight the efficient, public utilization of privately held assets and skills, increased job creation and social interaction as the benefits of this model. Sundararajan distinguishes between the sharing economy and the on-demand economy with the former evolving into the latter, which is profit-based, and where individuals obtain economic gains by renting or capitalizing on their assets.[2] In his book on the "Uber economy," he traces the history of the on-demand economy and classifies it as a form of crowd-based capitalism. Bostman and Rogers emphasize the collaboration and efficiency dimensions of the sharing economy, which lead to a more environmentally sustainable economy.[3]

Proponents of the on-demand economy highlight an efficient, public utilization of privately held assets and skills, increased job creation and social interaction as the benefits of this model.

Critics of the on-demand economy highlight that it negatively impact the quality of employment and restructures the workforce in a way that exploits workers. In the United States, Hill views this model – especially in the context of on-demand transportation sharing services such as Uber – as creating a "freelance society", which redesigns the workforce, reduces the quality of employment and changes dramatically "the ways [in which] we live and work".[4] The study also criticizes the sharing economy as hastening the 'race to the bottom'

[i] *The terms on-demand and sharing economies are used interchangeably in this paper.*

for low-paid workers. Banning stresses that "an ever-evolving array of programs, platforms, and practices" is exploitative toward workers.[5]

The effects of the on-demand economy vary across countries and are different for developed and developing economies – though the global debate surrounding applications like Uber has largely focused on industrialized regions such as North America and Europe. In those contexts, on-demand transportation providers such as Uber may be expanding the share of the workforce that is part-time and self-employed, an undesirable outcome since these workers tend to enjoy fewer protections and receive fewer benefits than regular employees.[6]

In many developing countries, however, two factors complicate the narrative adopted in the Global North: high levels of informality and poor employment outcomes in the formal economy.[ii,7] The first implies that those who take up work through on-demand companies may be transitioning from an entirely unorganized form of informal self-employment to a more formal, if not regular, work arrangement. In Indonesia, the informal economy accounts for 57.7 percent of employment.[8] The second factor means that workers in the Global South may find compelling reasons to give up a formal job in order to work in the on-demand economy; this stands in contrast to the way on-demand work is understood in developed countries – as a kind of last resort. The effects of the on-demand economy, therefore, need to be examined and understood differently in a developing country context.

The effects of the on-demand economy need to be examined and understood differently in a developing country context.

This chapter draws on primary data from 205 *ojek* (motorcycle taxi) drivers in the Greater Jakarta Metropolitan Area,[iii] collected in May and June 2016 Perkumpulan Prakarsa with support from the JustJobs Network. The data highlight that most of these workers have completed upper secondary schooling and work full-time. Prior to working in the on-demand economy, equal shares of these full-time workers were engaged in the informal and formal economies. This reflects the fact that incentives exist for both informal and formal workers to take up jobs in the on-demand economy, and that on-demand employment is attracting relatively well-educated youth. The drivers perceived their current employment in the on-demand economy as an opportunity to monetize their assets and

[ii] Some scholars have shown that, in developing countries, the quality of jobs in the formal and informal economy is often not very different.
[iii] The Greater Jakarta Metropolitan Area refers to Jabodetabek, which includes Jakarta, Bogor, Depok, Tangerang, and Bekasi.

earn a better income, and a majority felt that working through the on-demand firm was better than their previous job.

The authors of this chapter recommend that the potential of on-demand employment be harnessed, but that job quality in the on-demand economy be steadily improved as well. As the sector grows, on-demand firms should provide basic benefits for workers, including social protections and additional training beyond basic safety training. The authors also propose revising income-sharing arrangements between the drivers and the firms, using the provincial minimum wage as a benchmark for the typical working hours and paying overtime for drivers working more than eight hours.

The chapter encouraged the formation of workers' associations and communities as they can help improve the drivers' bargaining position vis-à-vis on-demand firms and also help effectively link on-demand workers to government programs.

Objectives of the study

This study contributes to academic literature and public debate on the on-demand economy by describing its employment and welfare effects in a developing country. It draws on data from on-demand workers to understand how they perceive their economic outcomes. The study aims to answer the following questions: Who are the workers employed through these on-demand applications? Were they previously unemployed, informal or formal workers? How does the on-demand economy affect their income and well-being? How do workers compare working conditions in the on-demand economy to their previous jobs?

Given these broad questions, the study has three main objectives:

1. To profile the workers engaged in the on-demand economy in Indonesia, specifically those in the transportation sector in Jakarta.
2. To understand how the rise of the on-demand economy impacts workers' welfare, including their incomes and overall well-being.
3. To provide evidence-based policy recommendations to leverage the rising on-demand economy in Indonesia toward improving workers' welfare.

Data collection was done mainly through a survey of 205 taxi or *ojek* respondents, all of whom are working through online motorbike taxi-hailing applications, mainly GoJek and Grab Bike. The respondents were randomly selected with a snowballing technique,[iv] from the five districts of Jakarta –Central Jakarta, South Jakarta, West Jakarta, East Jakarta and North Jakarta – and other towns in Greater Jakarta such as Bekasi and Tangerang.

While initially the study planned to survey the taxi drivers of online apps like Uber, it was only able to survey *ojek* from companies such as GoJek and Grab Bike. When approached, Uber drivers refused to give their consent to the research, citing that responding would be against the company's policy. The management of the other companies approached by the researchers such as GoJek and Grab Bike did not give their consent to be interviewed for the study either. The study focuses on on-demand transportation services because they are the largest component of the on-demand economy in Indonesia, far larger than other services such as on-demand food, courier or cleaning. GoJek for instance, the largest on-demand company in Indonesia, has operations in food delivery, payments, and other on-demand services, but its transport service is by far the largest.[9]

The on-demand economy in Indonesia

The rise of the on-demand economy in Indonesia has spurred a new conversation among policymakers and the broader public. Existing debates in developed countries like the United States and among global institutions often do not take into account the experience of emerging economies. This is despite the fact that they generally offer higher growth prospects for the on-demand economy than highly industrialized countries. For instance, an assessment of the growth potential of different markets found that the Asia-Pacific region is a more promising market for the on-demand economy than countries in North America or Europe, due to a greater receptiveness among consumers to sharing their own goods and renting items from others.[10]

Policymakers, consumers and traditional car or motorbike taxi drivers hold mixed views about on-demand services such as GoJek or Uber. GoJek

[iv] *The snowballing technique is a method of sampling that involves identifying a small pool of respondents who are then used to refer researchers to other respondents. See Atkinson and Flint (2001).*

launched in 2010 as a call-based taxi service. It has since expanded not just to Greater Jakarta, but also to other urban centers in Indonesia, including Bandung, Surabaya and Denpasar. It has a fleet of about 200,000 motorcycle and car taxi drivers.[11] It must be noted however, that as with other on-demand applications, these drivers are not regular employees but rather "work partners" – i.e. independent contractors.[12]

The proliferation of on-demand transport options is seen by many in government and by the broader public as a mechanism for addressing the enormous, unmet demand for public transit.

Initially, the Minister of Transportation sought to ban GoJek in 2015. However, the President of Indonesia cancelled the proposed ban. The debate has been framed in terms of balancing legality versus innovation, job creation and consumer need.[13] Uber, the globally operating ride-sharing company, was launched in Jakarta in mid-2014. In 2016, Uber continues service in Jakarta, despite the governor's opposition to private drivers and car owners working as taxi drivers without obtaining the necessary business permits and without paying taxes.[14]

At the same time, most consumers feel positively about this on-demand taxi option, as it is cheaper than a regular taxi and is perceived to be more reliable.[15] Moreover, the proliferation of on-demand transport options is seen by many in government, and by the broader public, as a mechanism for addressing the enormous, unmet demand for public transit. Greater Jakarta sees 20.7 million passenger trips daily,[16] but only about 350,000 trips take place on its bus rapid transit (BRT) system[17] and another 700,000 on its commuter rail network,[18] due to the limited capacity and coverage of these transit systems.

From the perspective of a policymaker or regulator, the important considerations in overseeing the on-demand economy are taxation, transportation policy, employment, and worker and consumer rights. Most of Indonesia's informal firms are very small, pay low wages, are relatively unproductive, and serve only local markets.[19] In this context, firms such as Uber or GoJek provide workers with an alternative to existing low wages and underemployment in the informal economy.

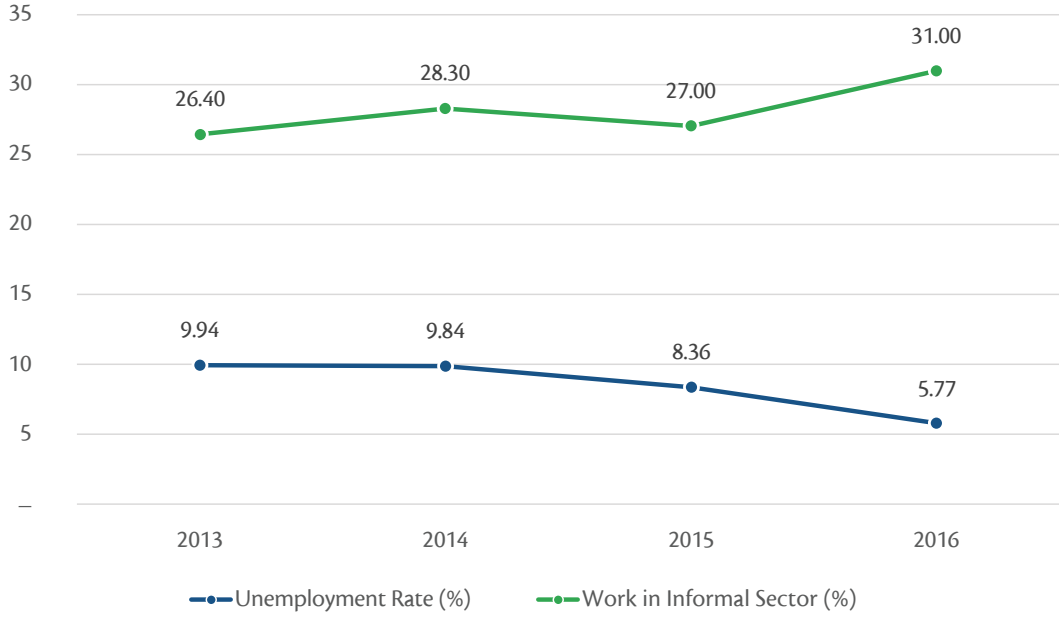
The informal economy is responsible for the majority of total employment. Currently, Indonesia's workforce stands at 122.4 million, of which 7.6 million persons remain unemployed.

The unemployment rate has increased slightly, from 5.94 percent in 2014 to 6.18 percent in 2015.[20] In 2014, those who have completed higher secondary education made up 27 percent of the unemployed population.[21] The informal economy accounts for 57.7 percent of employment, and nearly a third of workers in the formal economy are unpaid family workers, indicating that a large proportion of those jobs may be low quality.[22]

Although unemployment in DKI Jakarta (*Daerah Khusus Ibukota Jakarta*, or the Special Capital Region of Jakarta) has declined in the last year, from 8.3 percent in February 2015 to 5.77 a year later, the share of informal employment has increased from 27 to 31 percent between 2015 and 2016 alone (see **Figure 1**).[v] Informal work is often associated with low quality jobs, poor working conditions, a lack of health insurance or other benefits, and lower pay than formal

Figure 1

Unemployment and informal work in DKI Jakarta, 2013-2016



Source: BPS DKI Jakarta, 2016.

[v] *This is the official DKI Jakarta Province data only, excluding non-register citizens and greater Jakarta satellites' citizens e.g. the areas that are administratively under the provinces of Banten and West Java.*

work. The high unemployment and informal employment rates, coupled with the fact that 8 in 10 households in DKI Jakarta own motor vehicles,[23] have created an environment that is conducive for online transportation platform companies like Uber or GoJek to operate.

Main findings from primary data

Who are the on-demand workers in Jakarta?

Most of the taxi drivers in the sample are men between 18 to 57 years of age. Their educational attainment ranges from primary school to university, but they are generally far more educated than the average Indonesian worker (see **Figures 2a** and **2b**).[vi] More than two-thirds of the respondents have completed their higher secondary education, or senior high school. As **Figure 2a** highlights, 15 percent are junior high school graduates and 10 percent are university graduates. Though the survey found that 6 percent of the drivers had only primary school education, the platforms stipulate a minimum educational requirement of lower secondary school completion.

Higher secondary school graduates form the majority of respondents across all age groups, but make up the highest share in the 25-30 years age cohort; about 83 percent of respondents from this age group have completed higher secondary school. Nearly three quarters of respondents said that they are originally from Jakarta. The remaining one-fourth were migrants born outside Jakarta. Most of the respondents have been working as online *ojek*s between 7 months to a year (see **Figure 3**). Since companies such as Grab Bike require their drivers to have a Greater Jakarta ID Card (KTP), it is unsurprising that those with this card form the majority of drivers.

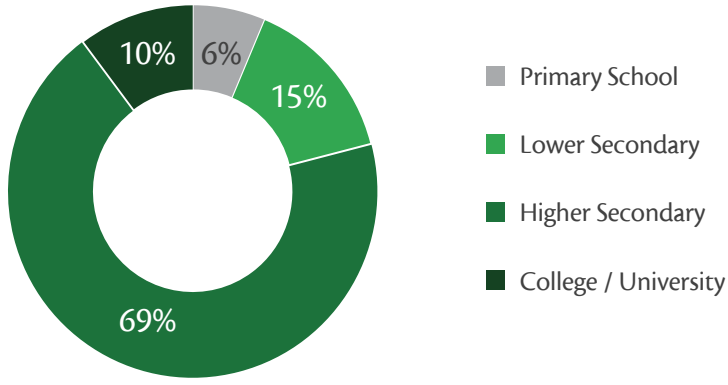
Previous jobs and reasons for leaving

Before working as online *ojek*s, about 51 percent of respondents worked in the formal economy and the remaining 49 percent were engaged in the informal economy. Most of the respondents (82.4 percent) said that they chose to work as

[vi] *Primary school corresponds to Sekolah Dasar (SD); junior high school corresponds to Sekolah Menengah Pertama (SMP); higher secondary education or senior high school corresponds to Sekolah Menengah Atas (SMA); and university corresponds to Sarjana-1 (S1).*

Figure 2a

Highest level of educational attainment among respondents



Source: Authors' calculations.

online *ojek*s voluntarily. The rest said that their circumstances, such as being unemployed or job dissatisfaction, compelled them to become online *ojek*s.

When asked about the reason for leaving their previous employment, the largest share of respondents cited the prospect of a higher income, 33 percent cited increased time flexibility, and 12 percent cited dissatisfaction at their former workplace as the main reason for leaving. Only 11.7 percent of respondents mentioned that they were previously unemployed.

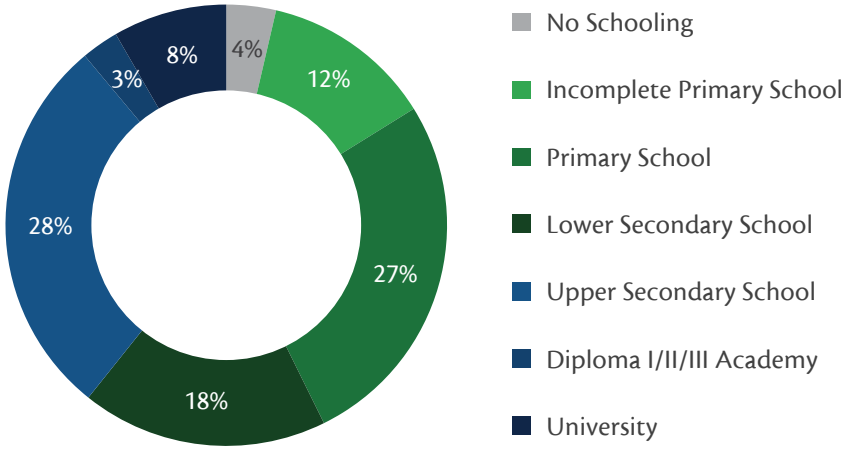
Higher future income and increased time flexibility are the main reasons cited by both previously formal and informal workers, for leaving their previous jobs.

Capital and running costs

All of the respondents use their own motorbikes on the job, serving as their start-up capital. Technology-based, on-demand transport aggregators such as GoJek and Grab Bike also require equipment such as smartphones and some money for initial smartphone balance. The official information from online platform companies mentions that smartphones can be provided to the workers, but they need to be purchased in installments (see **Table 1**). On average, the respondents spend in the range of US$ 38 to 76 for fuel, less than US$ 38 for

Figure 2b

Highest level of educational attainment, Indonesian workforce (2016)



Source: Statistical Yearbook of Indonesia 2016.

maintenance costs, and less than US$ 38 on phone credits each month.[vii]

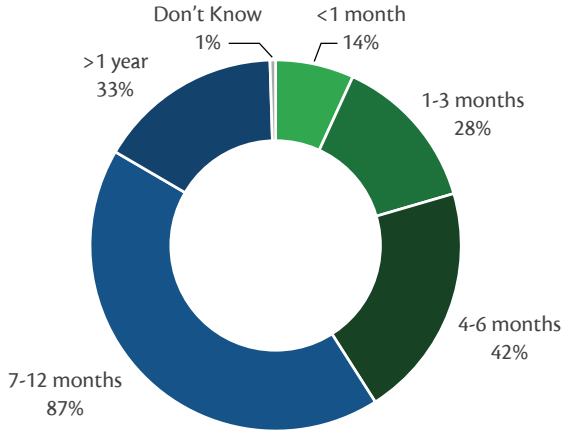
While owning one's own motorcycle may seem like a high barrier, automobile companies have made motorcycles highly accessible through extremely low down-payments. With only IDR 500,000 (US$ 38), consumers can walk away with a new entry-level motorcycle whose total cost is US$ 1250, thanks to creative ways that distributors have found to skirt official regulations that require a minimum down-payment of 20 percent.

Though the companies' official policies mandate a rather extensive list of necessary identification documents, interviews and survey results show that the implementation of these rules is not strict. For example, Grab Bike ostensibly requires that all its drivers hold an identification card from the Greater Jakarta region. But in reality, some of its drivers were found to hold identification cards from outside the Jakarta metro area or from other parts of the country.

[vii] *Using the current exchange rate on August 31, which is about IDR 13,200 per US$ 1.*

Figure 3

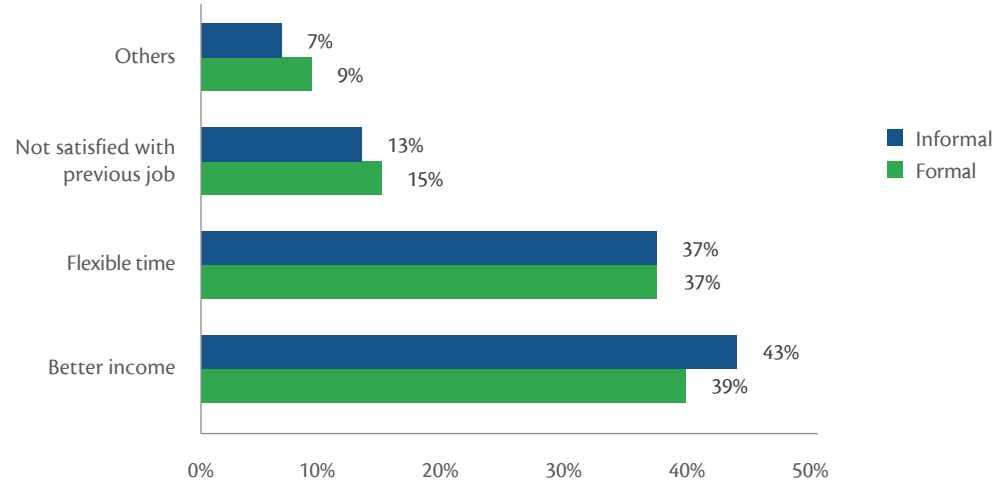
Length of tenure with on-demand firm among respondents (number of respondents)



Source: Authors' calculations.

Figure 4

Reason for leaving previous jobs, formerly informal and formal workers



Source: Authors' calculations.

Table 1

Criteria and capital required to become an online *ojek*

	GoJek	Grab Bike
Criteria to be a driver	Papers and documents: • Photocopy of ID card, household card, driving license, and motorbike registration evidence. • Residential letter if ID card address is different than current address. • Motorbike original ownership paper, latest diploma, household card, birth certificate, and marriage certificate Education and skills: • Minimum education: Junior high school Age: • Maximum age: 55 years of age	Papers and documents: • Original ID card and driving license and the photocopies (must be citizens of Jabodetabek[viii] metropolitan area) • Original police check document and its photocopy must be presented Grab staff. • Leaving (one of these original documents) as guarantee: household card, diploma, original motorbike ownership, marriage certificate. Education and skills: • Minimum education: Junior high school • Able to drive passengers and know the roads in Jabodetabek area well (optional) Age: • Maximum age: 50 years of age (those >50 years of age should bring health document from physician).
Worker's required startup capital	• Motorbike (in good condition) • Smartphone purchased by driver from company, paid in installments	• Motorbike (in good condition) • Smartphone purchased by driver from company, paid in installments • Motorbike's standard equipment • Money: IDR 100,000 (US$7.57) to be used for initial smart phone balance
Capital provided by apps	• Hair cap, mask, gloves • Jacket and helmet are lent by company	• Jacket and helmet are lent by company

Source: Companies' websites and interviews.

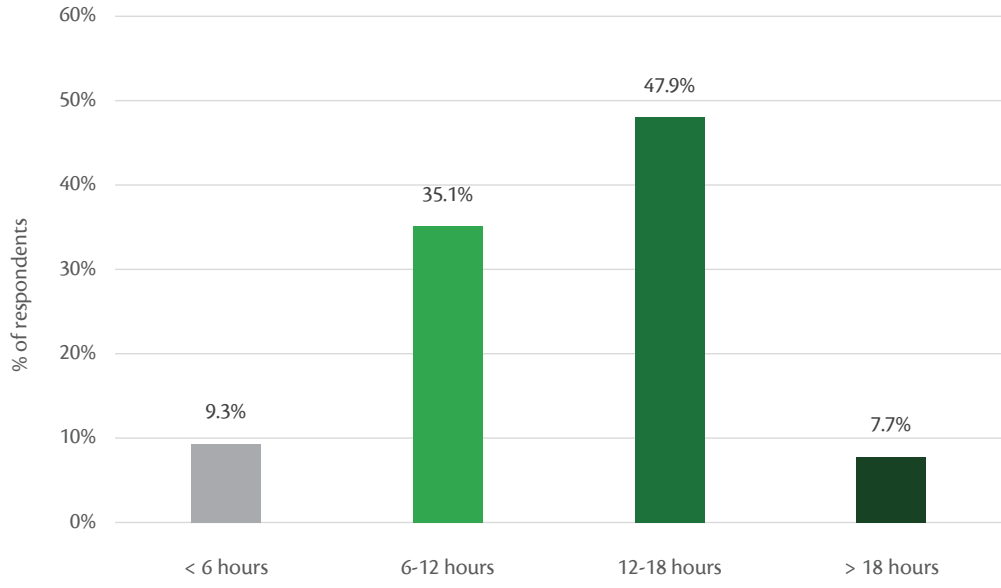
[viii] *The Greater Jakarta Metropolitan region refers to Jabodetabek, which includes Jakarta, Bogor, Depok, Tangerang, and Bekasi.*

Nevertheless, it is still necessary to consider the companies' requirements from the perspective of inclusion. The extent to which these firms create barriers to entry for prospective drivers also determines the extent to which employment in the on-demand economy can serve as income support for poor and marginalized workers. The requirement of a lower secondary school education has indeed kept the share of workers with less education very low (see **Figure 2a**). The requirement of identification documents may function the same way.

While the companies require that the driver produce a birth certificate, the National Socio-economic Survey (SUSENAS) found that only 52 percent of Jakarta residents were able to produce their birth certificates. Another 42 percent claimed to have one but could not produce it, while 5 percent did not have a birth certificate.

Figure 5

Number of hours per day spent working (% of respondents)



Source: Authors' calculations.

Nationally, 23.7 percent of Indonesians do not have a birth certificate.[24] These workers would be disqualified from online *ojek* driving. The age requirements also exclude older workers for whom the flexibility and part-time possibilities of on-demand work may be ideal.

Working hours

More of the respondents reported working full-time as compared to part-time. The share of full-time workers – defined as individuals for whom working as an *ojek* is their only job – was 64 percent. The remainder (36 percent) reported working part-time or having jobs in addition to being an online *ojek*. As **Figure 5** shows, the majority of the respondents (47.9 percent) work on average between 12 to 18 hours each day. Just over a third of all respondents work between 6 and 12 hours per day, and 9.3 percent work under 6 hours per day. There is also a small percentage (7.7 percent) who work over 18 hours per day. The companies do not provide any kind of overtime compensation. Moreover, this raises concerns about overworking and fatigue. Not only does this sort of schedule place tremendous strain on the driver, but fatigue when driving can be dangerous from a safety standpoint.

The majority of the respondents (41.5 percent) spent about an equal amount of time waiting for and driving passengers to their destinations. However, 23.4 percent of all drivers said they spent more time waiting for passengers than driving them.

Income and hours worked

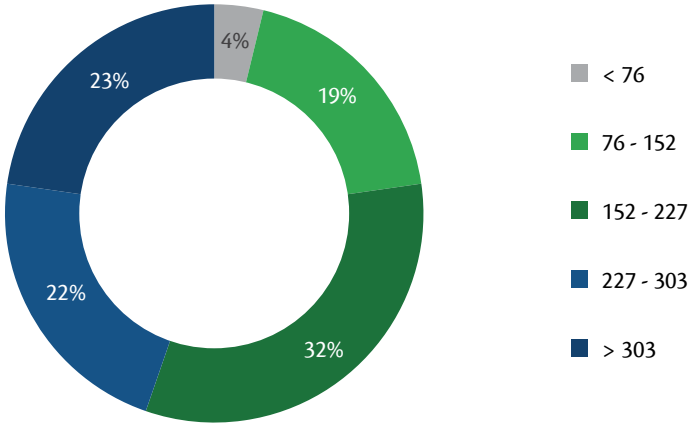
Drivers most commonly earn between US$ 152 and 227 per month; about 3 in 10 place their average monthly net income in this range. Another 23 percent earn between US$ 76 and 152 per month, and an almost equal share earn between US$ 227 and 303 per month (see **Figure 6a**). This demonstrates that at least 55 percent of online *ojek* drivers are earning below the Jakarta minimum wage of US$ 235 per month. However, about 82 percent of respondents said the online *ojek* position offered them a higher income than their previous job. The cost-of-living in Jakarta, according to survey and calculations by Jakarta's tripartite wage committee, stands at roughly US$ 215.[25] Those who drive part-time are most likely to earn in the range of US$ 76 to 152 per month.

Almost 9 percent of the respondents said that they are concerned this job will not provide them with a sufficient income to make ends meet. Over a quarter, 26.3 percent, stated that they often worry about their income and living requirements.

Across all income groups, except for those who earn less than US$ 76 per month, there are respondents who work 12-18 hours or even 18-

Figure 6a

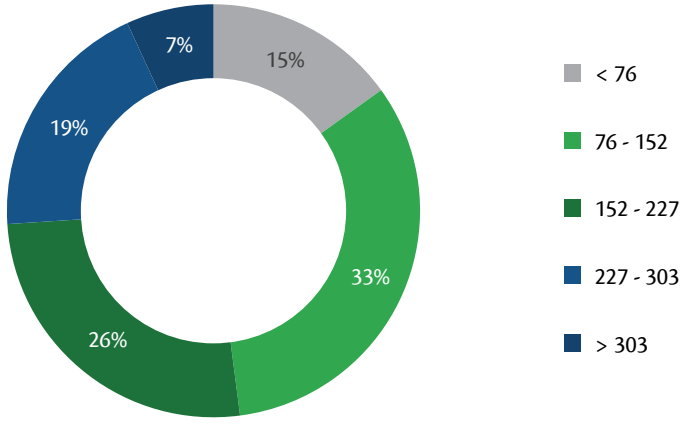
Full-time workers, average monthly net income range (US$)



Source: Authors' calculations.

Figure 6b

Part-time workers, average monthly net income range (US$)



Source: Authors' calculations.

24 hours daily. This indicates that respondents working longer hours does not always result in a higher income.

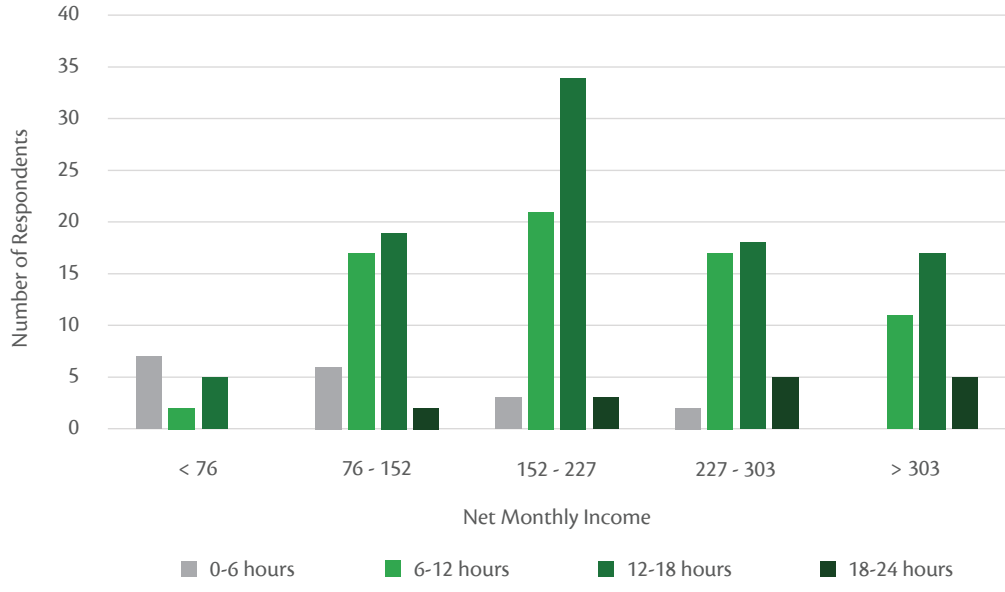
Benefits beyond income

Over half of respondents (56 percent) cited receiving social protection in some form. The types of benefits workers are receiving include health insurance, occupational/pension insurance, and accident insurance. Of these, the most common by far is health insurance.

These benefits are largely obtained through a new national health insurance program (BPJS *Kesehatan*), launched in 2014, and Occupational insurance (BPJS *Ketenagakerjaan*) in 2015, through which the government of Indonesia aims to provide universal health coverage and occupational insurance regardless of a worker's status. Before 2014 and 2015, only civil servants, police and military groups were registered with such schemes, while only citizens categorized as poor received free health insurance. Now, not

Figure 7

Number of respondents, by average monthly income and hours worked daily



Source: Authors' calculations.

only the poor but also non-salaried citizens and informal economy workers are encouraged to sign up for state health and occupational insurance. The National Law on Social Security obliges companies to share the cost of premiums for their employees, while those who are non-salaried can register themselves and make individual contributions. Some of the respondents who have BPJS insurance received help from the on-demand firm to register, but they still pay the insurance premiums out of pocket due to their status as a "work partner" rather than an employee. In other cases, the drivers arranged their own registration through BPJS Occupational directly. The BPJS itself classifies online *ojek* drivers as informal workers.[26]

However, interviews with *ojek*s, and data on how long they have been working as *ojek*s, highlight that those who have more recently become drivers are less likely to be covered by BPJS health and occupational insurance. Most of those who reported having health insurance are those who

Table 2

Example of benefits received from companies[ix]

	GoJek	Grab Bike
Benefits obtained by drivers	• Sharing of profits: 80% for driver, and 20% for the firm (GoJek). • Bonuses are point-based, a combination of the distance and number of passengers driven by drivers in a given day. • Driver/ GoJekers receive phone credits of Rp. 250,000 (100,000 deposits, 100,000 mobile phone account, Rp 50,000 internet package). • Accident insurance for driver and passenger • Facilitation (but not financial support) in Registering for Government-Provided health insurance[x] • Lost goods insurance	• Sharing of profits: 90% for drivers and 10% for Grab. • Bonuses for certain time period within a day for drivers with most passengers. • Prizes for drivers with high rating, e.g. motorbike and Hajj pilgrimage paid by company. • Accident insurance for driver and passenger • CIPS registered the 'members' for Occupational BPJS. • Maintenance cost for motorbike Rp 50K/month

Source: Official website of GoJek and Grab Bike, and respondent interviews.

[ix] *This is not an exhaustive list of benefits.*

[x] *The company, in some cases, assisted ojek drivers to register with BPJS – however this is not a 'benefit' per se, although on its website (www.go-jek.com), GoJek for instance states that "GO-JEK drivers say that their incomes increased after joining as our partner. They also received health and accident insurance as well as access to more customers through our application.*

have worked as online *ojek*s for more than 6 months.

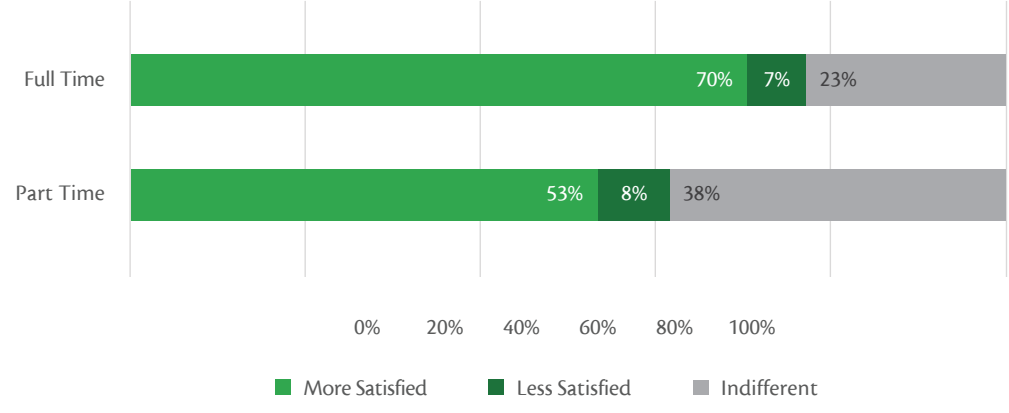
Nascent forms of worker organization

To increase their bargaining power and exchange information on benefits such as insurance, drivers for the company Grab Bike said they formed an informal community or association of drivers named CIPS (*Central Information Point Social*). This association works to increase the number of drivers that register for BPJS Health and negotiates with the company on issues related to legal status and income.

These nascent forms of worker organizations have found unique and creative ways to communicate. They form large digital communities on chat applications like WhatsApp or social media sites, and they use these platforms to disseminate information and even elect leadership. On 3 October 2016, following an announcement from GoJek of a new performance system which would threaten drivers with dismissal if they refused or canceled too many passenger requests, hundreds of workers organized a protest to demand the new system be abandoned. The management acquiesced, illustrating the power of these union-like associations that have formed.[27]

Figure 8

Job satisfaction compared to previous employment, full-time vs part-time drivers



Source: Authors' calculations.

Job satisfaction over time

In terms of job satisfaction, almost two thirds of the respondents said that they were more satisfied with their work in their current position relative to their previous employment. Only seven percent of respondents said that they are less satisfied now than they were in their former job. The remainder, about 28 percent, cited no difference in job satisfaction.

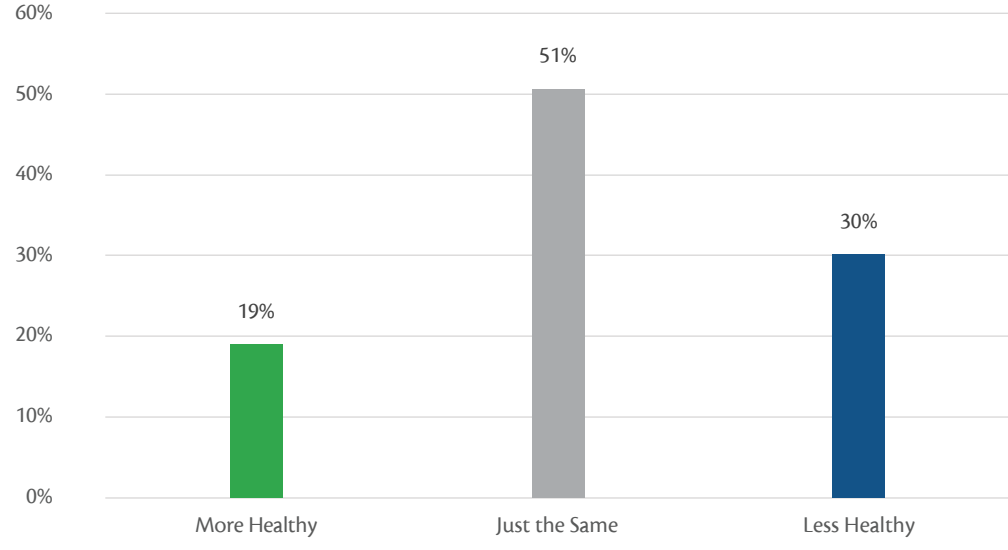
The share of drivers satisfied with their jobs increased with drivers' tenure with the current employer, to a certain extent. Respondents working full-time were more likely to be satisfied with their current job than those working part-time (see **Figure 8**).

Perception of health conditions

As **Figure 9** shows, about half of the respondents claim that their health condition is about the same as it was prior to working for the on-demand transportation company. However, workers were more likely to claim that their health condition has deteriorated since taking up on-demand

Figure 9

Drivers' perception of their health conditions since beginning on-demand work (% of respondents)



Source: Authors' calculations.

work than they were to perceive an improvement. About 30 percent of respondents said that they are less healthy now than before working as an *ojek*, whereas 19 percent said their health condition has improved after starting their current position. There could be several reasons behind the perceived deterioration in health. Often, online *ojek*s work longer hours, leading to increased fatigue. Another possibility is that their new status as drivers may have led to a loss of insurance benefits or more variable income that does not allow them to pay for unanticipated medical expenses.

Receiving health insurance seems to have some impact on drivers' perception of their health status. While almost half of respondents who received health insurance after beginning on-demand work said their health condition had not changed, 35 percent said it had improved.

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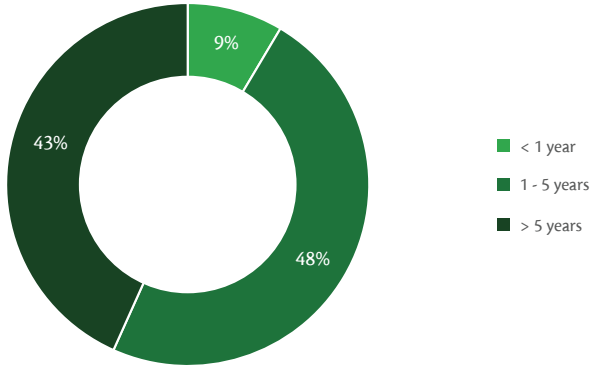
Figure 10

Years expected to keep working as online *ojek* in the future (% of respondents)



Source: Authors' calculations.

significantly higher than the 19 percent among all respondents who say the same.

Workers' leisure and social capital

In their current positions as on-demand workers, 84 percent of the respondents said that they still have time to engage in social, cultural and religious activities. Interestingly, the share of part-time workers who have enough time to participate in leisure activities (about 82 percent) is slightly lower than the share of full-timers who do (about 86 percent). This perhaps points to the fact that those who have no work obligations beyond online *ojek* driving have greater flexibility to structure their schedules around other activities and obligations. Almost six out of ten respondents said they felt that they gained respect from their family for their jobs, an important consideration given that increased social capital is correlated with greater psychological well-being.[28]

Future plans

Most of the respondents stated that they did not want to continue working as online *ojek* drivers in the long term. They would rather look for better paying jobs. Among the respondents who said they wanted better paying jobs in the future, 68.75 percent feel more satisfied working as online *ojek* compared to their previous jobs.

However, only 9 percent said they planned to quit working on the online *ojek* platform in less than a year. Almost half planned to keep their current occupation for 1-5 years, and 43 percent said they planned to remain *ojek* drivers for more than 5 years, suggesting that they have not been exposed to better opportunities or are not optimistic about finding a higher paying job (see **Figure 10**).

The majority of the respondents (84 percent) wanted to remain as private, independent workers not linked to any one employer. About 8 percent of respondents reported wanting to work as employees in private companies in the future and another eight percent expressed a hope to work as government employees.

Competition between on-demand firms and erosion of workers' incomes

Intense competition between different on-demand providers has led to a reduction in fares for on-demand transportation services, and thus an erosion of income for drivers. GoJek, the first online *ojek* application provider in Indonesia, initially provided generous bonuses for its drivers. A GoJek driver stated that initially he could earn an average of US$ 1,136 per month – about five times the minimum wage of US$ 235 in DKI Jakarta. However, more recently, the monthly amount that this respondent could earn has been reduced to less than half of the initial amount, largely because bonus amounts have been reduced, now that the platform has enough drivers to satisfy passenger demand. Some respondents complained about "*oprekan*," an illicit online *ojek* platform that offers a similar service to the traditional applications but at a lower rate. Unregistered, unofficial on-demand applications, they said, were driving down the price of motorbike rides and lowering the income of *ojek* drivers.

Customers' ratings and violating regulations

Ratings of drivers by previous customers are available on the on-demand technology platforms for other ride-share users. These ratings also shape demand. The respondents, aware of the importance of these ratings for customers, often feel compelled to follow their will, even if it means violating traffic regulations such as trespassing traffic lights, driving against traffic or speeding. Not only do these violations break traffic rules, they are also not compliant with company policy.

For example, according to one respondent, if drivers do not follow the customers' instructions, they might be given a low rating, which indirectly decreases their potential to earn bonuses.[xi,29] In addition to affecting bonuses, sustained low ratings for a driver may lead to suspension from the company. The bonus systems differ across companies but most are based on the number of passengers driven and the distance covered.

[xi] *According to GoJek, "at the end of the order, you can give ratings to your drivers. We take customer service very seriously at GO-JEK in order to improve our service, so please rate honestly and accordingly." The details on how exactly the customer rating affects bonuses are not quite clear, but it may cause the suspension of drivers if they consistently receive a low rating.*

Beating Jakarta's traffic with an *ojek*: Competing ground for online business platforms

The rapid penetration of information and communication technologies (ICT) is one the central drivers of the growing on-demand economy: the spread of Internet use, increase in Internet speed and increasing portability of gadgets such as tablet PCs and smartphones. Now, in Indonesia, tablet PCs and smartphones are no longer perceived as luxury goods and Internet access has improved significantly in terms of speed and coverage.

The increase in smartphone ownership has enabled nearly everyone to get involved in the on-demand economy, in roles ranging from a seller to a consumer. Sites such as or *Toko Bagus* in 2005 and *Buka Lapak* in 2010, the local pioneers of online retail, marked the run-up to the emergence of an on-demand economy in Indonesia. In the transportation sector in particular, the soaring ownership of motor vehicles nationally acted as a catalyst for the development. Between 2004 and 2014, the ownership of motorbikes quadrupled, from 23 million to 92 million, largely fed by the rapid expansion of affordable credit.[30]

GoJek is a pioneering on-demand transport provider. Started as a call-based *ojek* service in 2010, GoJek gained momentum in 2014, when smartphone prices had dropped. On its web page, GoJek states that "GO-JEK is a techno-based social enterprise that aims to improve workers' welfare in various informal sectors in Indonesia."[31] The specific mention of informal economy implies that the company sees its business model as an intervention to raise well being and living standards for those in the informal economy.

With its drivers completing more than 600,000 rides per day and a founder from Harvard Business School, GoJek is hailed as a kind of national icon as a successful start-up enterprise. Sequoia Capital, a prominent U.S.-based venture capital firm specializing in funding start-ups around the globe, began investing in GoJek in January 2011. In the last quarter of 2015, NSI Ventures, a Singapore-based venture capital firm also injected more funds into GoJek.

Grab, its closest competitor, originated in Malaysia. Almost identical with GoJek, Grab Indonesia also puts improving welfare of its partners as its third mission: "Improve the life quality of our partners: We believe that a progressive business does not just profit one party but also brings benefits to others, by improving the welfare of those who are involved in this business, such as passengers, drivers, government and broader public."[32]

GoJek market capitalization is forecasted at around US$ 100 million. The online *ojek* market is getting further crowded with more competitors. Uber, the San Francisco-based giant, entered the *ojek* business with its Uber Moto in 2016. Smaller players include TeknoJek, BlueJek, TopJek and AdaJek.

It remains to be seen how market competition will affect revenue sharing models and the welfare of workers. Some interviews conducted for this project suggest that benefits have been reduced as more drivers have joined the service.

Summary of key findings

Workers from both the formal and informal economy perceive on-demand work as an opportunity to grow their incomes and increase the flexibility of their working hours. Those who are working as online *ojek* drivers are equally likely to have come from informal and formal economy employment. The reasons most commonly cited for opting into on-demand work were increased income and increased flexibility. This points to the poor quality of opportunities, even in the formal economy; 40 percent of those who left a formal economy job for on-demand driving said their primary motivation was higher income. The fact that half of the online *ojek* drivers came from the informal economy also points to the potential for on-demand applications to give workers a "more formal" – though not regular – employment opportunity than might be otherwise available to them.

Workers from both the formal and informal economy perceive on-demand work as an opportunity to grow their incomes and increase the flexibility of their working hours.

Nearly 80 percent of online motorbike or ojek drivers in Greater Jakarta have completed higher secondary or tertiary education. Online *ojek* driving requires only basic numeracy and literacy skills and the ability to operate a motorcycle and obey traffic laws. Given that 62 percent of the Indonesian workforce has only a lower secondary school degree or less education, online *ojek* driving could be an employment strategy for these workers. But currently, more educated workers are taking up this form of work. The fact that on-demand motorbike taxi drivers have, on average, more education than the typical Indonesian worker, points to (1) a lack of productive and meaningful employment opportunities for educated workers in the country, (2) mismatch between the skills obtained in formal education and those required by employers, or (3) both.

Despite the fact that 55 percent of full-time online ojek drivers earn less than the Jakarta minimum wage, 82 percent claim that their income has gone up since switching to on-demand driving. Workers are also more satisfied with the on-demand work than with their previous informal or formal employment. Two-thirds of online *ojek* drivers say their current employment is better than their previous employment. This apparent contradiction highlights the difficulty of finding an employment opportunity that pays the Jakarta minimum wage, which rose 15 percent in January 2016.[33]

Intense competition among on-demand transport providers is eroding drivers' income. Interviews with online *ojek* drivers made it evident that on-demand firms initially lured workers to the platform with lucrative bonuses, but over time reduced those bonuses once the platform contained enough drivers to satisfy demand. Moreover, intense competition among on-demand transport firms is driving down fares for passengers, which has further negative impacts on drivers' incomes. These trends point to the need for a regulatory framework which can ensure a living wage for full-time drivers on the platform.

New forms of worker organization are emerging in the on-demand economy of Indonesia. The on-demand economy is spurring its own forms of worker associations. These virtual communities are enabled by the same digital technology that created the on-demand economy itself. They hold the potential to empower on-demand workers, but this will depend in part on the policy environment and willingness of governments to recognize them as legitimate voices. They also represent an opportunity that the on-demand economy provides, particularly in developing countries with high levels of informality. Workers that before the on-demand revolution may have never developed any kind of collective power – e.g. informal *ojek* drivers unattached to any larger firm – now view themselves as connected through a common "employer" on whom they can make demands. One might argue that this is one step toward formalization.

The on-demand economy is spurring its own forms of worker associations. These virtual communities are enabled by the same digital technology that created the on-demand economy itself.

Health conditions and long working hours are main areas of concern pertaining to on-demand jobs. About 56 percent of respondents work more than 12 hours per day, far above the 8 hours per day as spelled out by labor laws. However, these laws are usually applicable only in the formal sector. Since the on-demand workers are officially not formal employees, it is unclear whether the restriction on regular working hours would be applicable to them. About 30 percent of respondents said their health condition deteriorated after becoming an on-demand worker. This may be linked to the long working hours.

Recommendations

1. **On-demand companies represent an opportunity for a country like Indonesia, which has recently introduced a national health and employment insurance program, to link large pools of informal workers to government benefits.**

   Government should work directly with companies like GoJek and Grab Bike to register all the drivers on their platforms for social protection schemes, and mandate that these companies pay the individual contribution fee for all those working full time on the platform. For part-time workers on the platform, the companies could pay a pro-rated amount toward the individual contribution. The proposals that have been made in developed countries for portable, pro-rated, universal benefits[34] may in fact be more practical in a country like Indonesia, where the social protection system is still nascent enough to accommodate new and emerging employment relationships, such as those in the on-demand economy.

2. **On-demand companies should consider revising their requirements in order to open up the opportunity of on-demand work to a larger pool of workers.**

   Currently, 43 percent of Indonesian workers are ineligible to become GoJek and Grab Bike drivers on the basis of their educational attainment, despite the minimal skills the job requires, and more are excluded on the basis of their age. A basic numeracy and literacy test would be a better gauge of a worker's readiness for online *ojek* driving, rather than the current requirement of nine years of formal schooling. Moreover, companies can provide simple training modules in occupational health and safety, motorbike maintenance and customer service in order to equip drivers with the necessary skills.

   The government should formally endorse on-demand economy workers' right to form a community or association.

3. **On-demand companies should revise the framework that governs drivers' income such that it takes into account the minimum wages in the province.**

   If the companies are allowed to operate as legally registered, formal entities, they should be held to a standard of ensuring minimum wage for full-time workers. If all companies are required to ensure payment

of minimum wages, then the intense competition currently driving down workers' incomes will be mitigated as well.

4. **The government should formally endorse on-demand economy workers' right to form a community or association of drivers.** This will not only help drivers negotiate with on-demand companies, but will also lead to empowerment with respect to linking workers with social security schemes such as BPJS health and occupational insurance.

Endnotes

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ARE ONLINE WORK PLATFORMS CREATING A FRICTIONLESS GLOBAL LABOR MARKET?

Analyzing data from the largest Spanish-speaking freelance portal

Hernan Galperin & Catrihel Greppi, Guest Contributors

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WAGE AND EMPLOYMENT INDICATORS

	SPAIN	ARGENTINA	MEXICO
GDP per person employed (constant 1990 PPP $)	82,651	30,844	39,586
Internet users (per 100 people)	76.2	64.7	44.4
Mobile cellular subscriptions (per 100 people)	108	159	82
Research and development expenditure (% of GDP)	1.24	0.58	0.5
High-technology exports (% of manufactured exports)	7	7	15

Note: Figures are from the most recent year when data were available.

CHAPTER 02

ARE ONLINE WORK PLATFORMS CREATING A FRICTIONLESS GLOBAL LABOR MARKET?

Analyzing data from the largest Spanish-speaking freelance portal

Hernan Galperin & Catrihel Greppi, Guest Contributors

Introduction

There is a familiar narrative about new communication technologies and their effect on white-collar labor offshoring. In the pre-internet days, geography generally protected workers in developed countries against competition from lower-cost providers in the rest of the world. As much as spatial distance discouraged a U.S. resident from getting a haircut in China, it also discouraged firms from outsourcing back-office operations or software development to other countries. Exponential increases in global telecommunications capacity and steep drops in per-unit communication costs since the 1980s have made distances less relevant, creating a globally contested market for workers. This has depressed wages and relocated white-collar jobs to developing countries, in a process that closely mirrors the offshoring of blue-collar jobs in the manufacturing sector.

The rapid diffusion of the internet and the emergence of digital labor platforms are seen as potential drivers of employment and wage growth in emerging regions.

From a development perspective, a similar narrative – but opposite in valence – celebrates the rapid diffusion of the internet and the emergence of digital labor platforms as potential drivers of employment and wage growth in emerging regions. The argument is based on a number of stylized facts. First, the majority of employers in online labor markets are based in high-income countries, while the majority of workers are based in middle- and low-income countries.[1] This simple fact suggests that workers may be able to earn higher (hourly) wages

relative to opportunities in local labor markets. Second, online markets dramatically expand the number and types of labor opportunities, facilitating access to employers in higher-wage countries and increasing the likelihood that individual skills will be matched with available jobs. Third, online labor platforms allow employers to break down large processes into "microtasks," enabling individuals or small firms in developing countries – who do not enjoy economies of scale - to compete alongside traditional offshoring firms.

Both narratives share the premise of a frictionless market for labor through digital platforms. In this narrative, white-collar or knowledge workers around the world compete for contracts on a level playing field regardless of nationality, gender or other characteristics unrelated to individual productivity. Further, some scholars have suggested that digital labor is particularly promising for groups facing higher barriers in traditional labor markets, such as women and youth. For example, Rossotto et al. argue that flexible schedules enable workers to balance online labor with other responsibilities such as childcare and education.[2] Raja et al. also suggest that, by making location irrelevant, digital labor allows women to overcome biases that restrict their careers in traditional workplaces.[3] Finally, digital labor tends to be associated with IT literacy. This naturally favors younger workers, who are more likely to have the skills and familiarity with technology required by employers.

Some scholars have suggested that digital labor is particularly promising for groups facing higher barriers in traditional labor markets, such as women and youth.

This chapter seeks to test the narrative of a frictionless global market for digital labor, in which cost differentials gradually shift jobs from high-wage to low-wage countries. The empirical strategy is based on the examination of internal data from Nubelo, the largest online labor platform for Spanish-speaking employers and workers. The authors obtained records for all transactions in Nubelo over a 44-month period between March 2012 and December 2015. The dataset includes basic demographic characteristics of employers and contractors, and extensive platform-specific information about contracted jobs.

The results suggest that information-related frictions characteristic of traditional labor markets are exacerbated in online contract platforms, resulting in a significant penalty for foreign job seekers. This results in two ways. First, after controlling for observable individual

characteristics and bid amount, workers based in less developed countries are 42 percent less likely to win contracts from employers in Spain, the highest-wage country in the sample and where the majority of Nubelo employers are based. Second, Spanish workers in the sample command a significant wage premium of about 16 percent over similarly qualified workers based in developing countries.

We offer two complementary explanations for these results. The first relates to the nature of the contracts outsourced through online labor platforms. Most of the job opportunities available in Nubelo require a degree of co-production between the buyer and seller, which implies iterative communication between the parties. This differs from other digital labor marketplaces, in particular Mechanical Turk, where demand is typically for very small, low-skill tasks that require minimal communication between the employer and contractor.

The hiring penalty for developing country workers seems to increase with task complexity. This indicates that employers anticipate higher communication costs when working with foreign contractors. Interestingly, this finding is consistent with studies of other digital labor platforms in which spatial distance and cultural differences between parties are greater, such as Hong and Pavlou.[4] In this study, communication costs continue to be salient even in the context of a region-specific platform in which cultural and time zone differences between employers and contractors are relatively small.

The second explanation relates to information asymmetry and uncertainty about worker quality. Employers, lacking verifiable information and unable to personally screen workers, tend to attribute quality to individual workers based on their country of origin. As more information about individual workers' productivity becomes available, and as employers acquire more experience with foreign workers, the foreign worker penalty falls. This suggests that the preferences of Spanish employers are affected by information uncertainty rather than distaste for workers from developing countries.

The results suggest that information-related frictions characteristic of traditional labor markets are exacerbated in online contract platforms, resulting in a significant penalty for foreign job seekers.

This chapter contributes to the emerging literature on the dynamics and distributional effects of digital labor markets. In general, the literature

detects persistent frictions that significantly diminish potential gains for job seekers in developing countries, as well as potential losses for workers in developed countries. This chapter adds value to this literature in two ways. First, the analysis corroborates previous findings in a setting where language and other cultural factors are by and large irrelevant, thus establishing the continued relevance of communication frictions in digital labor markets. Second, it provides a novel measure to quantify wage differentials between foreign and domestic workers, and explore how wage penalties change with job experience and individual reputation.

Digital labor and information uncertainty

Information and Communication Technologies (ICTs) are significantly changing how labor markets operate. Following Autor we identify three mechanisms of such change.[5] First, search costs are significantly reduced, potentially improving matching between employers and employees. Second, the digitalization of labor enables more workers, particularly in the service sector, to perform their work remotely. Third, online delivery of labor services makes location much less relevant, freeing both employers and employees from the constraints of local job markets.

Online labor platforms enable knowledge workers in poor countries to access labor markets in rich countries, which were previously inaccessible to them due to high communication costs and barriers to labor migration.

The third mechanism is of particular relevance for development debates. Online labor platforms enable knowledge workers in poor countries to access labor markets in rich countries, which were previously inaccessible to them due to high communication costs and barriers to labor migration. Following standard economic theory, the predicted effect would be a reduction in income differentials between workers until wages reflect individual productivity rather than geographic proximity to employers. In the final equilibrium, workers in high-wage countries are made worse off as jobs migrate overseas, driving down wages and reducing employment. At the same

time, virtual labor mobility benefits workers in poor countries, expanding market access and improving matching with individual skills.

Several recent studies have examined this hypothesis. In general, the results suggest the persistence of communication costs and information frictions that significantly limit the offshoring of labor to lower-wage countries. For example, Gefen and Carmel find that most contracts in an online programming market are awarded to domestic contractors.[6] When jobs are offshored, employers prefer workers from countries with minimal cultural distance, rather than simply lower costs; for instance, U.S. employers would hire programmers from English-speaking countries such as Canada and Australia. Hong and Pavlou find that differences in language, time zone, cultural values and levels of economic development negatively affect hiring probabilities in a global platform for IT contracts.[7] Similar results are reported by Lehdonvirta et al. who find that the hiring penalty for foreign contractors increases when tasks require knowledge of local formal institutions- for instance, legal work - or regular interaction with employers.[8]

These studies also identify several mechanisms that mitigate information frictions in digital labor, which generally work to the advantage of workers in less developed countries. For example, Stanton and Thomas show that being affiliated with an outsourcing agency increases hiring and wages among inexperienced workers, helping them overcome the first-job barrier.[9] The disadvantage developing country workers face dissipates over time and jobs, as more information becomes available about the quality of individual workers. Mill finds that feedback from previous contracts significantly reduces the effect of geographical location in hiring probabilities.[10] Similarly, Agrawal et al. find that the benefit of platform-verified information is disproportionately large for contractors from less-developed countries, which suggests that employers face more difficulty in evaluating quality among foreign workers.[11]

In general, the results are consistent with statistical discrimination models whereby employers, faced with uncertainty about worker productivity, attribute values based on perceived group averages.[12] At its core, statistical discrimination is a theory of stereotyping. When hiring workers, employers seek information that helps predict future productivity. If this information is too noisy or simply unavailable, stereotypes provide cognitive shortcuts that help orient employers' choices. Stereotyping has long been studied in the context of traditional labor markets. However, there are several reasons why it may play an even bigger role in hiring decisions in online labor markets.

First, online employers are unable to screen workers in person. Second, while job seekers are encouraged to upload as much information as possible to their online profiles, the amount of platform-verified information is typically very limited. As Pallais shows, even small differences in the amount of information available on workers' profile can have a significant effect on future hiring and earnings.[13] Finally, given the value and short-term nature of a typical digital labor contract, it is unlikely that employers would be willing to incur high screening costs. In short, faced with several dozen applicants, limited verifiable information and a tight deadline, employers are likely to activate cognitive shortcuts in making hiring decisions. Prior beliefs about the average productivity of workers based on available signals – for example, country of residence, ethnicity, gender and so forth – are likely to become highly salient in such contexts.

Data and descriptive results

Nubelo is a leading online labor platform serving Spanish-speaking markets, with more than 1 million workers offering services to about 100,000 employers. The platform matches employers who post contracts for short-term jobs (the demand side) with workers who bid for these jobs (the supply side). Job postings typically describe the tasks required, the job category, the expected date of delivery, and the country where the employer is located. A successful match occurs when an employer selects a worker, based on her bid as well as other characteristics that are visible on the contractor's online profile. These include name, country of residence, prior work experience on the platform and a summary feedback score from previous contracts. In addition, contractors can voluntarily include other information such as a CV, a brief description of offline work experience and skills, portfolio samples, and a personal picture.

Our dataset includes records for all transactions in Nubelo for a 44-month period between March 2012 and December 2015. The data includes information on all jobs posted by employers and on all bids placed by contractors, both winning and unsuccessful.[i] Unlike other platforms, Nubelo actively discourages employer-contractor

[i] *The units of observation are the bids made by contractors. Therefore, the dataset is restricted to active contractors, i.e. those who have submitted at least one bid during the 44-month study period. The full dataset includes 81,497 bids made by 18,356 contractors for a total of 5,262 jobs posted by 2,517 employers. We note appropriately when partial data subsets are used in the analysis.*

interaction prior to hiring. Therefore, all the information visible to employers is available in our dataset, reducing concerns about omitted variables in our estimation models.

Nubelo primarily serves Spanish-speaking markets. Therefore, while 63 countries are represented in our dataset, Spain and a few large countries in Latin America account for the majority of active workers (see **Table 1**). The distribution of employers is even more skewed towards Spain, which accounts for about two-thirds of all employers. The share of jobs posted follows a similar distribution: about two-thirds originate in Spain, with the remaining third distributed between Argentina and other Latin American countries.

Descriptive results suggest that employers tend to favor Spanish contractors. As shown in **Figure 1**, Spanish contractors win a larger-than-expected share of jobs posted, though this advantage seems to be relatively small in magnitude, about 11 percentage points. Yet when the sample

Table 1

Contractors, employers and jobs posted by country

Work	Contractors	%	Employers	%	Jobs Posted	%
Spain	6820	37.15	1639	65.12	3528	67.05
Argentina	4045	22.04	390	15.49	689	13.09
Colombia	2144	11.68	139	5.52	222	4.22
Mexico	1326	7.22	175	6.95	419	7.96
Venezuela	1268	6.91	8	0.32	13	0.25
Chile	648	3.53	49	1.95	147	2.79
Peru	399	2.17	9	0.36	17	0.32
Uruguay	239	1.30	10	0.40	16	0.30
Ecuador	175	0.95	9	0.36	50	0.95
Dominican Republic	144	0.78	6	0.24	6	0.11
Others	1148	6.25	83	3.30	155	2.95
Total	**18356**	**100.00**	**2517**	**100.00**	**5262**	**100.00**

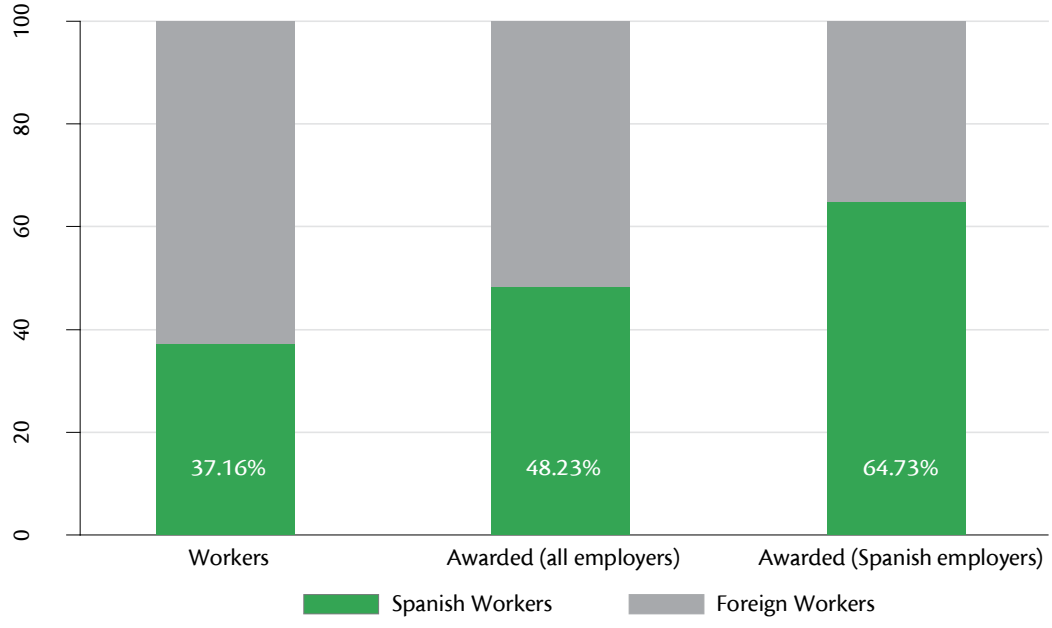
Source: Authors' calculations based on Nubelo data.

is restricted to projects posted by Spanish employers, the difference grows significantly, to about 28 percentage points.

A key question is whether online platforms promote the movement of white-collar employment from high– to middle– and low-income countries. In order to examine this question, we look at the distribution of awarded contracts using the World Bank's country wealth classification. **Table 2** shows that two-thirds of jobs originating in high-income countries are awarded to contractors in high-income countries, with only a third going to contractors in lower-income countries. This by and large reflects the fact, noted above, that Spanish employers tend to contract domestically.[ii] Interestingly, employers in lower- and middle- income countries tend to hire

Figure 1

Workers and contracts won by country of residence



Source: Authors' calculations based on Nubelo data.

[ii] *It is worth noting that due to government-set limitations to international currency trade in Argentina during our study period, Nubelo required that employers in Argentina hire Argentine contractors. This artificially inflates the value for trade within upper-middle income countries.*

Table 2

Employer/worker matches by country income category

		Workers			
	Income Category	High	Upper-middle	Lower-middle	Total
Employers	High	66.64%	30.01%	3.35%	100%
	Upper-middle	28.32%	66.62%	5.06%	100%
	Lower-middle	28.57%	65.71%	5.71%	100%

Source: Authors' calculations based on Nubelo data.

in higher-income countries, which may reflect a scarcity of human capital available in local labor markets.

Figure 2 maps the distribution of contracts awarded to foreign workers. Lines represent bilateral hiring in both directions, with line width proportional to volume. This visual representation corroborates that much of the trade takes place between Spain and Latin America, with only limited within-region trade.

Method and results

Descriptive results suggest a hiring bias in favor of Spanish contractors, particularly among Spanish employers. Further, most job seekers have never been hired in the platform, which suggests that landing the first job is a key barrier to online employment. We also that find Spanish contractors bid more actively on the platform, which may both reflect and reinforce their higher probability of being hired.

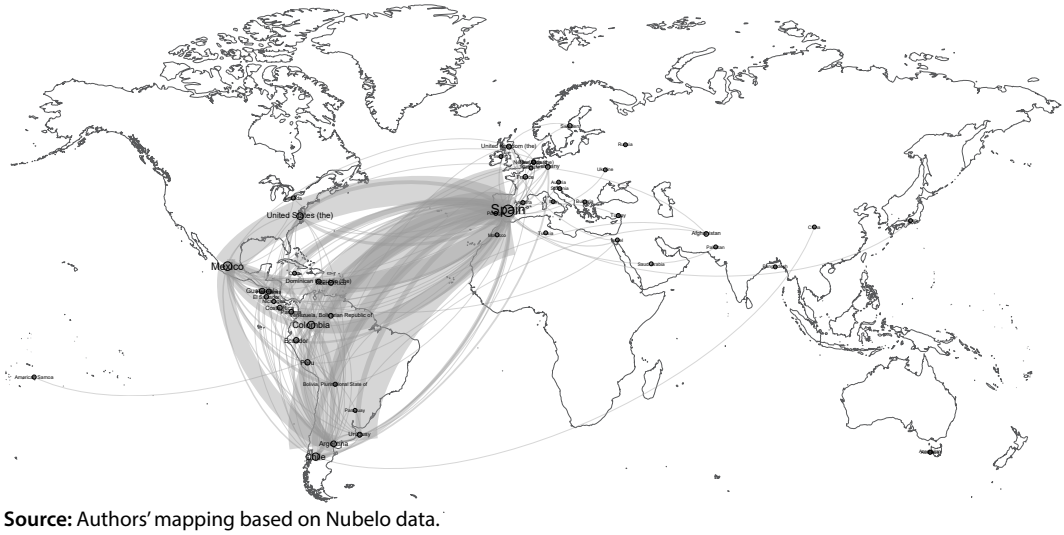
In order to test these propositions, we first build a linear model that estimates the probability of being hired, conditional on country of residence and covariates that capture bid competition, freelancer characteristics and country reputation. In addition, the model includes contractor-level characteristics such as the number of previous jobs that the contractor has held in the platform, whether or not they have completed their online

profile at or above the sample average of 80 percent, if they have received positive feedback from previous jobs (an average of 4 points or more on a 5-point scale), and whether they have previously worked with a given employer. It also accounts for job-specific effects. The details of the model are included in the Appendix.

We restrict the sample to job postings from Spanish employers, for a number of reasons. First, jobs originated in Spain represent the large majority, 67 percent, of jobs posted. Second, our interest lies in labor offshoring from high-income to lower-income countries. With a GNI per capita of US$ 28,520 in 2015 (in current terms), Spain's average income is about twice that of Argentina, the second largest employer. Further, Argentine employers were prevented from hiring outside Argentina due to government regulations, which eliminates variance in our main variable of interest. Mexico, which is the third largest employer and accounts for about 8 percent of all jobs posted, has only half of Spain's per capita Gross National Income (GNI).[iii]

Figure 2

Bilateral contract activity by country



Source: Authors' mapping based on Nubelo data.

[iii] Given our interest in examining whether Spanish employers discriminate statistically in favor of domestic workers, we further restrict the sample to job postings that received at least one proposal from a Spanish contractor and one proposal from a non-Spanish (i.e., foreign) contractor. Filtering for job postings that did not result in a positive match (i.e., where the employer did not hire a contractor), our restricted sample comprises of 46,799 bids for 2,500 job postings.

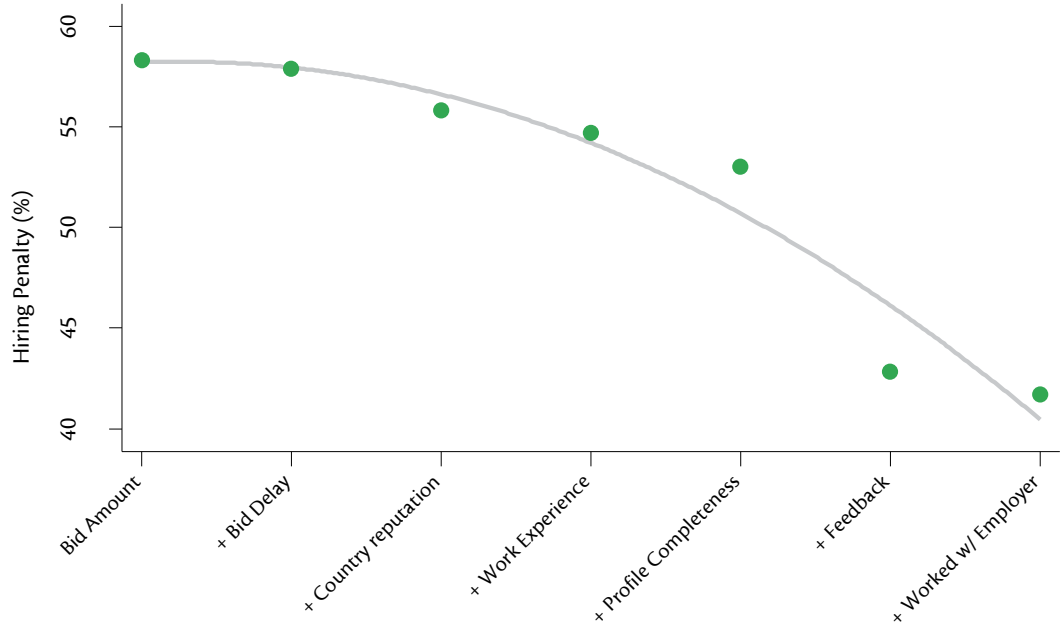
Hiring penalty

Non-Spanish contractors are less likely to be hired by Spanish employers. The full model – which controls for bid amount, bid delay, country reputation, previous contracts between employer and contractor, and covariates related to individual productivity – shows that, on average, being a foreign worker reduces the winning odds by 2.2 percentage points. Relative to the average winning odds of 5.3 percent in the full sample, this represents a hiring penalty of about 42 percent for foreign workers. **Appendix Table A1** provides the complete results from the linear model.

It is interesting to note how the penalty varies as different covariates are introduced in the model. When we only isolate the effect of bid amount

Figure 3

Hiring penalty in alternative model specifications



Source: Authors' calculations based on Nubelo data.

and worker's country of residence on hiring, the hiring penalty is about 3.1 percentage points, which represents a 58 percent penalty, relative to the average winning odds of 5.3 percent in the full sample. As more contractor characteristics are included in the model, the hiring penalty gradually falls, as shown in **Figure 3**.

As expected, job experience in the platform is a strong predictor of hiring, with every previous contract increasing the likelihood of being hired by about 5 percent. Likewise, having a more complete profile than the average contractor profile increases the likelihood of being hired by about 50 percent. This effect is surprisingly strong, given that this information is voluntarily disclosed and cannot be verified by the employer. It is likely that a more complete profile signals to employers a higher level of commitment on the part of the worker, especially with respect to online jobs and relative to offline alternatives.

As shown in **Figure 3**, the hiring penalty for foreign workers falls sharply when the model accounts for individual reputation, i.e. feedback from previous jobs. This strongly suggests that in the absence of reliable information about individual workers, Spanish employers attribute quality to workers based on their country of origin. When such information is available, the hiring penalty falls from about 53 percent to nearly 43 percent. Lastly, when the model captures previous contracts between the employer and contractor, the hiring penalty remains unchanged. However, as expected, given the fact that most hires result in positive matches, the effect of a previous relationship between the employer and contractor on hiring is large, and partly reduces the effect of other covariates such as individual reputation and profile completeness.

In the absence of reliable information about individual workers, Spanish employers attribute quality to workers based on their country of origin.

Wage premium

Descriptive statistics suggest that Spanish employers are willing to pay a wage premium for hiring domestically. In order to quantify this wage premium, we build another linear model that estimates the bid amount (in logarithm) conditional on the contractors' country of residence, the time delay between the employer posting the job and the contractor submitting the bid and other contractor characteristics. Again, the model includes job-specific effects. The model is described in greater detail in the Appendix.

We then restrict the sample to projects that resulted in a Spanish worker being hired, even

though foreign contractors may have submitted bids for the job. This helps gauge how much employers are willing to pay to hire domestically rather than hire similarly-qualified foreign workers. **Table A2** in the Appendix presents the results from this model. The results indicate that, when hiring locally, Spanish employers rejected alternative bids by foreign contractors that were, on average, 14 percent lower in cost. For Spanish workers, this translates into a wage premium of about 16 percent, when calculated as a premium over alternative bids.

Wage premium when employers possess more information

Next we examine if the wage premium varies when more information about individual-level productivity is available. The hypothesis is that the wage premium will be higher among inexperienced workers, workers without feedback, and workers with less complete profiles. In order to test this, we run the full model for job postings that ultimately resulted in a Spanish worker being hired but with different pools of job seekers - foreign and domestic contractors. **Table 3** below summarizes the results in euros (EUR). The complete results are presented in **Table A3** in the Appendix.

The results highlight that, in the absence of information about a contractor's previous job experience, the wage premium is larger. Put differently, when we restrict the sample to job postings that only received bids from inexperienced workers, the wage premium for Spanish workers is larger than when the sample is restricted to job postings that only received bids from experienced workers. This effect is even larger when feedback from previous jobs is lacking. Further, the wage premium is reduced

Table 3

Wage premium by worker characteristics (in EUR)

	Experience		Feedback		Profile	
Worker	No	Yes	Low	High	Incomplete	Complete
Spanish	378	214	527	225	392	236
Foreign	332	197	443	213	345	206
Diff (Eur)	46	17	84	12	47	30
Diff (%)	-0.12	-0.08	-0.16	-0.05	-0.12	-0.13

Source: Authors' calculations based on Nubelo data.

to a third when employers factor in individual reputation in hiring choices. As expected, the availability of information in workers' profiles only marginally affects the magnitude of the wage premium, since this information is not verifiable.

Discussion and policy recommendations

The internet is rapidly reshaping labor markets. This study contributes to our understanding of the dynamics of hiring and wages that result from digital labor. In online work platforms, employers can easily search and screen job seekers, while platforms standardize key functions such as contracting and payment mechanisms. In theory, the result could be a global labor market in which frictions are minimized and workers are paid regardless of geographical location and other characteristics unrelated to individual productivity.

There is ample room for collaboration between governments in developing countries, and platform operators for promoting skills training and for the development of certification mechanisms to reduce quality uncertainty among foreign employers.

Our findings detect a number of information-related frictions in online labor platforms that significantly favor workers located in geographical proximity to employers, which mitigate the migration of white-collar jobs to less-developed countries. Online hiring typically takes place in a context of very limited information about the quality of alternative job seekers. Unable to personally screen workers, employers are more risk-averse than in traditional labor markets, activating stereotypes that substitute for verifiable information. This has two important implications. First, we find that foreign workers are less likely to be hired, after controlling for the same productivity-related characteristics observed by online employers. Second, we find that employers are willing to pay a wage premium for domestic workers. This premium increases in the absence of verifiable information about previous job experience and individual reputation.

Both findings are consistent with models of statistical discrimination, in which biases result not from taste preferences but rather from imperfect information about the distribution of workers' skills. Lacking reliable information about individual workers, employers infer quality from country of origin. Since it is likely that employers are less certain about the distribution of quality among foreign

(relative to domestic) contractors, a hiring penalty results. As more information is available, employers adjust expectations, thus reducing the hiring penalty and the wage premium paid to domestic contractors.

Two key policy insights emerge from our findings and are suggested below.

1. There is ample room for collaboration between governments in less-developed countries and platform operators for promoting skills training and for the development of certification mechanisms to reduce quality uncertainty among foreign employers. An example is the partnership between Nubelo, Coursera — an online learning platform and Colombia's Ministry of Information Technologies, which offers online training in high-demand job categories such as web development and digital marketing.
2. Many governments have established programs that encourage local firms or the government itself to hire inexperienced, mostly young workers. These policy instruments can be expanded to include contract work in online labor platforms, thus helping workers overcome the first-job barrier.

Appendix

Linear model to assess the probability of a contractor getting hired

We set up a linear model that estimates the probability of being hired, conditional on country of residence, and covariates that capture bid competition, freelancer characteristics and country reputation. More formally:

$$Hiring_{ij} = \alpha_{ij} + \gamma Foreign_{ij} + \delta logPrice_{ij} + \eta CountryRep_{ij} + \beta Z + \sigma_i + \varepsilon_{ij}$$

where *Hiring* is the probability of contractor's bid *i* being selected for job posting *j*, *Foreign* is a dummy (yes=1) that identifies non-Spanish workers, *Price* denotes bid amount (in log), *Delay* is the difference (in hours) between the job posting and bid submission (in log), *CountryRep* denotes whether the employer has previously hired from the same country of the contractor submitting bid *i* at the time of job posting *j*, *Z* is a vector of contractor characteristics that vary over time, σ controls for job fixed effects, and ε is an error term.

The vector of contractor characteristics includes the number of previous jobs in the platform, a dummy for having completed the online profile at or above the sample average of 80 percent, a dummy for positive feedback from previous jobs (an average of 4 points or more on a 5-point scale), and a dummy that indicates whether the contractor has previously worked with the employer. We choose a fixed-effects specification at the level of each job posting, in order to allow contractor characteristics to vary over the study period while reducing bias from sorting effects across job postings. As discussed in the main text, we restrict the sample to job postings from Spanish employers.

Table A1 reports the results from an Ordinary Least Squares (OLS) regression using the above specification.

Table A1

Hiring probabilities (OLS with fixed effects)

	Dependent Variable : Hiring Probability						
	1	2	3	4	5	6	7
Foreign Worker Hiring Penalty	-0.0309*** [0.00214]	-0.0307*** [0.00214]	-0.0296*** [0.00220]	-0.0290*** [0.00219]	-0.0281*** [0.00219]	-0.0227*** [0.00217]	-0.0221*** [0.00204]
Controls							
Bid Amount	✓	✓	✓	✓	✓	✓	✓
Bid Delay		✓	✓	✓	✓	✓	✓
Country Reputation			✓	✓	✓	✓	✓
Work Experience				✓	✓	✓	✓
Profile Completeness					✓	✓	✓
Feedback						✓	✓
Worked with Employer							✓
Constant	0.152*** [0.00501]	0.168*** [0.00535]	0.167*** [0.00539]	0.148*** [0.00544]	0.128*** [0.00569]	0.0789*** [0.00580]	0.0743*** [0.00545]
N	46,799	46,799	46,799	46,799	46,799	46,799	46,799
R2	0.001	0.013	0.013	0.022	0.025	0.050	0.161
Number of Projects	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Mean of Hiring Probability	0.0530	0.0530	0.0530	0.0530	0.0530	0.0530	0.0530
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1							

Source: Authors' calculations based on Nubelo data.

Linear model to assess wage premium

We build another linear model that estimates the bid amount (in logarithm) conditional on the country of residence and a vector of contractor characteristics. More formally,

$$Log(Price)_{ij} = \alpha_{ij} + \gamma Foreign_{ij} + \lambda logDelay_{ij} + \beta Z + \sigma_{ij} + \varepsilon_{ij}$$

where *Price* is the bid by contractor *i* for job posting *j*, *Foreign* is a dummy (yes=1) that identifies non-Spanish workers, *Delay* is the difference (in hours) between the job posting and the bid submission (in log), *Z* is a vector of contractor characteristics that vary over time, σ controls for job fixed effects, and ε is an error term.

We then restrict the sample to projects that resulted in a Spanish worker being hired. Hence, our coefficient of interest γ indicates the marginal change in bid amount when bids were submitted by foreign contractors for jobs in which a Spanish worker was ultimately selected. In other words, it quantifies the premium that the employer was willing to pay to hire domestically relative to alternative bids by similarly-qualified (per observable characteristics) foreign workers.

The results in **Table A2** indicate that, when hiring locally, Spanish employers rejected alternative bids by foreign contractors that were, on average, 14 percent lower (column 6). This translates into a wage premium for Spanish workers of about 16 percent when calculated as a premium over alternative bids.

Table A2

Wage premium (OLS with fixed effects)

	Dependent Variable: Log of Bid Amount					
	1	2	3	4	5	6
Foreign Worker Hiring Penalty	-0.120*** [0.0123]	-0.122*** [0.0122]	-0.124*** [0.0122]	-0.125*** [0.0123]	-0.140*** [0.0123]	-0.141*** [0.0123]
Controls						
Bid Delay		✓	✓	✓	✓	✓
Work Experience			✓	✓	✓	✓
Profile Completeness				✓	✓	✓
Feedback					✓	✓
Worked with Employer						✓
Constant	4.738*** [0.00802]	4.615*** [0.0146]	4.644*** [0.0152]	4.660*** [0.0178]	4.746*** [0.0190]	4.747*** [0.0190]
N	31,516	31,516	31,516	31,516	31,516	31,516
R2	0.003	0.007	0.008	0.008	0.014	0.014
Number of Projects	1,626	1,626	1,626	1,626	1,626	1,626
Mean of Bid Amount	281.0	281.0	281.0	281.0	281.0	281.0
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1						

Source: Authors' calculations based on Nubelo data.

Wage premium when employers possess more information

We again run the same linear model as above,

$$Log(Price)_{ij} = \alpha_{ij} + \gamma Foreign_{ij} + \lambda logDelay_{ij} + \beta Z + \sigma_{ij} + \varepsilon_{ij}$$

However, similar to the regression in Column 6 of **Table A2**, we restrict the sample to instances where ultimately a Spanish worker was hired but different pools of job seekers (foreign and Spanish contractors) had submitted bids for the position. **Table A3** presents the results.

In column 1, the sample is restricted to job postings that only received bids from inexperienced workers, whereas in column 2 the sample is restricted to job postings that only received bids from experienced workers. As shown, the wage premium is larger in the absence of information about previous job experience. This effect is even larger when feedback information from previous jobs is lacking (columns 3 and 4). Put differently, the wage premium is reduced to a third when employers factor in individual reputation in hiring choices. Interestingly, the availability of non-verified information (in workers' profiles) only marginally affects the magnitude of the wage premium, as shown in columns 5 and 6.

Table A3

Wage premium (OLS with fixed effects)

	No Experience	Positive Experience	Feedback Less than 4	Feedback 4 or more	Profile less than 80%	Profile more than 80%
	1	2	3	4	5	6
Foreign Worker Hiring Penalty	-0.119*** [0.0285]	-0.0792*** [0.0203]	-0.164** [0.0655]	-0.0518*** [0.0174]	-0.122** [0.0480]	-0.135*** [0.0156]
Controls						
Bid Delay	✓	✓	✓	✓	✓	✓
Profile Completeness	✓	✓	✓	✓	×	×
Feedback	✓	✓	×	×	✓	✓
Work Experience	×	×	✓	✓	✓	✓
Worked with Employer	✓	✓	✓	✓	✓	✓
Constant	4.916*** [0.0413]	4.421*** [0.0493]	4.856*** [0.0926]	4.482*** [0.0257]	4.768*** [0.0638]	4.737*** [0.0224]
N	7,463	8,831	1,790	13,089	2,877	17,124
R^2	0.007	0.008	0.006	0.004	0.010	0.017
Number of Projects	518	1,108	144	1,482	321	1,306
Mean of Dependent Variable	377.5	214.0	527.3	224.6	392.1	236.6
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1						

Source: Authors' calculations based on Nubelo data.

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DIGITALIZATION OF INDUSTRIAL JOBS IN GERMANY

Prospects for human-oriented work design

Hartmut Hirsch-Kreinsen, Technical University of Dortmund
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Friedrich-Ebert-Stiftung (FES) is the oldest non-profit German political foundation. Its mission is to promote and strengthen democracy through political education, dialogue, and international cooperation. FES stands for social democratic values and supports the labor movement. As the largest global center-left "think and do tank" with more than 100 offices worldwide, the work of FES intersects with politics, the economy, the trade union movement, civil society, and science. By providing more than 2,700 scholarships annually to students from socially and economically disadvantaged families, FES makes an important contribution to promoting equal opportunities in facilitating access to education.

Hartmut Hirsch-Kreinsen contributed this chapter for FES.

GERMANY

84,050

GDP per person employed (constant 1990 PPP $)

87.6

Internet users (per 100 people)

117

Mobile cellular subscriptions (per 100 people)

2.87

Research and development expenditure (% of GDP)

17

High-technology exports (% of manufactured exports)

CHAPTER 03

DIGITALIZATION OF INDUSTRIAL JOBS IN GERMANY

Prospects for human-oriented work design

Hartmut Hirsch-Kreinsen, Technical University of Dortmund
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Introduction

The diffusion of digital technologies in manufacturing will have far-reaching consequences for jobs and skills. This is especially true for the German economy, where manufacturing accounts for roughly 22 percent of the country's Gross Domestic Product (GDP).[1] Most experts believe that the increased use of technology will alter production processes with potentially disruptive social and economic consequences. The world is on the cusp of a new digital era referred to as the "second machine age,"[2] the "third industrial revolution"[3] or, in Germany, the "fourth industrial revolution" or "Industry 4.0."[4]

The diffusion of Industry 4.0 systems and increased digitalization is changing the world of work.

The diffusion of Industry 4.0 systems and increased digitalization is changing the world of work. These changes will become commonplace in the future, but predicting the consequences of digitalization for jobs and skills is a much harder task. Experts have varying views on the consequences of the growing diffusion of technology. On the one hand, there is an optimistic perspective that emphasizes positive consequences for labor, skills and income. On the other hand, digitalization is expected to create some very thorny challenges for the future of work, such as the "de-skilling" of work and job losses.

This chapter examines expert arguments and existing literature on the consequences of the greater use of digital technologies from a labor market perspective. The author focuses mainly on examining potential changes in industrial work and explicating the tenets of the intensive debates taking place in Germany on Industry 4.0. More specifically, this chapter addresses the following questions: How has the nature of tasks required for industrial work evolved over the last several years? How is this evolution transforming work?

Second, the author proposes a response to technological change rooted in the principles of job design to guide the future of industrial work, while maintaining a focus on skills. Focused on these issues, this chapter will not address other debates around the digitalization of industrial work, such as wage polarization and increasing income inequality. The paper is mainly in reference to the German context, but lessons can be extrapolated for other countries as well.

How has the nature of tasks required in industrial work evolved during the last several years? How is this evolution transforming work?

This chapter draws on existing research on industrial work and labor that deals with the diffusion of digital technologies in industrial sectors. The analysis also uses the preliminary results of a series of semi-structured interviews carried out by the author with policymakers, representatives of industrial associations, unions and management representatives of manufacturing companies in Germany.[5,6] Despite the global debate around the impact of technological advancement on labor markets, the body of research on the transformation of industrial work is surprisingly thin.

Opposing perspectives on the evolution of industrial work

Many studies suggest that digital technologies will change the nature of work in almost all sectors, including manufacturing. From the activities on the shop floor to related areas such as planning, control systems and product development, all aspects will undergo significant transformation. Consequently, the demands on leadership and management will also change. Although experts predict thorough reorganization of work within companies and in the relationships between companies and their value chains, they do not agree about how industrial work will change and what those changes will mean in terms of job opportunities and skill requirements.

Pessimistic perspective

One line of argument can be characterized as pessimistic about how the future development of industrial work will affect workers. According to this perspective, the rapid development and dissemination of digital technologies, and an increasingly growing gap between the new demands of technology and the difficulties in skilling and re-skilling workers will mean fewer opportunities for employees.

This argument contends that the demand for many tasks and qualifications will decline as digitalization advances, reducing the number of available jobs.[7] Frey and Osborne support this view in a study of the U.S. labor market. They show that there is a significant potential for job losses to go hand-in-hand with the use of digital technologies, and conclude that approximately 47 percent of all activities in the American labor market over the next one or two decades could be threatened by automation.[8] Other authors present similar findings for the European and German labor markets. Bowles comes to the conclusion that in the long term more than half of all jobs in Germany are threatened by automation.[9] Another study predicts that for the German economy as a whole, 59 percent, or more than 18 million jobs, could potentially be lost as a result of automation.[10]

Experts with a pessimistic view of technology argue that increasing adoption of technology will erode jobs requiring medium-level skills, and will instead favor jobs demanding higher qualifications or jobs that cannot be routinized easily. This 'skill-biased technical change,' as it is frequently referred to, will exacerbate labor market inequalities.

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Historically, labor-intensive manufacturing work such as automotive installation and system monitoring, as well as many routine administrative and service activities that require medium skill levels, can be replaced by automation more easily.[i,11] In the pessimistic view, automation of these jobs will accelerate, but two types of jobs will persist and continue to be in high demand:

[i] *David H. Autor argues that the analysis should primarily focus on tasks and secondly on the skills. Following this "task approach," a task is a unit of work activity that produces output whereas a skill is a worker's stock of capabilities for performing various tasks.*

(1) complex activities in high-wage areas such as management, consulting or financial services, and (2) low-wage jobs in social work and sectors like healthcare, plus simple and manual tasks that – due to particular material characteristics – cannot be routinized on a factory floor. Goos and Manning characterize this trend as the emergence of "lousy and lovely jobs,"[12] and one of its primary consequences is rising inequality.

Similar trends toward a differentiated structure of activities are discussed in research on industrial work in the context of intelligent network logistics systems – automated systems for managing supply and distribution that rely on digital technologies, such as the self-controlling storage systems used by manufacturing companies. A clear job polarization is already taking place: On the one hand, sophisticated, more high-skilled occupations such as managers and supervisors have been created to run the new systems. On the other hand, low-value added tasks and simple activities like packaging and assembling were retained, since the cost of automating these tasks is still higher than the cost of paying a low-skilled workforce to execute them. Companies often avoid fully automated systems due to high technological complexity and high cost, but the tasks they automate are those that would have been performed by middle-skilled workers.

Optimistic perspective

Another strand of research predicts more positive effects of digitalization: job creation, increased skill requirements, and a general revaluation of jobs and skills, together constituting a "new, more humane turn."[13] These optimistic studies suggest that the efficiency gains, new products, new markets and new employment opportunities in the longer term will compensate for the negative employment effects of technological change in the short-term.[ii,14] In Germany's Industry 4.0 debate, experts predict

Optimistic studies suggest that the efficiency gains, new products, new markets and new employment opportunities in the longer term will compensate for the negative employment effects of technological change in the short-term.

[ii] *Evangelista et al. (2014) see little clear impact on employment, on the basis of a detailed literature review in anticipation of the adoption of digital technologies. In particular, they emphasize that it is particularly difficult to attribute causal effects on employment to digital technology.*

high productivity gains and higher economic growth rates[15] as well as consistently better jobs as a result of technology adoption.

The vast majority of manufacturers expect the share of the workforce employed in industrial production to remain relatively stable and significant over the next few years and do not expect large negative employment effects.[16] The same result is found in a study by the Boston Consulting Group, which predicts a 6 percent increase in employment in German manufacturing over the next 10 years, or about 390,000 jobs between 2015 and 2025.[17]

With respect to skills, experts predict that digitalization of work will bring a growing appreciation or an "upgrading" of worker qualifications. First, this is considered to be the result of increasing automation of jobs such as machine monitoring or simple and highly routinized assembly work. Second, upgrading will affect all employee groups. In this perspective, digitalization of work is a process of computerization, which makes a wide variety of information about ongoing processes increasingly available. The complexity and possible applications of technology result in fundamentally new and presently unknown requirements for all job-related activities. Current information technology applications in the context of Industry 4.0 reflect how technology adoption can prompt greater efforts to upgrade the skills of workers. For example, skilled machine operators are now able make decisions about work flow sequences on the basis of an optimized control and information system.

New technology provides data and evaluation capabilities that allow for a much higher degree of transparency in production processes. The optimistic perspective emphasizes that a general upgrading of qualifications in the future will not only be possible but is inevitable. One leading expert in Germany's Industry 4.0 debates, Henning Kagermann, expects that people in the future will be employed less as "machine operators" but rather as "mediators of experience, as decision-makers and coordinators ...[that is] the variety of job content for the individual employee will increase".[18]

Research findings also show that the model of work in German manufacturing industries is evolving into one characterized by a very limited division of labor and high flexibility. This model is referred to as a "holistic work organization," or metaphorically, "swarm organization" – a loose network of qualified and equally entitled employees. Simple and low-skilled jobs are being replaced by automated processes.

The central feature of this organizational model – which research shows is already present in the

German automotive industry – is the absence of defined tasks for individual employees. Rather, the "work collective" functions in a highly flexible, self-organized, and situationally determined way, adapting its behavior to the problems that need to be solved around the technological system. The German automotive industry was previously characterized by very low-skilled and repetitive assembly jobs. Today, "smart" robots substitute many of the low-skilled, highly routine assembly tasks. The remaining jobs focus on tasks like maintenance, quality assurance, and personal planning. They are pursued in a highly informal and flexible way. But in order for this new work model to be successful, workers need to be appropriately trained and continually upgrade their knowledge on the job.

Adopting the technology and establishing the corresponding work environment is not easy.

Requirements for work design

To summarize, there are opposing perspectives on how the digitalization of work will affect workers of different skill levels and the nature of jobs. Of course, the pessimistic perspective does present a possible scenario. However, labor research provides generally plausible reasons to be optimistic, particularly with regard to an upgrading of skills. Cooperative work processes, especially those characterized by high levels of workplace autonomy, can help skilled workers effectively harness digitalized systems to their advantage.[19]

Yet adopting the technology and establishing the corresponding work environment is not easy. Complex production systems are very susceptible to interference, and may have non-transparent and unpredictable effects.[20] Therefore, workers will require a high degree of flexibility and problem-solving skills going forward. Finally, the lifecycle of complex systems can always involve new system states that are difficult to control, such as unexpected start-up problems as well as unexpected disturbances in normal operation. Those can best be overcome in the context of open and informally designed forms of work. The model that the German automotive industry has begun to adopt may be the most effective in ensuring a positive pathway for industrial work.

Work design

The way that industrial work evolves in response to technological advancements will depend in part on how policies and stakeholders shape work design. Work design, or job design, refers to the way labor is deployed in a particular company or institution – the way jobs are executed and the kinds of tasks and interactions they involve. It affects the skill variety and autonomy of the job in question.

Multiple economic and social factors and labor market policies have a bearing on work design and the complex interaction between technology and jobs. These factors will ultimately determine how new technology is adopted and how it shapes the future of work.

One response to the digital transformation is to encourage the implementation of a skill-oriented work design model. This requires a proactive vision from company managers, worker councils and unions. It also requires labor policies that are rooted in an understanding of the complex relationship between the proliferation of digital technologies and their social consequences. The following section will outline the conceptual and normative propositions of this approach. It will focus first on its starting point, the concept of a "socio-technical system," and second on the system's interfaces as the main areas of job design.

Socio-technical approach

An analytical starting point for a skill-oriented design concept is the "socio-technical system" – an approach to work design that emphasizes the interactions and interdependences between technology, humans and the organization as a whole. Although research has not always been consistent in its definitions, a socio-technical system can be understood as a production unit consisting of interdependent technology, organization and personnel subsystems.[21] In this concept, the issue is not one of "either technology or human action," but one of a holistic design, which not only produces a good or a service but also attempts to ensure job satisfaction for the worker. This approach takes into account the functional relationships and interfaces between workers, technology and the organization as a whole. Work design is oriented around humans and their potential.

An analytical starting point for a skill-oriented design concept is the "socio-technical system" – an approach to work design that emphasizes the interactions and interdependences between technology, humans and the organization as a whole.

Based on original research on skill-oriented work design, the author has identified the following basic challenges in incorporating the socio-technical approach in companies utilizing digital technologies.[22,23]

The relationship between the worker and technology

The first relevant interface is the relationship between technology and human labor and the "distribution of behavioral responsibility." How functions are delineated between the worker and the machine is one of the fundamental challenges for systems that rely on digital technologies. In skill-oriented work design, the objective is an interface design in which the human worker obtains or maintains control over production processes and is supported by intelligent assistance systems. The resulting work situation can be characterized by an extended range of tasks supported by "social media" functions, such as the use of tablet computers and data glasses that are web-connected for communicative and supportive functions.

The relationship between the worker and the organization

The interface between the organizational structure and the worker is the second important area of work design. The way an organization or company is structured ultimately determines a worker's job profile and the associated qualifications that are required. Here, the key challenge lies in determining how labor-intensive a task should be as well as what learning and training opportunities the organization provides a worker. There are a lot of possibilities for an organization design that is aimed at a positive revaluation of all jobs and skills. For example, various forms of group work, including staff rotation in the field of assembly operations, reflect a human-oriented approach to work design. Such work situations are characterized by a high degree of operational freedom and include various possibilities for "learning-on-the-job."

The relationship between technology and the organization

At the interface between technology and organization, challenges emerge for the design of work in several ways. First, the level of automation determines which tasks should be performed by machines and which should be performed by workers. Second, since digital technologies enable the separation of a worker's task and a machine's task in terms of time and space, there emerges a wide scope for alternative forms of organization. Third, with networked systems, the organizational design not only includes the horizontal dimension of the shop floor but also the vertical or hierarchical dimension of the work organization and supply chains. New forms of

communication enable the horizontal, vertical and hierarchical integration of organizations.

These functions permanently connect the areas of planning, managing and engineering as well as executive and management functions. Here in particular, the new conditions for manufacturing on the basis of autonomous, self-regulating systems must be considered. In terms of a human-oriented organizational design, this could indicate a turn toward far-reaching decentralization and the delayering of hierarchies.

A framework for the future of work

Building on this conceptual framework, a preliminary design for work in the digital era is taking shape. The socio-technical approach and the holistic design of the industrial production process are critical for skill-oriented patterns of work organization to emerge.

Basic criteria for the development of a human-oriented design of "Industry 4.0" work should be:

- The workers on the factory floor should have far-reaching monitoring and regulation capabilities over the technological systems, in order to be able to solve directly and efficiently unexpected system disturbances.
- Intelligent assistance systems should be adopted. These should be flexible enough to adapt to diverse skill levels and support on-the-job training.
- The highly decentralized structure of digital systems should be used to reduce hierarchies and implement new forms of self-organization and a far-reaching autonomy of workers on the factory floor.
- Management styles must move toward participative management – an approach that encourages the involvement of employees at all levels of an organization in analyzing problems, developing strategies, and implementing solutions. This is a central prerequisite to bring about increased autonomy on the factory floor.

Most companies still focus on addressing the technological problems that arise with the adoption of more automated systems.

According to the author's research findings, in Germany only a few industrial firms are pursuing such a skill-oriented design strategy. Most companies still focus on addressing technological problems that arise with the adoption of more automated systems. In order to promote the skill-based implementation of digital production systems, institutional and political measures are required as well.

Policy frameworks can enable and incentivize the adoption of human- and skill-oriented work design in the context of digital transformation. The following policy recommendations represent a step in this direction:

1. Germany's government should increase public funding for research and development on new skill-oriented patters of work organization that take into account the principles outlined in this chapter. The research could inform capacity-building programs for businesses that want to implement skill-oriented work design but lack an understanding of how to do so.
2. The promotion of advanced vocational training activities can increase the availability of the types of skills and qualifications required to implement skill-oriented work design. Adoption of participative management styles and human-oriented organizational structures becomes more viable if the pool of available labor is trained with these goals in mind.
3. Information transfer on the advantages of "good practice" examples of skill-oriented patterns of work organization should be systematically encouraged to convince hesitant companies.

Beyond these specific policy measures, the German government should more generally broaden its focus when it comes to preparing for the future of work. The dominant focus on technological innovation and industrial policy should be expanded to include innovations in work design so that, by engaging in meaningful and skill-oriented work, workers benefit from the digital transformation.

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HARNESSING DIGITAL PLATFORMS TO MOBILIZE WORKERS IN CHINA

The experience of workers' rights centers

Eric Gottwald & Kevin Lin, International Labor Rights Forum

International Labor Rights Forum (ILRF) is a human rights organization that advocates for workers globally. ILRF works with trade unions, faith-based organizations, and community groups to support workers and their families. They lead on initiatives such as making apparel factories safe in Bangladesh; stopping the exploitation of children in the cotton fields of Uzbekistan; increasing the income of farm workers in the cocoa fields of West Africa; developing labor law clinics in China; and supporting threatened union leaders in Latin America's banana sector. ILRF's work in Latin America carries forward the mission of the U.S. Labor Education in the Americas Project (USLEAP) and its founder Stephen Coats (1952-2013).

CHINA

23,074

GDP per person employed (constant 1990 PPP $)

49.3

Internet users (per 100 people)

92

Mobile cellular subscriptions (per 100 people)

2.01

Research and development expenditure (% of GDP)

25

High-technology exports (% of manufactured exports)

CHAPTER 04

HARNESSING DIGITAL PLATFORMS TO MOBILIZE WORKERS IN CHINA

The experience of workers' rights centers

Eric Gottwald & Kevin Lin, International Labor Rights Forum

Introduction

Community-based, non-profit workers' rights centers in China have proliferated since the mid-1990s with the common goal of assisting internal migrant workers in resolving labor rights disputes.[i] Founded by migrant workers and concerned professionals, these organizations primarily provide *pro bono* legal aid and trainings to individuals and groups of migrant workers in their local communities. China's rapid industrialization has fueled a large-scale migration of rural workers to burgeoning cities over the last two decades, and today over 270 million migrant workers are employed in export manufacturing, construction and service sectors.[1]

Rural migrant workers face endemic violations of their basic labor rights. The number of labor-related legal disputes has been rising since the 1990s. Between 2010 and 2014, the annual number of disputes rose from 600,865 to 715,163, a 19 percent increase over four years. The majority of the cases related to unpaid wages, failure of the employers to contribute to the government-mandated social insurance scheme, and inadequate severance compensation for laid-off workers.[2]

Progressive reforms to labor law, including the Labor Contract Law and the Labor Dispute Mediation and Arbitration Law, have provided migrant workers with legal tools to challenge employer violations. Government statistics reflect that workers have a good chance of either winning or reaching a compromise in the majority of such disputes. For labor litigation cases in 2014, employees won 250,284 cases or 35.2 percent, both employers and employees partially won in 378,219 cases or 53.2 percent, and employers only won 82,541 cases or 11.6 percent.[3]

[i] *These workers' rights centers are usually referred to as labor NGOs. To avoid any confusion or misunderstanding, here they are referred to as worker centers. For an overview of worker centers in China, see Yi Xu (2013), "Labor NGOs in China: Mobilizing rural migrant workers," Journal of Industrial Relations, vol. 2.*

Yet in practice the labor laws have been undermined by ineffective enforcement, migrant workers' lack of legal knowledge to pursue claims and the high cost of representation. A critical task of labor rights advocacy, therefore, is to equip workers with the necessary legal knowledge and provide them with the means to help pursue formal claims. Because migrant workers remain unorganized and only notionally represented by the government-affiliated union federation, the All-China Federation of Trade Unions (ACFTU), there is a large need for alternative forms of organization and forums for dispute resolution and representation, which workers' rights centers hope to address.

A significant challenge for these centers is connecting with hundreds of thousands of transient migrant workers in their localities. Thanks to their rapid development and popularization, China's worker centers have taken advantage of Information and Communication Technologies (ICTs) to reach out to large number of migrant workers. Increasingly, ICTs have served as indispensable tools for the monitoring, reporting and remission of labor rights violations among migrant workers. Moreover, these ICTs also act as a tool to organize workers.

The labor laws have been undermined by ineffective enforcement, migrant workers' lack of legal knowledge to pursue claims and the high cost of representation.

This chapter analyzes the use of ICTs by examining two long-established worker centers in China, both of which have extensively deployed these technologies in their day-to-day work. It outlines the ways in which the organizations have used these technologies, how effective the technologies have been in helping them in their work, and the risks – such as government surveillance – associated with the use of these ICTs.

The two centers are located in China's southern, export-oriented manufacturing region and cater primarily to migrant workers in consumer-manufacturing industries such as electronics and apparel, which produce products for many popular global brands. The chapter draws on data collected between 2012 and 2016 in ILRF's quarterly reports, and semi-structured interviews ILRF conducted with the directors of both worker centers in 2016. This information highlights issues and trends in the use of information technologies by migrant workers and worker centers to address labor rights violations.

In offering insights into how migrant workers and worker centers have adopted ICTs to promote rights at work and the obstacles and challenges

confronting them, this chapter serves as a guide for practitioners and policymakers to evaluate alternative means of engaging with workers, labor rights groups and unions in China and elsewhere in the world.

Worker centers, legal aid and hotlines

In the 1990s, the earliest Chinese worker centers primarily relied on telephone-based hotlines to provide workers with advice and legal consultation. The centrality of the hotline service was reflected by the decision of many centers to embed the word "hotline" into their names: "hotline" defined not only their main method of communication but also their identity as a provider of legal consultation services.

Centers A and B,[ii] based in the export-processing zone of Shenzhen in southern China, have used telephone hotlines for legal consultation with migrant workers since they were both established in 2004. Center A has since become one of the most high-profile worker centers in southern China, while Center B has established offices in multiple cities and runs an extensive labor education program. Over the years, they have consistently offered legal consultation as well as labor rights training, positioning themselves as public interest organizations and operating independently of companies and the government.

Adopting a hotline as their main means of communication with workers was a necessary choice due to limited resources and long distances between workers and the office. The Center A director explained: "Telephone hotline is a necessary method and tool for [our] work. To establish an organization like ours, it is necessary to have a method of contact." Hotlines soon became the first and primary point of contact for workers. The service provides a safe and anonymous way for workers to raise concerns and report employer violations. Center B's director emphasized that "[the hotline] is not only cheap to operate but also gives workers a sense of trust." In addition, both centers used traditional forms of media, including local newspapers and radio, to advertise their services to the local migrant worker community.

The hotline service is complemented by face-to-face visits. Both centers make one or two of their staff members available in the office for answering hotline calls and meeting with workers

[ii] *The names of the organizations have been left anonymous to protect their identities.*

for face-to-face consultations. A telephone call is sometimes followed up by a worker's visit to the office when a particular case needs more elaborate consultation or litigation. The hotline created an easily accessible, safe way for workers to report labor rights disputes and seek legal assistance. This model proved very successful in reaching hundreds of workers every month and building connections and networks with a large number of workers using only a small staff and limited budget.

Yet these telephone hotlines have also had drawbacks. Without complementary face-to-face consultations, it is difficult for workers' rights centers to maintain longer-term relationships with workers. While enabling easy access, the use of hotlines unwittingly creates dependency on workers' rights centers, supplanting more transformative forms of organizing. However, this has begun to change with the popularization of social media in China and its adoption by workers' rights centers.

From telephone hotlines to social media

Over the last decade, worker centers have increasingly utilized various social media platforms, especially those available on smart phones, which have become very popular among migrant workers. The Chinese population of internet users is among the fastest growing in the world.[4] Social media and mobile smart phones have become affordable to workers. As Qiu argues in his study on the diffusion of ICTs among migrant workers in China and its potential use:

> *"New modalities of communication have been appropriated in ways that reflect characteristics of working-class life. From employment opportunities to entertainment, from safety issues to discrimination, the experiences of have-less migrants contain important openings for social change, embedded in larger structures of power inequality that trigger bottom-up responses at the grassroots."*[5]

With more than half a billion internet users, 300 million social media users and 1.3 billion mobile phone users, technologies are transforming the way workers communicate and address labor rights issues.[6] Since the mid-2000s, the popularization of diverse social media tools has enabled more dynamic interactions between workers' rights centers and migrant workers.

Online social networking platforms such as Weibo and WhatsApp-like instant messaging tools such as Tencent QQ and WeChat have allowed workers to share information and hold discussions directly, discreetly, and instantaneously with one another and with staff at worker centers.

While Center A maintains the use of a telephone hotline, since 2010 it has found that the hotline has increasingly been displaced by the internet and social media as the main method of communication and legal consultation. According to the director of Center A, this shift came about "because of the change in workers' needs and method of communication where online communication became easy, and we followed them [by] adapting our work," adding that "the majority [of consultation] is online [because] using the internet is very convenient [for workers]."

Since the mid-2000s, the popularization of diverse social media tools has enabled more dynamic interactions between workers' rights centers and migrant workers.

At worker centers, the directors and staff share the responsibility for online consultation and communication – much like the hotline service. Staff members usually answer general inquiries and pass on more complex cases to the director. Center A mainly uses QQ, an instant messaging application that is similar to WhatsApp, and secondarily WeChat and Weibo, which are popular microblogs used for sharing information. The messenger app QQ allows both individual-to-individual conversations and semi-permanent discussion groups for hundreds of users, making it useful for both individual consultation and dissemination of information to groups of migrant workers.

Microblogging is also a public platform widely used by workers' rights centers and labor rights advocates. Since 2010, Center A has made more than 1,000 postings using its Weibo account. Topics include the center's activities, responses to workers, reports on collective labor disputes, news and state policy, and other public statements. However, various microblogs have become more heavily censored by the authorities in the last few years, and many worker centers have abandoned using microblogs, or only update them irregularly.

Assessing hotlines and social media

The data contained in reports by both centers do not always distinguish among online, telephone and in-person consultations. Nevertheless, they provide some basis for assessment. It is evident that the combined use of telephone hotlines and online consultations has enabled the two centers to reach a significant number of migrant workers. In four of the five quarters from October 2012 to December 2013, Center A was able to provide legal consultation to a total of 3,390 workers. Many of these cases were conducted via social media, including online chat tools available on smart phones.

Social media has been used for more than legal consultation and is contributing to labor organizing.

In the ten quarters from the fourth quarter of 2012 to the second quarter of 2015, Center B offered legal advice to 17,980 workers, or an average of 1,798 workers per quarter.[7] The use of internet and social media contributed to reaching this large number of migrant workers. The number of staff members at Center A and Center B fluctuated but was never more than 10 at each center. This is a small number to handle a large volume of consultations in addition to engaging in other activities such as legal trainings for workers.

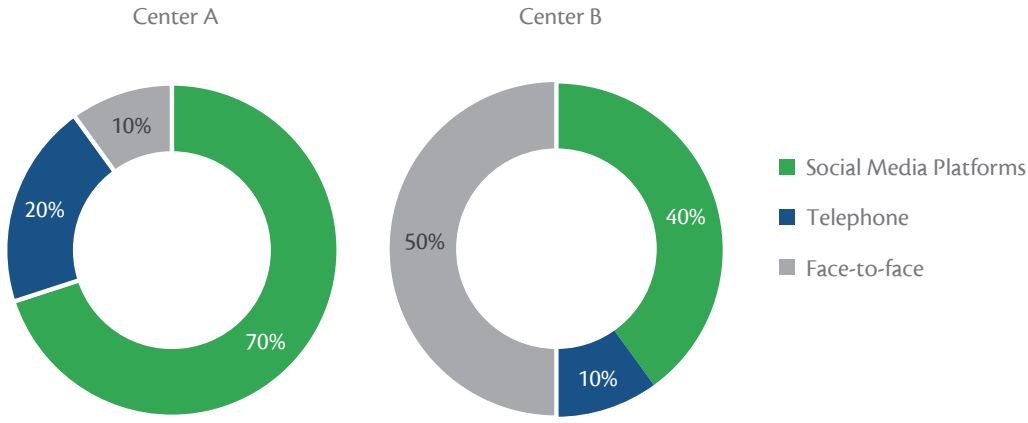
Most recently, Center A reported in the fourth quarter of 2015, 70 percent of the 220 consultations were conducted via social media platforms, and 20 percent via telephone. In the first quarter of 2016, 40 percent of the 380 consultations were conducted on social media, 10 percent through the hotline and the rest by office visits and at community stalls. Social media usage therefore fluctuate from quarter to quarter, but it is well integrated in the activities of workers' rights centers.

How does the use of the telephone hotline compare with that of the internet? Both directors still find the telephone hotline relevant and useful. As Center A's director remarked, "The telephone consultation remains superior to other methods of consultation because online communication in written words conveys limited information. A telephone call gives you the opportunity to ask clarifying questions. On the other hand, telephone calls cost money while the internet is cheap. The internet is more convenient and not constrained by [workers'] dialects as written text is more easily and correctly understood." An unavoidable limitation easily solved by the adoption of social media.

Center A's director believed that "the internet is more convenient but telephone is more

Figure 3

Workers' rights center consultations, by center, 2015 and 2016



Source: Authors' calculations.

effective. It depends on the specific [legal] case. If it is a simple case, it can be resolved easily on the internet. But if it is a complex question, it will be difficult online [and] it will ultimately take more time." Similarly, Center B's director stated that workers use both mobile phones and the internet, and he thinks that "workers prefer calling on mobile phone despite growth in online consultations in recent years."

It is likely that this combination of telephone hotline, office visits and social media will continue in the foreseeable future. However, social media has been used for more than legal consultation and is contributing to labor organizing.

Beyond consultations: Building solidarity and mobilization through digital tools

The workers' rights centers' most innovative use of social media is the dynamic interaction enabled by workers' online discussion groups. In a recent article posted online, the director of Center A has reflected on the use of social media tools such as the popular chatting app QQ:

> *"QQ is currently the most widely used social media tool among workers. Today, every worker has a mobile phone and one or multiple QQ accounts. QQ has become part of workers' daily lives. Most workers join [chat] groups. If used in building labor solidarity and organizing, it will have a very important role. Therefore, in organizing to defend their rights, workers should fully use QQ and [chat] groups to clarify demands and unite ideas and actions. Through QQ, individual workers can be united and quickly become organized collectives."*

Center A has been particularly proactive in using social media to mobilize and connect workers. At the time of the interview, it had either initiated or was part of more than 20 discussion groups. There are groups focusing on a particular topic, such as workers' injuries, and groups established for workers in particular geographic areas. The largest group, named Chinese Labor Discussion Group, has 1,100 members; others have more than 600, and most groups generally have at least 200 members (Director of Center A, interview, April 2016). These groups are managed by the center's staff and volunteers who collect and respond to workers' questions and inquiries.

According to Center A's director:

> *"In the discussion groups, workers who are knowledgeable about the law can answer other workers' questions. They can also be answered by my colleagues, and complex questions by myself. We only provide guidance, and correct them only when we find the answers provided by other workers to be incorrect. If we find workers knowledgeable about the law, we will make them group administrators. These groups serve important functions."*

Center B has similarly created, managed and participated in multiple social media discussion groups consisting of migrant workers. In particular, it encourages workers who volunteer to set up their own online groups, and participate in the activities organized by workers through social media. The director believes that it is key to develop relationships with the workers who volunteer at the center and play an indispensable role to help the worker center to reach out to workers:

> *"Our volunteers organize co-workers in their factories and in their social media discussion*

groups, and invite us as guests (to their events)…The volunteers help introduce our organization, and bring workers to us when they need help. They also help organize social events and trainings, which we will participate in as an organization. And depending on the abilities of the volunteers, the number of workers contacted varies from a few to a dozen."

This highlights the supportive role of social media and strong reliance on the organizing abilities of volunteer workers "off-line." Social media, ultimately, is a complementary tool rather than a substitute for face-to-face interactions and labor organizing. But by establishing and tapping into these large networks of migrant workers, the workers' rights centers begin to resemble quasi-membership-based organizations without a formal membership structure. The centers are able to establish direct links with workers and assist them in individual and collective labor rights disputes.

While both Center A and Center B adopt broadly similar tactics, there are some noteworthy differences. To take one example, in contrast to Center A, Center B does not principally organize workers on social media based on regions or factories, but deliberately encourages them to intermingle across factories and regions. Whereas Center A's approach helps focus efforts to build solidarity within specific factories and industrial zones, Center B aims to develop more broad-based relationships. Both strategies are necessary and complementary for building a strong labor movement.

It is critical to emphasize that the shift in the utilization of ICTs has taken place in the context of migrant workers' increasing awareness of not only their legal rights, but also of their collective power. This has precipitated a gradual transition from individual legal disputes to collective forms of labor mobilization such as collective labor protests and strikes. The reorientation of leading worker centers from exclusively legal service providers to facilitating labor organizing corresponds to migrant workers' increasing activism. The rise of social media platforms in particular has made communication more interactive and dynamic, tapping into workers' collective capacity for strategizing and organizing to address labor rights violations. The increasingly sophisticated use of social media

The shift in the utilization of ICTs has taken place in the context of migrant workers' increasing awareness of not only their legal rights but also of their collective power.

serves as a further catalyst for collective labor organizing.

While the solidarity and organizing built via social media is not easily quantifiable, it is significant. Center B's director believes that workers' interactions on social media have a significant positive impact on workers' consciousness. It manifests most strongly when used for organizing strikes. In China, practically all strikes are "wildcat" – that is, not organized by any union. Workers are organizing themselves, and worker centers sometimes play a supportive role. Center A's director reflected on how the center used social media to facilitate workers' mobilization during a recent strike by migrant workers in southern China:

> *"Center A has found that its QQ groups, which it had set up for consultation purposes, were popular and useful to workers seeking advice on collective labor disputes, so at the request of several [factory] workers who visited its offices, it set up groups online for these workers to discuss their missing social security benefits. The [factory] workers flocked to the QQ groups in the hundreds to discuss these and other issues, and when a small group proposed strike ideas and times to Center A (personnel), he had a talk with them on the best ('appropriate, legal') ways to strike in early April. The content of this talk spread throughout the QQ groups and to the workers all over the campuses throughout the factory. It was after this discussion with self-made, then elected, leaders that the strikes occurred."*

But these technologies also carry potential security risks arising from government censorship and surveillance. This requires workers and workers' rights centers to be cautious in their use of social media. There already exists extensive internet censorship and surveillance in China, and not surprisingly it has been a serious concern for workers and labor rights advocates. Social media accounts have been and will be censored or shut down, and online communications may be monitored. Center A has operated under the assumption that the general online discussion groups will be monitored, but the director has not been particularly concerned because the content of discussions is usually not very sensitive. However, for discussion groups that touch on labor organizing, the worker center takes a much more cautious approach. In contrast, Center B's director contended that for security the discussion groups should not include more than a hundred participants, arguing that "such discussions will be noticed, and workers lack an acute sense of security and share politically sensitive text and pictures." The security concerns, however, have not deterred worker centers from using social media.

Conclusion

Finding innovative and effective strategies to integrate technology into workers' rights advocacy is crucial for labor rights advocates and worker groups. In China, the use of telephone hotlines and social media that evolved in the last two decades has emerged out of the intersections between technological innovation and the changing demands and rights awareness of migrant workers.

The rise in collective labor rights disputes has been enabled by more interactive communication among workers themselves as well as between workers and labor rights groups and advocates. The success of workers' rights groups in reaching out to tens of thousands of migrant workers lies in adapting and embedding technologies in their everyday practices, making hotlines and social media necessary and integral components of these organizations.

The success of workers' rights groups in reaching out to tens of thousands of migrant workers lies in adapting and embedding technologies in their everyday practices, making hotlines and social media necessary and integral components of these organizations.

There are challenges. It is essential to have affordable internet access and mobile phones and a relatively educated labor force to use social media. Moreover, the possibilities unleashed by technologies are keenly monitored by the authorities, limiting its potential and forcing labor rights advocates to be cautious. As this chapter has discussed, the efficacy of technologies for labor rights advocacy depends on both their availability and on worker centers' skillful adaptation to new technologies and capacity to engage and empower workers. Social media is certain to feature even more prominently in the way marginalized communities such as migrant workers address labor rights violations and organize themselves collectively in the future, and analysis of its successes and challenges will help shape workers' rights groups' social media strategies.

Endnotes

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DEPLOYING TECHNOLOGY TO GROW MICRO-ENTERPRISES IN INDIA

Evidence from urban Gujarat

Keren Nazareth, Saath Charitable Trust
Vishakha Pandit, Saath Savings and Credit Cooperative Ltd.

Saath is a non-profit organization based in Ahmedabad, India and a member of JustJobs Network. Over the past 27 years, Saath has facilitated participatory community development to improve quality of life for the urban and rural poor. Its one-stop, integrated services have reached over 500,000 individuals in the states of Gujarat, Maharashtra and Rajasthan. It has incubated and facilitated the launch of a credit and savings cooperative, an affordable housing facilitation company, a marketing platform for rural weavers and a successful formal platform for domestic workers.

INDIA

14,681

GDP per person employed (constant 1990 PPP $)

26

Internet users (per 100 people)

79

Mobile cellular subscriptions (per 100 people)

0.82

Research and development expenditure (% of GDP)

8

High-technology exports (% of manufactured exports)

CHAPTER 05

DEPLOYING TECHNOLOGY TO GROW MICRO-ENTERPRISES IN INDIA

Evidence from urban Gujarat

Keren Nazareth, Saath Charitable Trust
Vishakha Pandit, Saath Savings and Credit Cooperative Ltd.

Overview

In most countries, micro-enterprises[i] have the smallest share of aggregate employment. India is no exception. Yet these firms are manifestations of entrepreneurial activity that can grow into small- and medium- sized enterprises, which are significant sources of new job creation.

Technology is key to the growth and productivity of an enterprise. Using primary data on micro-entrepreneurs in Ahmedabad, the largest city in the Indian state of Gujarat,[ii] this chapter explores the role of technology in micro-enterprises. Specifically, it examines (i) the extent to which informal micro-enterprises utilize technology, (ii) the policy environment that governs their access to technology, and (iii) the broader potential for technology to help micro-enterprises expand their operations, become small and medium enterprises, and create jobs.

Ahmedabad is the largest industrial center in the western state of Gujarat[1] and the second largest industrial center in western India after Mumbai. In Gujarat, the Government's Industries Commissionerate reported in 2014 that there were 230,000 registered and 1.94 million unregistered micro-enterprises in the state, employing about 1.25 million and 3.5 million people, respectively.

[i] *Micro-enterprises are manufacturing and service sector enterprises with investments in plant and machinery less than US$ 37,290 and less than US$ 14,915 respectively. In India, according to the MSME Development Act of 2006, a manufacturing firm is defined as a micro-enterprise if its total investment in plant and machinery does not exceed INR 2.5 million (about US$ 37,290). A firm in the service sector is defined as a micro-enterprise if investment is less than INR 1 million (about US$ 14,915). Many other countries define a micro-enterprise in terms of the number of employees or annual turnover.*

[ii] *The Saath Savings and Credit Cooperative is a microfinance institution started in 1994 in urban slums and as of date has over 20,000 members from 7 slums, of which 16,906 members are active as of 31 March, 2016. The remaining are considered inactive as they had not accessed their accounts in at least 6 months.*

The state capital, Ahmedabad, alone accounts for 63,915 registered micro-enterprises that employ over 370,000 people.[iii]

This study looks at micro-enterprises in two distinct informal settlements, or "slums" of Ahmedabad – Saraspur and Sarkhej. The data include information from a wide variety of micro-entrepreneurs, including those selling apparel and furniture, owners of provision stores and service providers such as tailors and beauty parlors.

The findings of the analysis highlight that owners of micro-enterprises are familiar with simple technologies, but their ability to fully exploit the benefits of those technologies, upgrade or use more advanced technologies is limited by several factors, including lack of access or exposure to technology, or lack of information about it.

The chapter begins by describing the landscape of urban informality, micro-entrepreneurship and technology use, and the relevant policies in India. It then analyzes primary data from 327 micro-enterprises in Ahmedabad. The analysis focuses on entrepreneurs' access to technology, their understanding and willingness to adopt new technology to upgrade existing technology, and their perception of how technology will impact their business. Finally, the authors offer policy recommendations to Indian policymakers on using technology as a catalyst for micro, small and medium enterprises (MSMEs), especially among women-owned enterprises, to create more and better jobs.

Micro-entrepreneurship in India

With poor access to formal sector employment – because of a lack of formal jobs or because workers lack the requisite skills for existing jobs – many Indian workers opt for self-employment or become casual laborers. According to the Fourth Census of Micro, Small and Medium Enterprises in 2006-07, of all MSMEs in India, micro-enterprises make up 95 percent of registered businesses and 99.8 percent of unregistered businesses.[2] In terms of output, the MSME sector accounted for about 45 percent of manufacturing output and 40 percent of the country's total exports in 2011-12.[3] Micro-enterprises can be formal or informal, sole proprietorship, part-time and/or home-based.[4]

[iii] *No reliable estimate exists for the number of unregistered micro-enterprises in Ahmedabad.*

Of the 36.1 million MSMEs – both registered and unregistered – in 2006-07 in India, 2.6 million were owned by women.[5] Nearly 98 percent of the women-owned MSMEs were micro-enterprises.[6] Running micro-enterprises is a way for women to engage in economic activity at a time when women's labor force participation in India is declining – from 37 percent in 2004-05 to 22.5 percent in 2011-12.[7] These women-owned micro-enterprises contributed 3.09 percent of industrial output and employ over 8 million people.[8]

The Indian government has made entrepreneurship a priority through recent campaigns like "Make in India," a national initiative to transform India into a global design and manufacturing hub, and "Start-up India," an initiative to foster entrepreneurship and promote innovation by creating an environment conducive to start-up growth.[9,10] There is a renewed focus on the MSME sector as an engine of growth. While these firms already employ millions of Indians, the government seeks to bring informal enterprises into the formal economy and grant them access to schemes, subsidies, credit and technology. Historically, micro-enterprises have largely avoided formal registration and have proved difficult to regulate.

Historically, micro-enterprises have largely avoided formal registration and have proved to be difficult to regulate.

Lack of access to technology, finance and skills are key problems that prevent the growth of micro-enterprises. Micro-entrepreneurs could benefit from training in skills such as business plan development, marketing and book and record keeping.[11] Micro-entrepreneurs consistently cite the lack of finance as one of their most significant barriers to growth.[12] They also lack access to technology. This goes hand-in-hand with low productivity and low wages.[13,14] Microenterprises would also benefit from more and better avenues for accessing technology. Such interventions would not only boost the output and growth of micro-enterprises, but could also serve to enhance the livelihoods of many micro-entrepreneurs.[15]

Placing urban micro-enterprises in context

Urban micro-enterprises are often housed in informal settlements or slums, which act as hubs of economic activity in Indian cities. Slum residents provide cities with myriad services – from domestic help like cleaning, cooking, gardening and driving, to informal retail vending, repair work and manufacturing. The quintessential example of an informal settlement that plays an important economic role is Dharavi, one of the world's largest slums that is located in Mumbai, where over 10,000 businesses operate in leather, pottery, manufacturing and recycling.[16]

The two slums in this study, located in the city of Ahmedabad, differ geographically and demographically. Saraspur lies in the western part of the city; it is a diverse neighborhood with residents from different religions and castes. Sarkhej is located on the outskirts of the city and its residents are almost exclusively Muslim. The Sarkhej community has struggled to stake its claim to the city, having been marginalized socially, politically and economically. This study highlights that Sarkhej has a higher adoption of technology amongst its micro-entrepreneurs.

Ahmedabad is known as a megacity, with a population of 6.3 million.[17] It is one of twenty designated cities selected by the Indian government to develop into "smart cities", with the vision of *"providing efficient, affordable, equitable and customized governance to the citizens of Ahmedabad."*[18] The plan calls for the redevelopment of slums and faster registration for businesses, but does not explicitly take into account the specific needs of the city's 63,915 registered micro-enterprises. Plans propose improving transport, surveillance and other facilities, which may indirectly improve the business environment for micro-enterprises. However, micro-entrepreneurs are not the primary focus of urban strategies.

Access and use of technology by micro-enterprises

Low levels of technology adoption are partly responsible for the low productivity of micro-enterprises. Despite contributing 45 percent of the industrial output, 40 percent of exports, and 42 million in employment,[19] the sector constitutes only 17 percent of India's gross domestic product (GDP).[20]

Discourse on the kind of assistance micro-enterprises need tends to focus on credit

constraints. The question of how technology might help micro-enterprises expand features less prominently in policy discussions despite the fact that there is a strong body of academic evidence to suggest that micro-enterprises can benefit from technology.[21,22]

Previous studies show that mobile phones are the technology that micro-entrepreneurs most often prefer.[23,24] Entrepreneurs prefer mobile phones due to a variety of reasons including their low cost and high penetration. Most micro-entrepreneurs use mobile phones to communicate with their customers and exchange information with vendors on input supply and payments. A study of Ugandan women micro-entrepreneurs found that 63.9 percent saw an increase in profits from mobile phone usage through the elimination of middlemen, and 76 percent of women micro-entrepreneurs who owned a phone witnessed an increase in sales through business networking, which increased the number of customers.[25] Mobile phone technology has been shown to have a positive and significant impact on economic growth, and this impact may be twice as large in developing countries, where the density of micro-enterprises is greater when compared to developed countries.[26]

Low levels of technology adoption are partly responsible for the low productivity of micro-enterprises. Despite contributing 45 percent of the industrial output, 40 percent of exports, and 42 million in employment, the sector constitutes only 17 percent of India's gross domestic product (GDP).

A study examining the role of information technology for urban, women-run, micro-enterprises in Mumbai showed that education, perceived usefulness of mobile phones, increased access to information, and the way mobile phones were deployed, all had an impact on business growth. In other words, simply having technology like a mobile phone may not lead to business growth, but the way in which the mobile phone is used for the business does.[27] The findings of the study conducted for this chapter support this conclusion.

The need for access to technology among micro-entrepreneurs is well recognized by the Indian government.[28] One of the main objectives of the Ministry of MSMEs is to support upgrading of technology and modernization. A 2010 report by the Prime Minister's Taskforce on MSMEs identified low technology levels and lack of access

to modern technology as major barriers to MSME growth in India.[29] Technology adoption among MSMEs is extremely low due to a variety of factors: cost, lack of awareness of the use and benefits of technology, not enough skilled manpower to operate technology, poor infrastructure for utilizing technology and concerns over security and privacy.[30]

The government has introduced various measures to increase firms' access to technology, some of which focus on improving manufacturing competitiveness, such as the Credit Linked Capital Subsidy Scheme for Technology Upgradation[iv,31] and the ICT scheme.[v,32] These programs tend to target larger firms rather than taking into account the specific needs or limitations of micro-enterprises. For example, there is no government scheme aimed at supporting micro-enterprises in learning how to use technology for the benefit of their businesses. Awareness is another issue. Among 748 micro and small enterprises interviewed in a study conducted by Intuit and the Indian government in August 2012, only 32 percent of firms had knowledge of specific government schemes to improve access to technology.[33]

Methodology

Respondents in the study were micro-entrepreneurs receiving loans from the Saath Savings and Credit Cooperative. Micro-entrepreneurs make up about 17 percent of the cooperative's nearly 17,000 active members. Almost all of these entrepreneurs have taken asset creation or productive loans to build their businesses. About 11 percent of active members are self-employed, which means that they work from home and take on contractual or task-based work, and 6 percent run small businesses. The researchers randomly selected 327 respondents from this pool of 2,890 micro-entrepreneurs, half from Saraspur and half from Sarkhej. The questionnaire was designed to generate data on micro-enterprises and their use of technology which could range from communication devices such as mobile phones to sewing machines.

[iv] The revised scheme aims to facilitate technology up-gradation by providing 15 percent up-front capital subsidy to SSI units, including tiny, khadi, village and coir industrial units, on institutional finance availed of by them for induction of well-established and improved technologies in specified sub-sectors/products approved under the scheme.

[v] The objective of the scheme is to encourage and assist the potential manufacturing MSME clusters to adopt ICT tools and applications in their production and business process, and thereby, improve their productivity and competitiveness in national and international markets.

A major obstacle in primary data collection was the fact that enumerators and micro-entrepreneurs did not have a single, common definition of technology, and interviewers had to use individual strategies to overcome this challenge.

Profile of the micro-entrepreneurs

The study[vi] included 163 micro-entrepreneurs from Saraspur and 164 micro-entrepreneurs from Sarkhej. The vast majority of the micro-enterprises were unregistered sole proprietorships. Of the respondents from both areas, 25 percent were men and 75 percent were women.[vii] This is roughly the same as the share of women that are loan recipients; 80 percent of the members of the cooperative with active savings and loan accounts are women.[viii]

The entrepreneurs ranged in age from 18 to 57 years old, with the majority (45 percent) between the ages of 27 and 38, and only about 11 percent between the ages of 18 and 27. Young business-owners tend to be better educated than older business-owners (see **Figure 1**). On the one hand, this is to be expected, as access to education in India has improved significantly over the years. On the other hand, micro-entrepreneurship remains a livelihood strategy even for young people with higher levels of education, suggesting that the labor market may not be providing suitable employment opportunities even for relatively well educated young people.

Men tend to enter micro-entrepreneurship at an earlier age than women. They also tend to exit earlier. This suggests that men begin their businesses at an age when women are likely to be involved in the care economy and household management. But as families grow, women must take up income-generating activities in order to make ends meet.[34]

Broadly, the enterprises can be divided into firms selling goods and firms selling services. About 45 percent of firms sold goods, including items

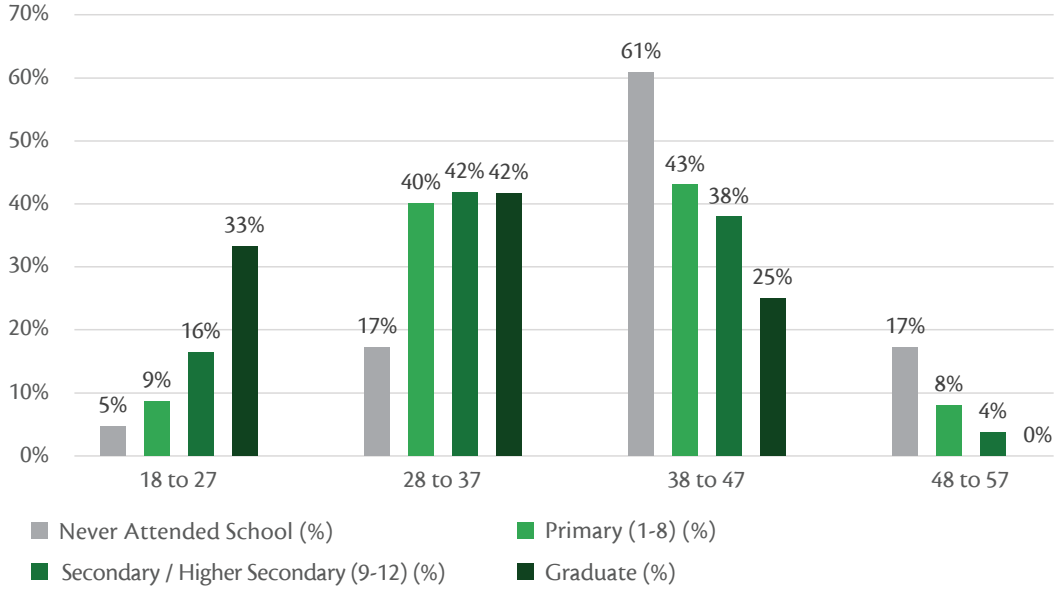
[vi] The primary data collection was carried out by Saath Savings and Credit Cooperative and Saath Charitable Trust.
[vii] However, the share of women micro-entrepreneurs in these two settlements is not indicative of the proportion owned by women in India overall. According to the Fourth All India Census of MSMEs, in 2006-07, only 7.36 percent of all MSMEs – registered and unregistered – are women-run.
[viii] Cooperative here refers to the Saath Savings and Credit Microfinance Cooperative Ltd. that is registered in Gujarat and has over 20,000 active savings members. It is through the database of this cooperative that micro-entrepreneurs were identified for the study.

like clothing, food, as well as other items such as perfumes and kites. The remaining 55 percent of firms were service-based businesses such as tailor shops and beauty parlors. Service-providing micro-entrepreneurs also provided electrical, plumbing, carpentry, masonry, and driving or chauffeuring services. About 43 percent of the surveyed enterprises were "young" (less than 5 years old), another 44 percent were "middle-aged" (5 to 16 years old), and just 12 percent were "old" (16 years or older).

The monthly income of micro-entrepreneurs was between INR 1,000 and 50,000 (about US$ 15 to 750). About 64 percent of the micro-enterprises reported generating profits that were less than INR 10,000 per month (about US$ 150). Nearly 30 percent of micro-entrepreneurs earned between INR 10,000 and 20,000 (about US$ 150 and 300), while about 6 percent of the surveyed enterprises earned over INR 20,000 (see **Table 2**).

Figure 1

Age and education distribution of micro-entrepreneurs



Source: Authors' calculations.

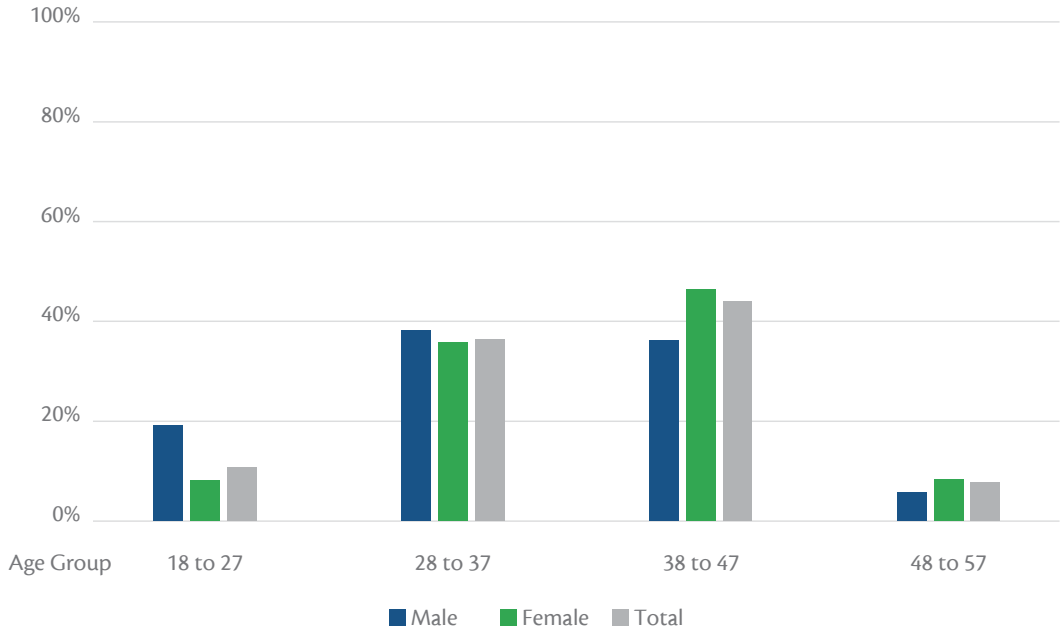
Application and access to technology

Among the surveyed micro-entrepreneurs, 77 percent said that they were currently using technology in their businesses, although the type of technology varied across businesses. Among those who reported using *any* technology, 62.2 percent reported using a mobile phone as their primary technology, while 26.3 percent reported using a sewing machine.[ix] Other technologies used by entrepreneurs in the study include digital weighing scales, refrigerators and computers, laptops and tablets. Only one business owner, a kite maker, was using internet-based marketing to increase his customer base.

The most commonly utilized technology among those surveyed was mobile phones, which were

Figure 2

Age and gender distribution of micro-entrepreneurs



Source: Authors' calculations.

[ix] *While micro-entrepreneurs could be using multiple technologies at once, they reported the main technology as a response to the survey question.*

primarily used to communicate with customers. Most micro-entrepreneurs stored customer phone numbers and details. In some cases, mobile phones were used to arrange the procurement or delivery of raw materials or goods. Micro-entrepreneurs claimed that this significantly improved procurement and delivery and by eliminating the need for them to physically visit the place of procurement, reducing waiting times and making their work more efficient. However a few business owners reported using their phones for tasks such as accounting or budgeting. Only four of the 327 micro-entrepreneurs surveyed were using a laptop or tablet in running their business (see **Table 1**).

Among the 251 firms using technology, roughly 60 percent were engaged in services oriented trades while the remaining 40 percent were engaged in the sale of goods. Forty-seven percent of the young enterprises began utilizing technology when they started operations, whereas 41 percent of middle-aged and only one in five old enterprises were using technology at the time they started. The declining costs of smart phones and cellular data, and their growing

Table 1

Technology used by micro-enterprises*

Type of Technology	Frequency	Frequency in %
Mobile	156	62.2
Sewing Machine with Electric Motor	66	26.3
Advanced Sewing Machine	6	2.4
Beauty Parlor Machines	5	2.0
Digital Weighing Machine	6	2.4
Computer/Tablet/Laptop	4	1.6
Online Marketing	1	0.4
Refrigerator	1	0.4
Other Machines	6	2.4
Total	**251**	**100.0**

* Among all those who are technology users.

Source: Authors' calculations.

pervasiveness, may account for the difference in the point of technology uptake between "middle-aged" and "young" firms.

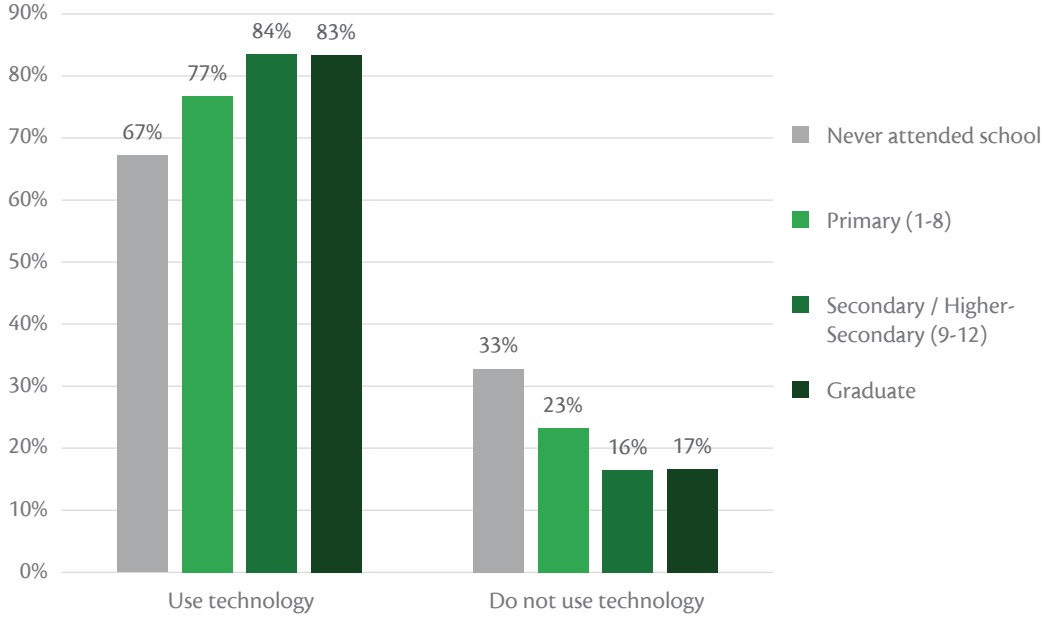
Male micro-entrepreneurs were slightly more likely to use technology than female micro-entrepreneurs, though the gap was not substantial: 82 percent of men and 75 percent of women in the sample used technology.

Women's strong representation in the micro-enterprise sector, as well as their high rates of technology use, point to an opportunity to facilitate female labor force participation. The government could use micro-enterprises as an entry point to get women into the labor force.

The likelihood of using technology increases with education level. While 67 percent of those who

Figure 3

Usage of technology based on education (% of respondents)



Source: Authors' calculations.

never attended school were using technology, about 83 percent of those with secondary and tertiary education were utilizing technology. This finding supports the widely discussed notion that technology is skill-biased in nature – i.e. procuring technology, incorporating it into the business, and then utilizing it generally requires some a certain skill level.

The likelihood of using technology increases with education level. Technology is skill biased in nature, i.e. procuring technology, incorporating it into the business, and actually utilizing it generally requires a certain level of skill.

One might expect that business owners in the more centrally located community, Saraspur, with deeper social and economic links to the rest of Ahmedabad, would be more likely to adopt new technologies, but the data show the opposite. Sarkhej – the relatively more disenfranchised neighborhood on the city's periphery – had a larger share of technology users among micro-entrepreneurs. The gap was particularly pronounced among women. While 91 percent of female entrepreneurs in Sarkhej reported using technology, just 63 percent of women in Saraspur did. It is possible that, given their strategic location in a dense, central neighborhood, enterprises in Saraspur

Table 2

Monthly income of micro-entrepreneurs who use technology vs. those who do not

Monthly Income	Usage of Technology				
	Yes	%	No	%	Total
1,000 to 10,000	158	62.95	53	69.74	211
10,001 to 20,000	74	29.48	21	27.63	95
20,001 to 30,000	17	6.77	2	2.63	19
30,001 to 40,000	1	0.40	0	0	1
40,001 to 50,000	1	0.40	0	0	1
Total	**251**	**100**	**76**	**100**	**327**

Source: Authors' calculations.

have less need for information communication technologies (ICTs) such as mobile phones to establish interface with customers or attract business.

Almost three-quarters of the respondents said they were comfortable with technology, while over half claimed to keep themselves abreast of newer technologies for possible upgrading. However, when asked what technologies could be used to help them expand their business, 61.8 percent said they did not know, suggesting that moving beyond simple technologies and uses would have to be facilitated through skills training, access to finance and improving awareness. The latter are barriers that need to be addressed in order for a micro-entrepreneur to fully harness the potential of new technologies to grow their business.

One of the survey questions focused on barriers to growth vis-à-vis technology. While 60 percent of enterprise-owners said that they would require an additional loan or financial help to procure new technology, just 6.7 percent said they needed better machines, and only about 1 percent mentioned computers, tablets, or laptops. Not a single individual said that they were aware of any government scheme related to technology that they could access to improve their business.

Table 3

Answers to the question "Which technology could you use to expand your business?"

Name of Technology	Frequency	Frequency in %
Don't Know	202	61.8
Advanced Sewing Machine (Juki)	82	25.1
No Need	13	4.0
Computer/Tablet/Laptop	10	3.1
Smart Phone	7	2.1
Sewing Machine with an Electric Motor	6	1.8
Other Machines	4	1.2
Vehicle for transportation of goods	2	0.6
Digital Weighing Machine	1	0.3
Total	**327**	**100.0**

Source: Authors' calculations.

Technology as a catalyst for micro-enterprises

There is need for more studies into technology can enhance efficiency for micro-enterprises. This study shows that 62.2 percent of all respondents are using mobile phones, but not necessarily in all the ways they could be useful.

Comparing patterns of technology use with firm profits, two stylized facts emerge. The first is that a firm's use of technology does not guarantee a more profitable business. About 63 percent of micro-enterprises utilizing technology still earn less than INR 10,000 (US$ 150) per month. However, the data also make evident the fact that most firms that earn higher incomes utilize technology. Among micro-enterprises earning more than INR 20,000 (US$ 350) per month, over 90 percent are technology users, compared with 77 percent of all surveyed firms. Technology may not guarantee business expansion, but the likelihood of a micro-entrepreneur growing his or her business in its absence is slim. Technology enables greater efficiency and greater outreach to customers. In particular, technologies such as mobile phones – the most commonly used technology in the sample – act as a gateway to a wider customer base.

Technology may not guarantee business expansion, but the likelihood of a micro-entrepreneur growing his or her business in its absence is slim since technology enables greater efficiency and greater outreach to customers.

The majority of respondents were not familiar with specific technologies to help expand their business or improve productivity. Only 34 percent of respondents gave a specific answer when asked if they were aware of which technologies could help them expand their business (see **Table 3**). This could mean that their understanding of technology remains restricted to its immediate function rather than its broader productivity-enhancing potential. It is also possible that the current scale of work is small, and they are not yet in a position to create streamlined production processes or invest in expansion. This highlights the fact that any intervention to boost technology use among micro-enterprises must work in concert with other initiatives that can increase their ability to expand, such as access to affordable credit, and in turn leverage the economies of scale that technology enables.

Conclusion

Primary data from urban settlements in Ahmedabad reveal important insights on technology use among micro-enterprises and their potential to create jobs. Digital technology has reached some of the poorest micro-entrepreneurs in the Global South's urban slums and has influenced their business operations.

In Saraspur and Sarkhej, even though a large share of micro-entrepreneurs use technology, they do not always leverage its full potential. For instance, firm owners are using mobile phones to communicate with customers through voice calls, but rarely did these owners use their phones in other ways, like SMS-based accounting systems. Moreover, few firms used technology that was more advanced than the mobile phone and in the case of tailors, a sewing machine.

The limited schemes that define technology only in terms of large industrial machines completely neglect more affordable, smaller technology inputs that can revolutionize micro-enterprises.

The limited use and simplicity of technologies suggests two hypotheses. First, micro-enterprises struggle to expand in size to a point where technology may be more useful to capitalize on economies of scale. Second, micro-entrepreneurs often lack the necessary information and training to more successfully tap into the benefits of technology.

For technology to prove transformative for microenterprises – that is help them expand in size to become small and medium enterprises, improve efficiency and productivity and/or formalize – policymakers must adopt well-rounded interventions. Programs that improve access to credit and offer loans to finance better technology, trainings that include modules on using simple technologies in an impactful way, and slum upgrading initiatives that take into account the specific needs of MSMEs operating in informal settlements would help micro-enterprises harness the benefits of technology.

Beyond policies to improve technology at the firm level, a successful approach would also take into account the unique factors applicable to micro-enterprises. Currently, schemes aimed at supporting the MSME sector tend to be more appropriate for small- and medium-sized

firms rather than micro-enterprises. The micro-entrepreneur may be accessing finance through microfinance institutions and may have some skill-building opportunities, but still may not be able to access information and technology. The limited schemes that define technology only in terms of large industrial machines completely neglect more affordable, smaller technology inputs that can revolutionize micro-enterprises. For example, amongst the entrepreneurs who were tailors, 25.1 percent requested the efficiency-enhancing Juki sewing machine,[x] a machine that has in-built programs for designs, patterns and buttons, and costs INR 10,000 (about US$ 150) in the market. A credit-linked subsidy scheme for such an appliance would be welcomed by many micro-entrepreneurs.

Technology has the potential to be a catalyst for business development, job creation and growth among the smallest enterprises. Moreover, the fact that women micro-entrepreneurs and business owners in marginalized communities are using technology at similar rates as peer firms means that the micro-enterprise sector may hold opportunities to improve livelihoods for female and other marginalized workers. A more integrated policy approach that recognizes and addresses the particular needs and constraints of micro-enterprises – even within larger schemes such as the "Smart City" initiative – can unlock the potential of technology to expand micro-enterprises and grow them into successful businesses that generate new jobs.

[x] *This machine has an automatic Needle threader, White LED Light, 4-Step Buttonholing, 7-Point Feed Dog, 22 Stitch Pattern and Buttonhole.*

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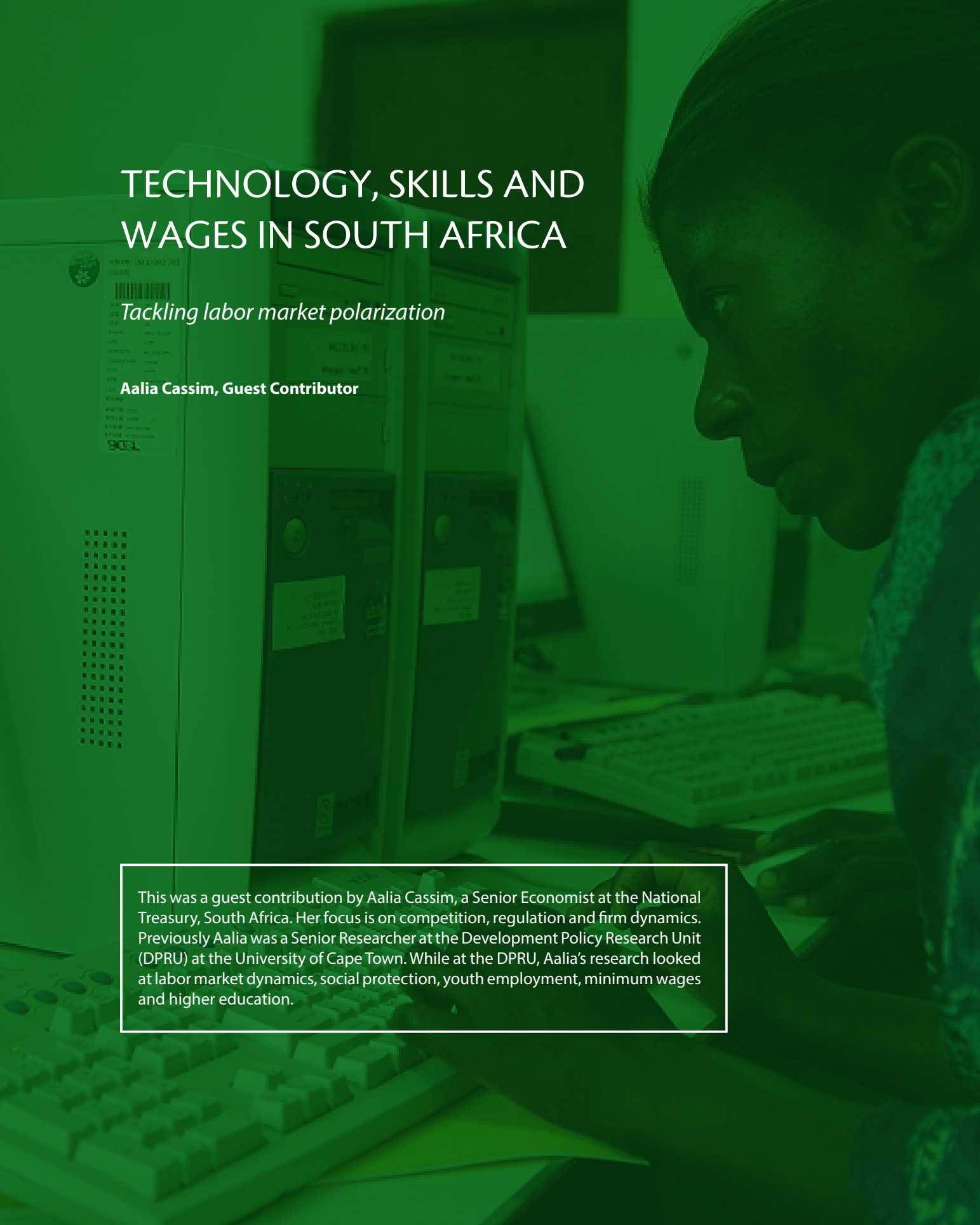

TECHNOLOGY, SKILLS AND WAGES IN SOUTH AFRICA

Tackling labor market polarization

Aalia Cassim, Guest Contributor

This was a guest contribution by Aalia Cassim, a Senior Economist at the National Treasury, South Africa. Her focus is on competition, regulation and firm dynamics. Previously Aalia was a Senior Researcher at the Development Policy Research Unit (DPRU) at the University of Cape Town. While at the DPRU, Aalia's research looked at labor market dynamics, social protection, youth employment, minimum wages and higher education.

SOUTH AFRICA

44,422

GDP per person employed (constant 1990 PPP $)

49

Internet users (per 100 people)

149

Mobile cellular subscriptions (per 100 people)

0.73

Research and development expenditure (% of GDP)

6

High-technology exports (% of manufactured exports)

CHAPTER 06

TECHNOLOGY, SKILLS AND WAGES IN SOUTH AFRICA

Tackling labor market polarization

Aalia Cassim, Guest Contributor

In the past two decades of the post-Apartheid era, South Africa has faced persistently high levels of inequality and unemployment. While poverty in the country has declined, income inequality has risen.[1] The Gini Index – a measure of income inequality – worsened from 59.3 to 63.4 between 1994 and 2011.[i] And unemployment has averaged approximately 25 percent since 1994.

Uneven access to economic opportunity, differences in the quality of education and varied settlement patterns between those at the upper and lower end of the income distribution are among the reasons for the rise in wage inequality. Many in South Africa's labor force remain unskilled and have limited access to internet connectivity and social networks. This is partly related to the post-Apartheid era's poor quality of education. In addition, spatial and settlement patterns in which poorer households are situated outside of urban centers make it harder for residents of these communities to access good jobs. These factors have essentially resulted in the development of a divided economy.

South Africa is caught in a vicious cycle in which existing income inequality fuels low skill accumulation that further exacerbates inequity.

South Africa is caught in a vicious cycle in which existing income inequality fuels low skill accumulation that further exacerbates inequity.[2] The country's structural context does not allow for certain cohorts of the population, such as poor individuals, to access higher skills in part due to limited access to economic opportunities and quality services. For example, children from the poorest households in South Africa are seven times more likely than those from the richest households to rank in the lowest 10 percent of students.[3] This lack of access is partly due to poor social networks and low-quality schooling. However,

[i] *The Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal income distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.*

the widening gaps in opportunity are explained by the increasing diffusion of technology in the economy, whereby certain skills and jobs have been rendered less valuable. In general, these are the low- and medium- skilled jobs that firms can easily substitute using automation or technology. At the same time, more advanced skills – such as research and analysis – suited to technologies used in global markets, earn a higher wage premium, which is the differential in wages for a given set of skills relative to unskilled workers.[4] There is evidence of a growing wage premium for skilled labor in South Africa whereas wages for low-skilled work have declined in real terms.[5]

The shift in the nature of skills that a 21st-century economy demands is not unique to South Africa. It is also prevalent in a number of emerging and developed markets. But South Africa's exceptionally high unemployment rate makes its situation unique. In part, this is related to the fact that South Africa's informal sector is small. Therefore, if one is not employed in the formal sector, her/his odds of finding employment outside are limited. This is in sharp contrast with other African countries where the bulk of jobs are informal and so people find some form of work – however productive or unproductive it may be.

The South African economy is becoming increasingly capital-intensive, which also means it is becoming more technology- and skill-intensive.

This chapter first considers the global context and the falling share of income afforded to labor, and then goes on to focus on the sectoral investment trends in South Africa. Investment has a very clear relationship with the country's labor demand trajectory, which is presented thereafter. Finally, the chapter proposes practical policy recommendations that are required in South Africa to overcome the resulting earnings gap and to reduce inequality, with a focus on education, industrial policy and Information and Communication Technologies (ICT).

Labor share and sectoral investment in South Africa

The South African economy is becoming increasingly capital-intensive, which also means it is becoming more technology- and skill-intensive. Expansion of capital-intensive as opposed to labor-intensive sectors means that there are fewer jobs. Moreover, as economies become

more technological and therefore skill-intensive, those without the requisite qualifications are left behind. These factors are fueling a decline in labor's share of income.

Globally, the share of income secured by labor – as opposed to capital income such as profits – has declined over the past three decades.[6,7] The median labor share in 26 out of 30 Organisation for Economic Co-operation and Development (OECD) countries for which data were available fell from 66.1 percent in 1990 to 61.7 percent in 2009.[8] The International Labour Organization suggests that globalization, financialization and technological shifts are the primary drivers behind labor's falling income share in both developed and developing countries.[9] Technological change, specifically information technology, has increased the productivity of physical capital relative to labor and is partly responsible for the decline in labor's share of income.[10] This has resulted in the substitution of labor for physical capital in some cases.[11] For example, firms may view physical capital, such

Technological change, specifically information technology, has increased the productivity of physical capital relative to labor and is partly responsible for the decline in labor's share of income.

Table 1

Investment growth against capital-labor (K-L) ratios by sector, 1997-2013

	K-L	Investment Growth (%)
Manufacturing	5.15	4.14
Transport, Storage and Communication	1.57	8.07
Construction	1.53	10.22
Wholesale and Retail Trade	0.83	5.78
Community, Social and Personal Services	0.77	5.96
Financial and Business Services	0.32	2.56
Agriculture, Forestry and Fishing	-0.38	0.00
Mining and Quarrying	-1.80	7.13
Electricity, Gas and Water	-4.18	7.69

Source: Bhorat, Cassim & Hirsch (2014).

as machines, as a better investment than human capital. Rather than hire additional labor, firms increasingly invest in physical capital.

Moreover, the increasing size and market for financial services has also fueled a decline in labor's share of income.[12] In South Africa, the financial services sector contributed 22 percent to GDP in 2012, an increase from 12 percent in 1994.[13] This sector tends to demand workers that have a middle to a high level of skills. Yet South Africa's labor force remains largely low-skilled.[14] The increasing market share of a sector that does not require low-skilled workers is part of declining demand for labor in general.

Previous research on South Africa has found that capital-intensive industries have attracted far more investment, even though these sectors were less likely to generate employment.

Previous research on South Africa has found that capital-intensive industries have attracted far more investment, even though these sectors were less likely to generate employment.[15] **Table 1** presents annual investment growth in South Africa between 1997 and 2013 against the Capital-Labor (K-L) ratio[ii] by sector.

The capital-intensive sectors such as construction and transport, witnessed the highest rates of annual investment growth. These sectors saw investment growth between 7 and 10 percent between 1997 and 2013.

Sectors such as agriculture that could drive rural employment, particularly for lower skilled workers and residents of less developed areas have had subdued levels of investment from the private sector. Currently, the sector employs only 5 percent of the country's total workforce.[16]

Among all the sectors, the K-L ratio was highest for manufacturing, highlighting that there are high levels of investment in heavy manufacturing and mechanization rather than in labor. Sectors such as wholesale and retail trade, finance and business, and community services had K-L ratios of less than one, reflecting that employment is growing faster than capital in these sectors. While these sectors have been the key employment drivers in services, investment was driven primarily by capital-intensive sectors such as construction and transport.[17]

[ii] *The capital-labor ratio (K-L) captures a firm's degree of capital intensity. For a given firm or sector, if this ratio is greater than one, i.e. the amount of capital utilized by a firm (K) is greater than the amount of labor (L), it means that the firm or sector is capital-intensive. Further, higher the ratio, then more capital-intensive is the sector or firm. Conversely, a K-L ratio of less than one implies that the firm or sector is labor-intensive.*

Impact of investment patterns on skill demand and wage premiums

The skill-biased technical change (SBTC) theory suggests that technological change has resulted in a downward shift in the demand for low-skill workers and a rise in demand for highly skilled workers, leading to income inequality. A series of studies highlight that technological change is one of the explanations for the rise in wage inequality in the United States.[18,19] There is also growing global evidence from developing countries of how SBTC can exacerbate wage inequality, especially in the presence of increased foreign trade.[20] Greater foreign trade leads to technology spillovers. Trading partners are likely to adopt foreign technology developed in skill-intensive advanced economies and end up with skill biases.[21] Using data from South Africa, Rattso and Stokke's model predicts an increase in technological skill bias as the economy becomes more dependent on foreign technology.[22]

The increasing investment in capital (noted in the previous section) has shifted the nature of skills demanded in the South African economy over the past two decades.

The increasing investment in capital (noted in the previous section) has shifted the nature of skills demanded in the South African economy over the past two decades. Rodrik found that, between 1980 and 2005, capital deepening – an increase in the capital intensity of firms – in South Africa resulted in a higher demand for skilled workers as opposed to low-skilled workers, which is among the reasons for a higher wage premium for skilled workers relative to low-skilled workers.[iii, 23]

A study undertaken by the Development Policy Research Unit on the South African labor market considers the changing nature of skills and the impact of the change on wage premiums. The study considers different skill types, including ICT skills, analytic or strategic decision-making skills, and skills that can be automated because of their routine nature, including construction or the operation of machinery.[24] It shows that between 2001 and 2011, employment where ICT skills are used increased by 64 percent. During the same period, employment of those using analytic or problem-solving skills rose by 53 percent. Analytic jobs are dominated by high-skilled persons such as managers and professionals, including those in the legal field; consultants; and other desk-based jobs that are not solely administrative. However, employment of those using automated or routinized jobs has

[iii] *Rodrik decomposed sectoral real remuneration into skill composition and skill adjusted (residual) or wage push components.*

increased by just 5 percent.[iv] A quantile wage regression follows in which the results show that, after controlling for demographic characteristics including age/experience, race and education, ICT-related jobs and those in the analytic category earn higher wages throughout the income distribution relative to workers in the other categories. The increasing demand for skilled work is thus matched by higher wage premiums.

For automated jobs as well as those involving high levels of physical exertion – such as operating machines, vehicles or mechanical equipment – wage premiums have seen a decline over time. These jobs can be automated and easily replaced by technology competing against workers in the labor market. South Africa also has an over-supply of labor to do less-skilled work.[25] Therefore, job profiles with no analytic or decision-making components are associated with low wage premiums that have been declining over time.[26]

This study essentially shows that wages in South Africa appear to be influenced by global demand for technical and analytic skills.

Wages in South Africa appear to be influenced by global demand for technical and analytic skills. While investment in technology is necessary to compete globally, its skill biased nature excludes a huge cohort of South Africa's labor force.

While investment in technology is necessary to compete globally, its skill biased nature excludes a huge cohort of South Africa's labor force. The expected gains from investments in technology are therefore potentially offset by the adverse impact they have on many workers that lack the requisite skills and are seeing their share of national income decline.

A country cannot grow prosperously when a quarter of its working age population is unemployed. At present, South Africa's poor labor force participation - 56.6 percent in 2014[27]- is exacerbating wage inequality. Improving upon this situation requires more balanced investment in terms of industrial policy as well up-skilling individuals.

[iv] *They include occupations such as textile weavers, engravers, machine operators and assemblers.*

Moving forward

This chapter proposes four recommendations to reduce wage inequality in South Africa.

1. Improve quality of education

One of South Africa's primary challenges is that the quality of education that the public system provides is of low quality and is not aligned with labor market demand. The skill set of young graduates does not match the requirements of growing industries. In order to rectify this mismatch, there needs to be more coordination between government agencies working on education, including national departments such as the Department of Basic Education and Department of Higher Education, as well as provincial departments; and employers, both in the private and public sector. A dialogue between the organizations responsible for education and employers would help align education to market demand.[28]

The country needs a long-term strategy to address the demands of those eligible for tertiary education but who are unable to afford it.

Further, education must be supplemented by skills training. Unemployment rates for college graduates are greater than 15 percent.[29] But the current landscape of skills training is not adequate either. More needs to be done to improve the quality of skills training, align it to labor market needs and boost enrollment in Technical Vocational Education and Training (TVET) in South Africa. In 2013, only 794,250 individuals were enrolled in Further Education and Training and TVET, while the country's youth population – individuals between the ages of 15 and 24 – was 10.6 million.[30,31]

A review of the curriculum and the skills demanded by the labor market is necessary to produce graduates with relevant qualifications can improve their personal welfare as well as contribute productively to economic growth. Updating the curriculum involves examining methods of global production that can be adopted in South Africa to enhance the potential of the labor force.

2. Increase access to education

In 2011, nearly 17 percent of South Africa's population lived on less than US$ 1.90 per day.[32] With such a high proportion of its population living in poverty, financial constraints are a significant barrier to accessing education. While the government offers free schooling to those who cannot afford it, there are a number of eligible people who do not access these benefits because of lack of information.

Tertiary or higher education at the college and university levels has also become expensive and inaccessible for the majority of the population. Over the last decade, the government subsidy as a share of total university fees has declined from 49 to 40 percent while the student contribution has risen from 24 to 31 percent.[33] While funding is available for poor students, there is a gap in the funding system for those who are not quite "poor enough" and are commonly referred to as the "missing middle."

The lack of access to higher education has led to a wave of protests around the country since 2015.[34] While the government agreed to not increase the fees for tertiary institutions in 2016, the country needs a long-term strategy to address the demands of those eligible for tertiary education but unable to afford it.

3. Link industrial policy to the labor force

Industrial policy that supports capital-intensive production that relies on physical capital or technology will not enable creation of large-scale employment. Yet, there is evidence that industrial policy in South Africa has focused on heavy rather than light manufacturing over the past two decades.[35] Support for heavy industry that utilizes more productivity-enhancing technologies rather than labor comes through various means, including favorable tariffs as well as the availability of cheap energy. But incentives for certain labor-intensive, light manufacturing sectors are, to some extent, nullified by regulatory barriers plus enhanced global competition and lower wages in other countries. This has an adverse impact on the potential of manufacturing to generate employment.

Supporting light manufacturing or less technology-intensive industries that make use of low-skilled workers, who constitute a majority of the labor force, is critical to providing productive employment

Policymakers should promote employment creation in industries that make use of the labor force in its current form and also take into account the levels of technology adoption in different sectors. While improving the education system is key, it will take some time to implement a new curriculum and integrate it into the current system. Therefore, in the short term, supporting light manufacturing or less technology-intensive industries that make use of low-skilled workers, who constitute a majority of the labor force, is critical to providing productive employment. While light manufacturing may not up-skill

workers to the point that their salaries can compete with wage premiums in, for instance, the ICT field, it is still critical to ensure that this group is employed productively. Reducing the number of unemployed individuals will also ease the burden on the state, which currently has an extensive social security budget. Industrial policy should be accompanied by on-the-job training to enhance employee productivity and acquaint employees with new technologies.

4. Enhance connectivity

A fundamental step toward up-skilling individuals is improving access to ICT, not only to enhance efficiency, but also as a tool for sharing information. Connectivity, particularly internet roll-out in both rural and urban areas, should be broader so that poorer segments of the population have access. Internet connectivity is a vital means of sharing information on government assistance and information on available jobs.

In 2015, 48.7 percent of households in South Africa had an internet connection, including connections on a mobile phone. The largest share of South Africans with access to the internet use it at the workplace, 15.1 percent, followed by their home, 9.7 percent, and at school/university/college, 5.1 percent.[36] Internet connectivity also varies by province. Wealthier provinces, such as Gauteng, host the highest number of connected households, 65.7 percent, while poorer provinces, such as Limpopo, have the lowest share of household internet connections, at 39.3 percent.[37]

Those excluded from access to internet lack information and have limited social and professional networks, perpetuating the already high levels of inequality. A possible solution is to create internet hubs around cities as well as in peri-urban areas where individuals can access computers, use online portals and forums, and possibly undertake computer literacy courses at subsidized rates.

Conclusion

Increasing technology adoption in South Africa has shifted the demand for labor toward more skilled workers and has had a direct impact on wage premiums across sectors. Skill-biased technical change has also exacerbated income inequality.

South Africa's growth has been higher in capital-intensive sectors such as construction and transport. These investment patterns have had significant implications for employment and wages. This chapter presents evidence of increasing wage premiums for higher skills linked to technology-intensive sectors such as ICT and analytical skills and a growing wage gap between high- and low-skilled workers. Policy options to reduce the resulting wage inequality include enhancing the quality of and access to education, linking industrial policy to the labor force and increasing focus on ICT.

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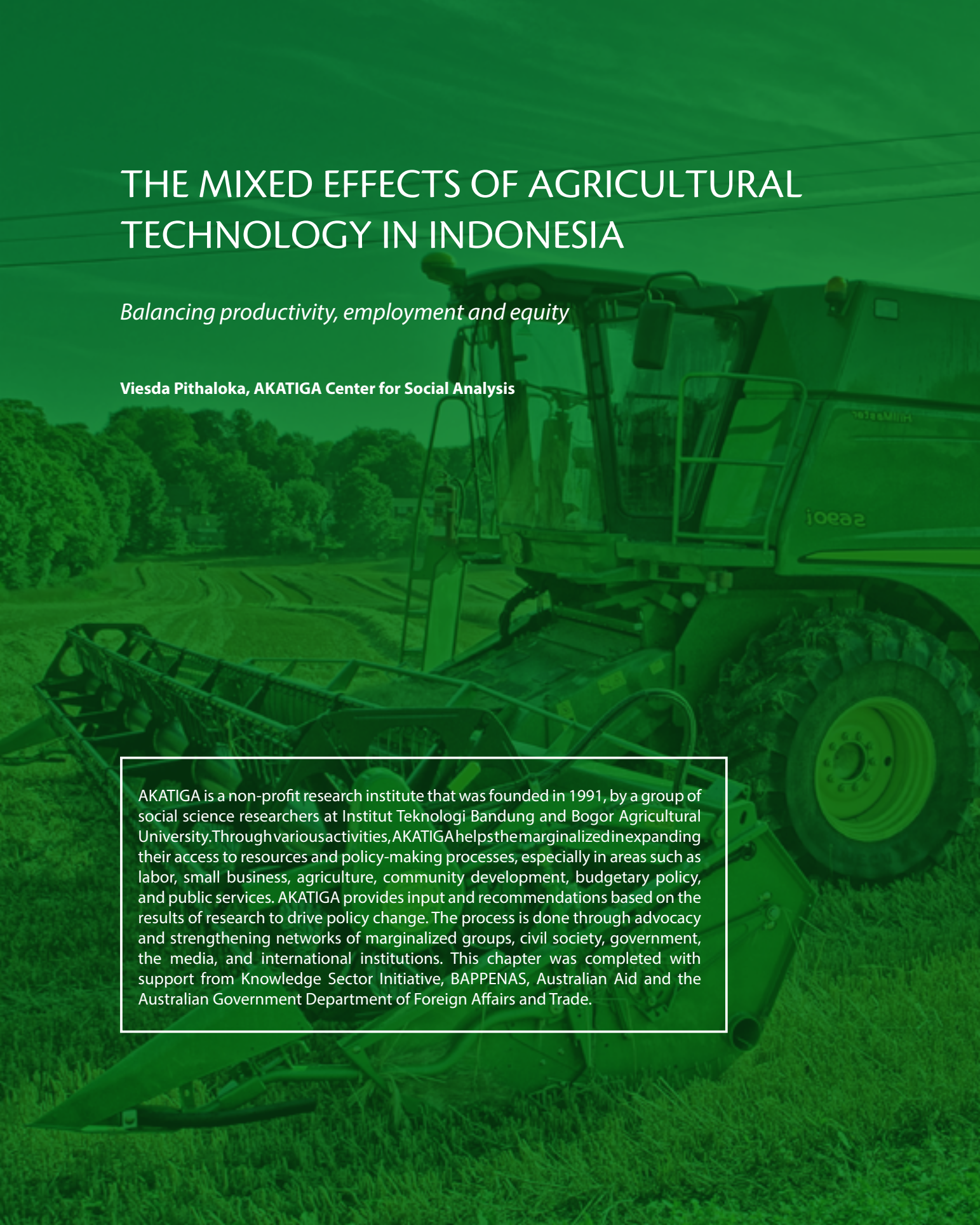
THE MIXED EFFECTS OF AGRICULTURAL TECHNOLOGY IN INDONESIA

Balancing productivity, employment and equity

Viesda Pithaloka, AKATIGA Center for Social Analysis



AKATIGA is a non-profit research institute that was founded in 1991, by a group of social science researchers at Institut Teknologi Bandung and Bogor Agricultural University. Through various activities, AKATIGA helps the marginalized in expanding their access to resources and policy-making processes, especially in areas such as labor, small business, agriculture, community development, budgetary policy, and public services. AKATIGA provides input and recommendations based on the results of research to drive policy change. The process is done through advocacy and strengthening networks of marginalized groups, civil society, government, the media, and international institutions. This chapter was completed with support from Knowledge Sector Initiative, BAPPENAS, Australian Aid and the Australian Government Department of Foreign Affairs and Trade.

INDONESIA

21,183

GDP per person employed (constant 1990 PPP $)

22

Internet users (per 100 people)

132

Mobile cellular subscriptions (per 100 people)

0.08

Research and development expenditure (% of GDP)

7

High-technology exports (% of manufactured exports)

CHAPTER 07

THE MIXED EFFECTS OF AGRICULTURAL TECHNOLOGY IN INDONESIA

Balancing productivity, employment and equity

Viesda Pithaloka, AKATIGA Center for Social Analysis

Introduction

Technology offers the potential to improve productivity in farm work and address the challenges posed by subsistence agriculture and food insecurity. The Ministry of Agriculture in Indonesia is actively introducing new technologies in the country's agriculture sector to increase crop yields, boost farm incomes and increase efficiency in agricultural production.

The results of the study indicate that not all technological interventions are appropriate across locations, and only some of these interventions enable the equitable distribution of income in the rural economy.

These investments in productivity-enhancing technologies in agriculture coincide with a large-scale structural transformation in the Indonesian labor market. In 2004, 45 percent of Indonesians were employed in agriculture. This figure fell to 35 percent by 2014.[1] As with any structural transformation, this movement of workers out of agriculture and into manufacturing and services is driven by a variety of push and pull factors. This chapter asks whether the agricultural technology policies implemented by the Indonesian government influence the process of structural transformation in a way that creates shared prosperity and takes into account the persistence of structural inequality in the rural economy.

The chapter draws substantially on a 2014 study in eight rice-producing villages in four

provinces of Indonesia, which examined the impact of the combine harvester – a machine used to harvest grain.[2] The Ministry of Agriculture has been actively promoting the combine harvester since 2012 through various grant- and loan-based initiatives. The results of the study indicate that not all technological interventions are appropriate across locations, and only some of these interventions enable the equitable distribution of income in the rural economy. The research finds that while the combine harvester improved total income from the harvest, it also eliminated wage employment for rural unskilled workers, altered the redistributive quality of the harvest, and exacerbated already high levels of inequality in rural Indonesia – partly because of how and where the technology was introduced.

The study begins by describing the continued reliance of Indonesian workers on agriculture as a significant source of employment, despite the ongoing movement of labor from agriculture to other sectors. It then proceeds to explain the context and political economy of rural, agriculture-based communities in Indonesia, drawing attention to the ways in which income and power are distributed and redistributed. Next, the study explains the impact of the combine harvester in the eight locations that it examined. Finally, it concludes with a discussion of how productivity in agriculture can be boosted without displacing farm labor and increasing inequality, and offers concrete policy recommendations to this effect.

While enhancing agricultural productivity is necessary for economic development, there are real social and economic costs to making the agriculture sector less labor-intensive.

The author argues that governments in developing and emerging economies must consider multiple factors when actively promoting the introduction of new technologies in the agriculture sector. While enhancing agricultural productivity is necessary for economic development, there are real social and economic costs to making the agriculture sector less labor-intensive. Even in a relatively urbanized and developed economy like Indonesia, a large proportion of workers depend on farm work. Further, conventional methods of agricultural production sometimes serve other aims too, like that of curbing inequality.

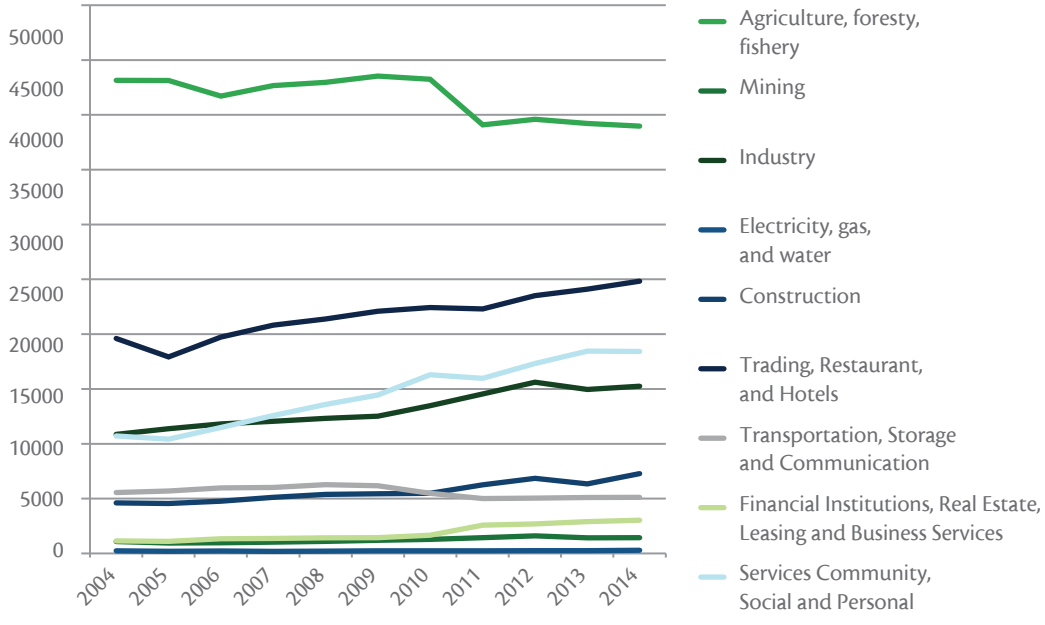
Indonesia's agriculture sector: Trends and policies

Despite the structural shift from agriculture to manufacturing and services in the Indonesian economy, the agriculture sector still plays an important role in the country's labor market, especially when it comes to employment for unskilled workers. Though the number employed in agriculture has declined by more than 4 million workers in the past decade – from about 43 million to nearly 39 million – agriculture still accounted for 35 percent of total employment in 2014.

Moreover, agriculture plays an important role in supporting food security in Indonesia. The nation's ability to support its own demand for staple foods has decreased over recent decades. While Indonesia produced all the rice it needed domestically in the 1980s, the demand has now outstripped the supply. As of 2014, Indonesia was a net importer of rice, importing about US$ 480 million more than it exported.[3] Despite high and sustained levels of economic growth, about

Figure 1

Total employment based on primary livelihood (in millions of person) 2004-2014



Source: National Labor Force Survey 2004-2014, Central Bureau of Statistics, Republic of Indonesia.

87 million Indonesians remain vulnerable to food insecurity,[i,4] and 36.8 percent of children under five were stunted as of 2007.[5]

It is in this context that the government has sought to improve agricultural productivity – to maintain the stability of the food supply and address food insecurity. It has introduced a variety of programs to improve agricultural productivity, like providing better storage facilities and infrastructure. In 2009, Indonesia declared its aim to become self-sufficient in rice, corn, soybean, beef and sugar production.[6] As evidence of the priority given to agriculture, Ministry of Agriculture's allocation now ranks in the top 10 among all ministries, though it is still far less than the budget given to other ministries for instance, of health or transportation (see Figure 2).[7]

According to the Employment Policy Direction 2014-2019,[8] the government of Indonesia plans to integrate agriculture, industry and energy policies to realize food and energy security. The coordination plan aligns with the effort to industrialize agriculture and improve the sector's productivity.

One of the government interventions in the agriculture sector is providing combine harvesters to rural farmers. The combine harvester, or simply the "combine," performs three distinct operations – reaping, threshing, and winnowing – as part of a single process.[9] The combine is expected to reduce wastage of food crops, maintain the quality of crops, extend the shelf life of agricultural products, and improve cost competitiveness of food crops. The combine is also more efficient for farmers because its operation is easier and faster than manual methods of harvesting.

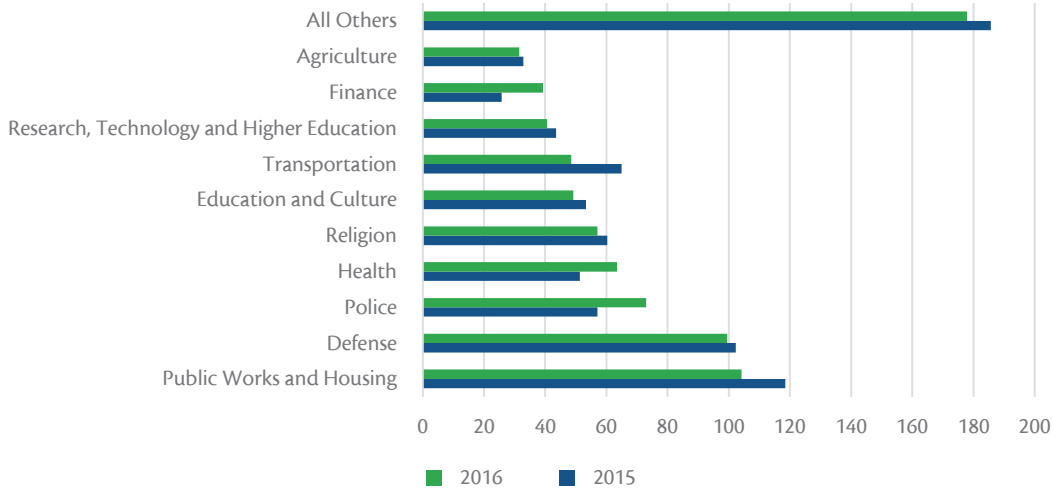
The Employment Policy Direction 2014-2019 strives to industrialize agriculture and improve the sector's productivity.

In 2012 the government launched a massive mechanization program – providing 62,221 pieces of agricultural machinery to farmers' groups throughout the country.[10] The machinery distributed included combine harvesters and other technologies, such as transplanters, dryers and rice mills.[11] The program also includes a training component to guide farmers on how to use the new technologies.

[i] *Food insecurity can be defined as the failure to achieve domestic food production capabilities through institutional support in securing the availability of adequate staple foods – in terms of quantity, quality, safety, and affordability, at the household level.*

Figure 2

Budget for state ministries and agencies (in trillions of Indonesian Rupiah) 2015-2016



Note: 2015 figures reflect the revised budget (APBN-P) while 2016 figures reflect the projected budget (APBN).

Source: State Budget of Indonesia, 2016.

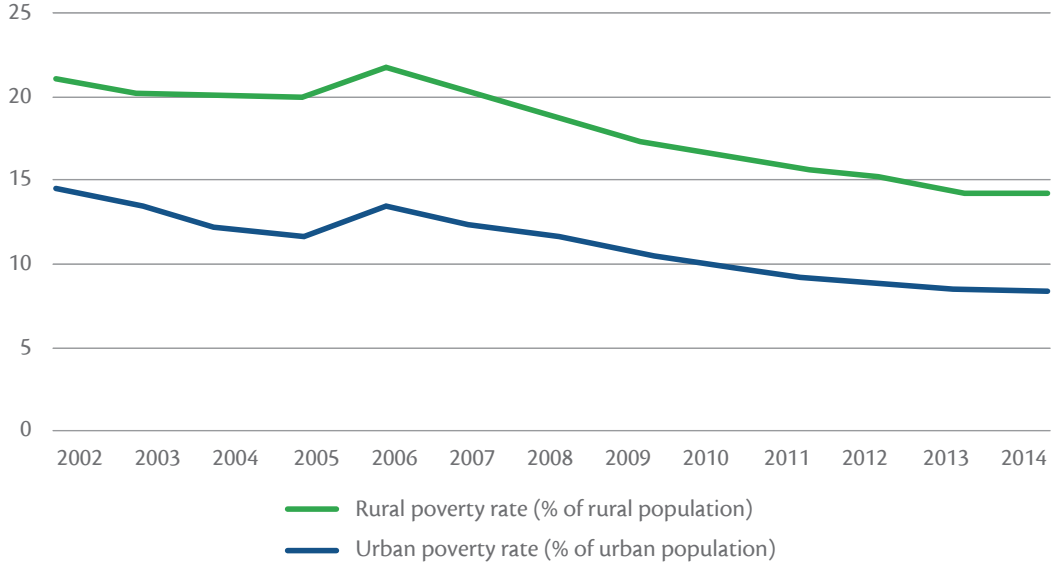
Inequality and labor in rural Indonesia

Agriculture in Indonesia is dominated by small-scale farming, but the distribution of land is not homogeneous, egalitarian, or static.[12] The rural economy includes capital-rich farmers, large landowners, medium-scale farmers, near-landless farmers and landless farm workers.[ii] More than half of farming households in Indonesia and about one-third of farming households in Java have less than half a hectare of land.[13] Seventy percent of Indonesians below the poverty line live in rural areas.[14]

Aided by strong economic growth, the percentage of people living below the poverty line has

Figure 3

Urban and rural povery rate, Indonesia (%)



Source: World Bank [iii]

[ii] For the purposes of this chapter, the definitions used are as follows: capital-rich farmers are those with more than 2 hectares of land plus substantial non-farm assets; large landowners are those with more than 2 hectares of land but no substantial non-farm assets; medium-scale farmers are those with 0.25-1.99 hectares of land; near-landless farmers are those with less than 0.25 hectares of land; and landless farm workers are those working on farms without any ownership of land.

[iii] These poverty rates are based on the Indonesian government's poverty estimates, and not on the international measure of poverty.

declined significantly in recent years (see Figure 3). However, the gains from this growth continue to be disproportionately captured by the middle and upper classes, fueling rising inequality. Between 2003 and 2010, the richest one-tenth of Indonesians increased their consumption as a share of income by 6 percent per year, in real terms. For the poorest 40 percent, it only increased by 2 percent per year – a surprising trend given that the poor tend to spend more of their income than the rich. The Gini coefficient – a standard measure of income inequality – has risen rapidly, from 30 in 2000 to 41 in 2013.[15]

Rural inequality has particular characteristics and drivers. Two AKATIGA studies on rural inequality, conducted in 2013 and 2014, across 20 villages in the main rice-producing areas of four provinces,[16] found that land ownership is the main factor that shapes inequality in rural areas. AKATIGA's research in the Wajo district of South Sulawesi showed that 67 percent of land in one village belonged to a single family, which brought in 72 percent of total income in the village, while 76 percent of the village's farmers were landless or near landless.[17]

Land ownership is the main factor that shapes inequality in rural areas.

Highly unequal distribution of land ownership and control are problematic for many reasons. In addition to posing the threat of food insecurity for a large section of poor, landless laborers, it also has negative effects on the distribution of employment opportunities and incomes in the agriculture sector and the rural economy overall, thus exacerbating inequality.

Capital-rich farmers in rural Indonesia often earn their income from three sources: agriculture and fisheries, rent collected from sharecroppers,[iv] and non-farm activities such as processing plants. Farmers with large landholdings often invest heavily in agriculture-linked non-farm activities that require substantial capital and provide high returns; such as trade, agro-processing, and renting out farm equipment including tractors and combines.[18] Although small in number, these landowners control a large slice of the rural economy through their diversified farm and non-farm investments.

The uneven distribution of land and income has inevitable political ramifications. Many of the rural rich obtain lucrative jobs or positions in village

[iv] *Those farmers who cultivate others' land with a shared tenancy agreement - such as being paid half the share of the rice yield.*

government or the civil services, which give them better access to government grants and subsidies. The impact of this nexus of economic and political power in shaping government initiatives in the agriculture sector will be discussed in the next section.

At the other end of the spectrum, landless farm worker households sometimes earn additional income in nearby factories or undertake informal service sector occupations. While in some cases their earnings from such activities may be higher than the income earned by operators of small farms, this depends largely on the characteristics of the local economy.

In most villages, the skewed landholding structure means that most young people have no realistic prospect of becoming farmers, at least not in their youth.

In most villages, the skewed landholding structure means that most young people have no realistic prospect of becoming farmers, at least not in their youth. Moreover, due to speculative investment in land and rising land prices, buying land is becoming an increasingly unrealistic option, except for those who are already rich. In the Karawang district of West Java, for example, land prices increased between two- and threefold in just three years between 2009 and 2014.[19] It is not surprising then that so many young rural men and women decide to find other jobs or informal work opportunities, whether in rural areas or through migration to cities or abroad.

Harvesting is an activity that absorbs a lot of labor and offers a short-term seasonal opportunity for poor farm workers in rural Indonesia to earn a relatively high daily wage. It is in this context then, that the harvest has historically acted as a redistributive mechanism, a counterbalance to prevailing inequality in rural economies. The combine, however, eliminates many of the employment opportunities that the harvest traditionally brings, as a later section will detail.

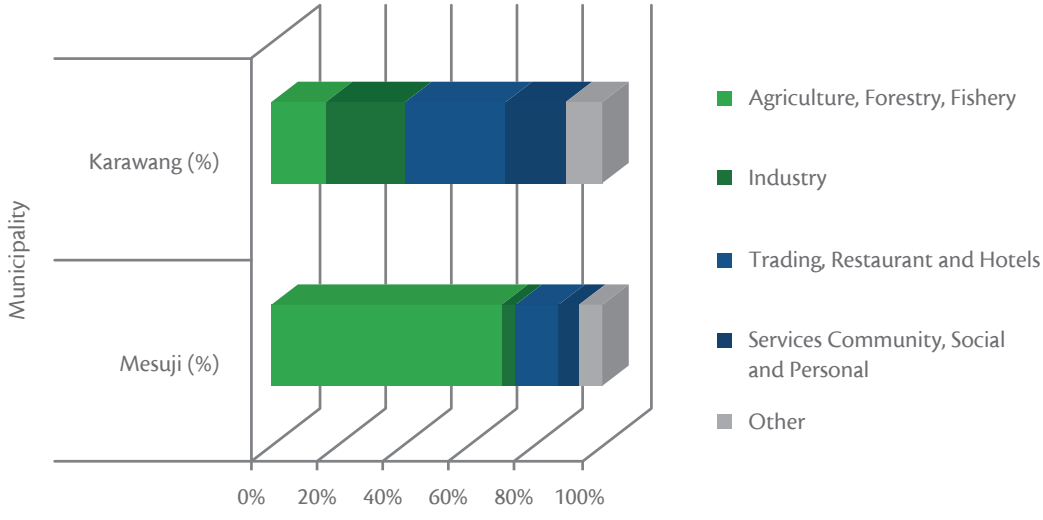
The tale of two rural economies

It is important to recognize that not all local economies in rural Indonesia are equal, particularly when it comes to the availability of non-farm work and the speed of structural transformation. Karawang in West Java and Mesuji in Lampung, two of the rice-producing regions of the country that were included in AKATIGA's study, demonstrate this variation.

In Mesuji, a regency on the island of Sumatra, agriculture still employs about 70 percent of the labor force, while other sectors remain underdeveloped. On the other hand, in Karawang, a regency not far from Jakarta, new industrial estates have been established that have created a diverse and vibrant local economy with a relatively tight labor market. In Karawang, despite the ongoing importance of agriculture –

Figure 4

Employed population (Ages 15+) by sector in Mesuji and Karawang 2014



Source: Karawang and Mesuji, Dalam Angka Reports, 2014.

specifically rice production[v,20] – only 16 percent of workers are still employed in agriculture. This is indicative of a widespread suburbanization process that is underway in Indonesia, wherein industrial activities are moving to once-rural urban peripheries, thus creating a mixed or "rurban" economy.

The distinction between Mesuji and Karawang becomes important in considering workers displaced by increasing mechanization of agriculture, and the employment options that lay before them. In a district like Mesuji, farm workers who lose employment have limited options. They take up work as rickshaw drivers, tailors or home-based artisans, or raise livestock like chickens, the latter of which involves significant capital investment and bears unreliable returns.[vi] Some also choose to migrate to other parts of Indonesia or even to Malaysia in search of work, for instance as laborers on palm oil plantations.

In contrast, a farm worker in Karawang who finds himself redundant, can earn up to IDR 4 million, or up to US$ 305, per month in more lucrative occupations available in his or her vicinity, that include factory work, construction, and wholesale and retail trading[21] (see **Table 1**).

Table 1

Non-agricultural work: Typical income

Work	Income (IDR) / Month	US$ Equivalent
Factory	1.6 - 4 million	122 - 305
Palm Oil Plantation in Malaysia	2 - 3 million	152 - 228
Construction	1.5 - 3 million	114 - 228
Retail	0.3 - 2 million	23 - 152
Rice Mill	~ 600,000	~ 46
Farm Work [vii]	0.38 – 0.75	29 - 57

Source: Nugraha, Yoga. A. & Rina Herawati.

[v] In 2015, Karawang produced 9 percent of total rice grain in the West Java province, the second largest rice producing province in Indonesia
[vi] Average monthly income from animal husbandry ranges from IDR 240,000 to IDR 600,000 (about US$ 18 to 45). See Yogaprasta A. Nugraha et al.
[vii] Although it doesn't fall within the classification of non-agricultural work, farm work has been included here for the purpose of comparison. Farm workers are paid IDR 25,000-50,000/day (US$ 2 – 4/ day), but since they don't work throughout the year (as agriculture involves waiting periods), they are estimated to work for approximately 15 days per month, in every season. See Yogaprasta A. Nugraha et al.

The differing nature and pace of structural transformation in areas such as Mesuji and Karawang should be taken into account when shaping policies that would be adopted by Indonesia's Ministry of Agriculture.

The combine harvester and its impacts on employment and inequality

In 2012, the government launched a massive mechanization program for the agriculture sector, providing 62,221 pieces of agricultural machinery to farmers' groups throughout the country.[22] The technology distributed included rice transplanters, dryers, power threshers, corn-shellers, rice milling units, tractors and water pumps, as well as combine harvesters.[23]

Based on AKATIGA's findings, combine harvesters have had two main effects on rural communities. First, the combine - like other technologies - has reduced the demand for labor while increasing productivity. Second, it has transformed the economic relationships inherent in the harvesting period, reversing the redistributive quality of the harvest and therefore increasing rural inequalities.

The combine has reduced the demand for labor while increasing productivity. It has also reversed the redistributive quality of the harvest, in turn increasing rural inequalities.

Prior to the introduction of the combine, about 30 manual harvesters would be contracted on a daily basis to cover approximately one hectare per day over the harvest period. Farm workers would typically earn IDR 40,000-50,000 (about US$ 3-4) per day during harvest season. Ultimately, this system resulted in farm workers earning about 89 percent of the total profits of the harvest, with the remaining profits going to the landowner, according to AKATIGA's findings.

With the introduction of the combine, the profit sharing arrangement has essentially been reversed. Approximately 80 percent of the total income of the harvest ends up in the hands of the owner of the combine harvester – who is nearly always the landowner. With the combine enabling three hectares of land to be harvested each day, only eight workers are hired

per machine during the harvest period. In other words, AKATIGA's research shows that both the redistributive effect and the employment effect of the harvest period are almost completely neutralized with the introduction of the combine harvester.

The rural elites have largely captured the government's provision of combine harvesters to local communities. The Ministry of Agriculture's program involves the direct donation of combine harvesters to farmers' groups. These groups are set up at the village level to increase farm income by encouraging partnerships and knowledge sharing among farmers. Ostensibly, a sharing mechanism in farmers' groups must ensure that the combine harvester reaches more people. But studies have shown that farmers' groups are generally dominated by village elites focused on gaining access to government funds, and that they lack transparency and accountability.[24] This means that channeling combine harvesters through farmers' groups is likely to ensure that it is the wealthy residents with large landholdings who gain access to the machine in the villages. AKATIGA's observations corroborate this. In its qualitative study, almost all those using a donated combine received it through a personal relationship with the local government.

These findings demonstrate that variables beyond total factor productivity must be taken into account when introducing new agricultural technologies. Local economic characteristics – such as the lack or abundance of non-farm work opportunities – will shape the degree of positive and negative impact from promoting new agricultural technologies. Policy frameworks must take into account these local and regional differences.

Variables beyond total factor productivity must be taken into account when introducing new agricultural technologies.

How to increase productivity and efficiency without exacerbating inequality

In a place like Karawang, promoting the combine harvester is a sensible policy approach. Broadly speaking, workers in this region who have been displaced by efficiency gains brought on by the combine have other employment options available to them. But in an area like Mesuji, the combine displaces workers who have few local employment alternatives, and increases local inequality by eliminating the redistributive quality of the harvest season.

This is why governments in developing and emerging economies must consider the characteristics of local and regional economies when introducing technologies for the agriculture sector. Economic development is partly underpinned by growing agricultural productivity. At the same time, the social and economic costs of making the agriculture sector less labor-intensive must be taken into account. Even in rapidly urbanizing countries, a large proportion of workers depend on farm work.

Governments in developing and emerging economies must consider the characteristics of local and regional economies when introducing technologies for the agriculture sector.

A smart policy approach can balance the competing priorities of an emerging economy like Indonesia by boosting agricultural productivity, enhancing food security, creating employment – especially for youth – and reducing inequalities. What follows is a set of recommendations towards such a balanced policy framework.

1. Promote different agricultural technologies based on the characteristics of local economies.

For regions like Karawang that are at an advanced stage of structural transformation and may even be experiencing farm labor shortages, introducing technologies like the combine harvester can dramatically boost agricultural productivity. In regions where the agriculture sector is still responsible for generating most employment, other technologies can be introduced that will improve efficiency without drastically reducing the labor-intensity of agriculture. For example, in China, the government introduced brush cutters[viii] and rice reapers[ix] in regions where the local workforce remained highly dependent on farming.[25]

[viii] *A brush cutter is a power tool worn with a shoulder harness, consisting of a rotary head with a small circular saw at the end of a boom, used for clearing various kinds of rank or low woody growth. With particular attachments, it can be used to aerate the soil before planting or destroy weeds after planting.*

[ix] *A rice reaper is a harvesting machine that cuts and gathers rice grain at the time of harvest.*

Governments in emerging and developing countries might also consider introducing pilots in regions with different economic and social characteristics in order to understand the impact of a particular technology before promoting it across all geographies.

2. Improve mechanisms for equitable distribution of farm-related grants, loans and subsidies.

There is adequate evidence now to demonstrate that farmers' groups, despite their intended purpose, are not the appropriate mechanism for ensuring that government programs to aid farmers reach those most in need. Other vehicles or models of delivery should therefore be considered. For example, groups of smallholder farmers – those owning less than one hectare of land – could be the beneficiaries of specifically targeted interventions. This would help address the problems of elite capture at the local level.

3. Invest in creating viable non-farm job opportunities in regions where the pace of economic development is slow.

Residents of regions like Mesuji deserve to reap the benefits of a more diverse, robust local labor market that offers a range of employment opportunities. The government should facilitate the creation of viable non-farm employment so that workers in regions like Mesuji are not perpetually dependent on labor-intensive agriculture for their livelihoods. For example, many parts of Indonesia are ripe for investments in agro-processing facilities. These could even take the form of medium-sized, producer-owned companies that give landless workers a scope for economic mobility. Some villages in Indonesia have already been successful in developing cooperatives in both farm and non-farm industries, such as village-owned rice mills.

If technology is to deliver on the promise of an equitable growth process, rising productivity cannot be the only consideration for its deployment.

If technology is to deliver on the promise of an equitable growth process, rising productivity cannot be the only consideration for its deployment. As this paper shows, context matters. And it is only by shaping technological initiatives to meet the challenges specific to an area and its people that governments can achieve the desired results.

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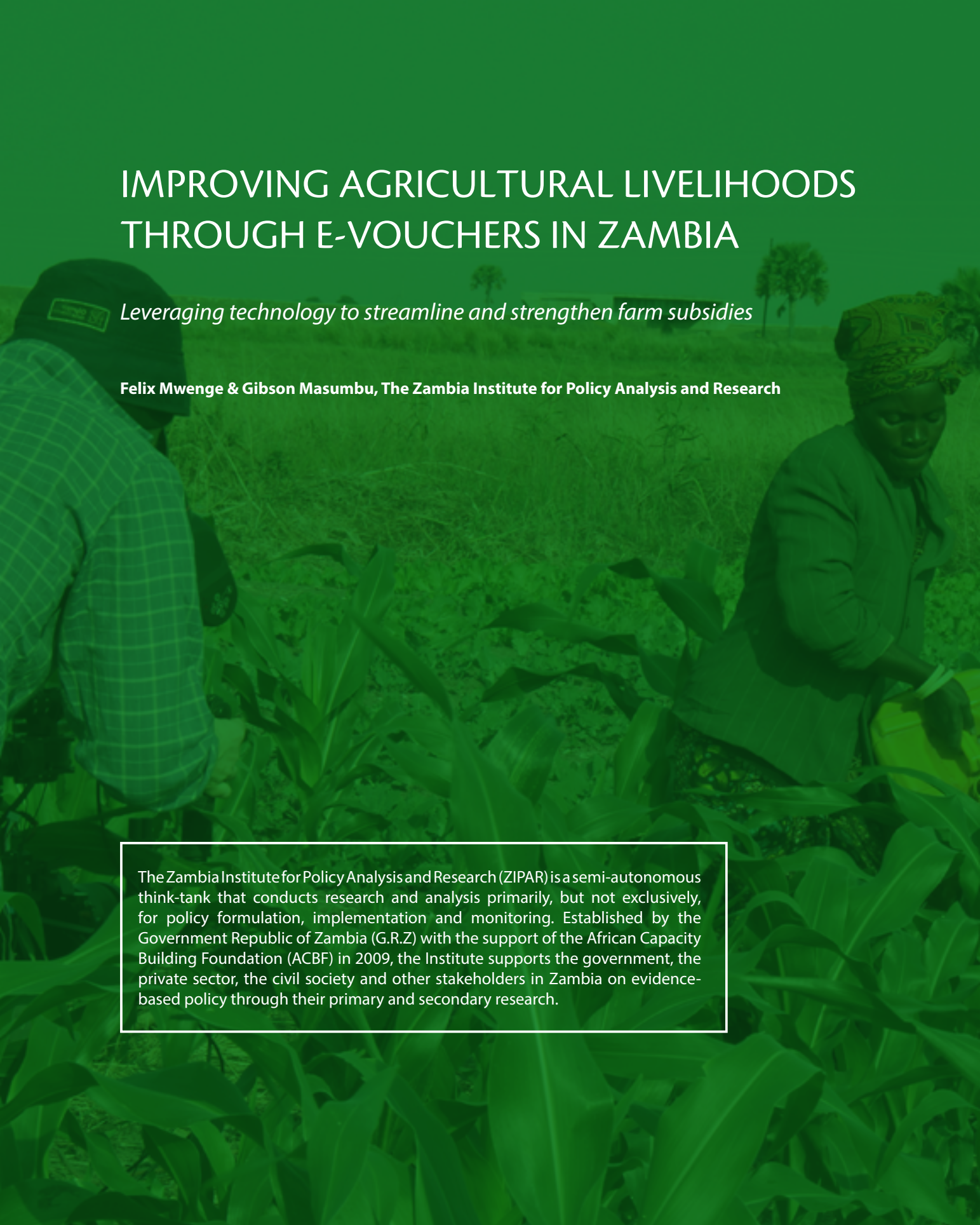
IMPROVING AGRICULTURAL LIVELIHOODS THROUGH E-VOUCHERS IN ZAMBIA

Leveraging technology to streamline and strengthen farm subsidies

Felix Mwenge & Gibson Masumbu, The Zambia Institute for Policy Analysis and Research



The Zambia Institute for Policy Analysis and Research (ZIPAR) is a semi-autonomous think-tank that conducts research and analysis primarily, but not exclusively, for policy formulation, implementation and monitoring. Established by the Government Republic of Zambia (G.R.Z) with the support of the African Capacity Building Foundation (ACBF) in 2009, the Institute supports the government, the private sector, the civil society and other stakeholders in Zambia on evidence-based policy through their primary and secondary research.

ZAMBIA

39,586

GDP per person employed (constant 1990 PPP $)

44.4

Internet users (per 100 people)

82

Mobile cellular subscriptions (per 100 people)

0.5

Research and development expenditure (% of GDP)

15

High-technology exports (% of manufactured exports)

CHAPTER 08

IMPROVING AGRICULTURAL LIVELIHOODS THROUGH E-VOUCHERS IN ZAMBIA

Leveraging technology to streamline and strengthen farm subsidies

Felix Mwenge & Gibson Masumbu, The Zambia Institute for Policy Analysis and Research

Introduction

The Zambian government has provided agricultural subsidies since the early 2000s in an effort to improve food security, raise the incomes of rural farmers and reduce poverty. The subsidies are intended to enhance smallholders[i] – access to inorganic fertilizer, improved seeds and other modern inputs required to increase crop yields and production. More recently the Zambian government has been testing a new market-based technology that could help the country improve the administration and management of these agricultural subsidies.

With the e-voucher system problems such as late delivery of agricultural inputs and the presence of ghost beneficiaries associated with the current administration system could soon become a thing of the past.

Over the next few years the electronic voucher or e-voucher, system will replace the existing system of administering agricultural subsidies under the country's Farmer Input Support Program (FISP). The e-voucher program has already been piloted in 13 districts in the country, reaching about 198,000 farmers during the 2015-16 agricultural season.[1] The successful implementation of the e-voucher across Zambia suggests that problems such as late delivery of agricultural inputs and the presence of ghost beneficiaries associated with the current system could soon become a thing of the past.

[i] *According to the Ministry of Agriculture, Zambia, the working definition of smallholders is farmers who cultivate less than five hectares of land. Those who cultivate between 5 to 20 hectares are referred to as emerging farmers.*

Under the existing system – the Farmer Input Support Program (FISP) – beneficiaries access inputs through approved farmer cooperatives and other farmer groups.[2] The cooperatives and groups apply to receive subsidies for their members through their local district agricultural committee. They collect beneficiary payments and deposit them into local bank accounts, a pre-requisite for the government to release the inputs.

Private firms, selected through a national tender process, then deliver inputs to the districts. Local transporters distribute the inputs to satellite depots for release to the approved beneficiaries through the same cooperatives and farmer organizations. This process has created a number of intermediaries and loopholes that have diminished the effectiveness of the FISP. The e-voucher system was designed to address the shortcomings of the current system.

This chapter focuses on the new e-voucher system that relies on technology to eliminate intermediaries, limit loopholes and enhance efficiency in the disbursement of agricultural subsidies.

Data from the e-voucher pilot in 13 districts highlights that the new technology successfully engaged more private sector companies, was readily taken-up by farmers and reduced leakages. Yet it also faced several challenges including delays in e-card issuing and activation; a heavy bias toward maize production and thus a lack of crop diversity; a built-in bias benefiting wealthier families, due to a required upfront contribution; due to their ability to provide the upfront contribution required to avail the subsidy; price volatility due to currency fluctuations; and limited farmer knowledge of the benefits of the voucher.

This chapter offers four policy recommendations to overcome these challenges as the program is scaled up. These include promoting crop diversification by way of spreading awareness and flexible rollout of the voucher, addressing leakages through verification by community leaders, reducing price volatility by encouraging domestic input production, and providing training to increase uptake of the e-voucher system among farmers.

The importance of agriculture in Zambia's economy

Zambia has experienced strong macroeconomic growth in recent years. Its economy grew at an average annual rate of 7.3 percent between 2010 and 2014.[3] However, the country has not been able to reduce poverty commensurate with the increase in its Gross Domestic Product (GDP). More than half of Zambians still live on less than US$ 1.25 a day.[4] The rural population, which is mostly employed in agriculture, accounts for 77 percent of the poor population, but only 59 percent of its total population.[5]

As it is the main economic activity in rural areas, policymakers view the agriculture sector as an important target for poverty reduction. Nonetheless, the sector is plagued by low productivity and slow growth.

Agriculture is the fourth largest contributor to Zambia's GDP, accounting for 10.5 percent in 2010.[6] The sector also accounts for nearly half of the country's total employment and provides livelihoods for more than 85 percent of the rural population.[7] As it is the main economic activity in rural areas, policymakers view the agriculture sector as an important target for poverty reduction. Nonetheless, the sector is plagued by low productivity and slow growth. Agriculture grew at an annual rate of one percent in the decade between 1996 and 2006.[8] The majority of agricultural workers are subsistence farmers who produce just enough for household consumption.

Historical context and the existing system of agricultural subsidies

Since independence in 1964, agricultural reform has been a priority for successive governments in Zambia. Farmers frequently report that access to agricultural inputs is a key constraint to enhancing their productivity. While commercial farmers can mobilize resources with relative ease, smallholders are constrained by limited access to credit and high interest rates that make it especially difficult for them to obtain agricultural inputs.

In the late 1990s, overall economic stagnation hit the nation's agricultural sector particularly hard. The Ministry of Agriculture later estimated that less than one-third of smallholder households had access to improved maize seed and just 20 percent of farmers had access to fertilizers.[9]

Following a decade of market liberalization, policymakers realized that small-scale farmer incomes were too low to afford farming inputs. To improve the situation, the government experimented with providing inorganic fertilizer and hybrid maize seed to smallholder farmers on credit from 1997-98 through 2001-02. But poor credit recovery and concerns about sustainability rendered this approach unsuccessful. Low farmer productivity and increased cases of food insecurity and poverty at the household and national levels persisted. By the early 2000s, poverty had intensified with nearly 78 percent of the rural population classified as poor.[10]

The Zambian government therefore started exploring an alternative support system for direct credit provision. Instead of a credit system managed by the public sector, the government opted to sell inputs on a direct cost-sharing basis. In 2002, in the midst of a stagnant economy, the government introduced a new cash-based (versus a credit-based) program called the Fertilizer Support Program (FSP). The government conceptualized the FSP to be a step in the transition to a more liberal economy. It aimed to build the capacity of both smallholder farmers and the private sector by increasing maize production and opening up new market opportunities for supply of inputs to rural areas.

In 2002, in the midst of a stagnant economy, the government introduced a new cash-based (versus a credit-based) program called the Fertilizer Support Program (FSP).

The FSP, which was implemented through 2008-09 before being renamed to the Farmer Input Support Program (FISP) in 2009-10, supplies a combination of basal and urea fertilizer and a pack of hybrid maize to farmers. Each beneficiary can receive 200kg of fertilizer and 10kg of hybrid maize seed, enough to cultivate half a hectare of land.[11] Farmers with a larger land size and capacity to grow additional maize or other crops have to source additional inputs through alternative means.

The FISP primarily subsidizes maize production as it is the country's staple food. In 2011, 86 percent of small-scale farmers grew maize and the crop

accounted for 70 percent of the cultivated land in 2014.[12] The government's initial aim was to stabilize the farmers' incomes and then gradually ease them out of the program. But over the years, more farmers have been added to the program than have graduated. The program has expanded in scale, from about 100,000 farmers in 2002 to covering about a million farmers by 2015.[13] Its budget allocation has increased tenfold, from about ZMW 100 million or US$ 10 million in 2002 to ZMW 1 billion, or US$ 100 million in 2016.[ii, 14]

Challenges with the existing system

How has the FISP fared in improving agricultural productivity and rural livelihoods? Studies show that despite the huge public investment in the program, there has not been a significant reduction in poverty, especially in rural areas.[15] Studies have also found that the FISP may be exacerbating inequality, as subsidized fertilizer is disproportionately allocated to wealthier households.[16]

Although there is evidence of increased maize production and increased incomes due to the existing system, the amount of the increase has been small.[17] The FISP has also been blamed for perpetuating dependence on a single crop at the expense of crop diversification. The lack of crop diversification and heavy reliance on maize is associated with increased risks through price volatility, climate change and limited supply of inputs for production.

Studies show that despite the huge public investment in the FISP there has not been a significant reduction in poverty, especially in rural areas.

The setup of the FISP limits private sector participation in providing input and output marketing services.[18] Subsidized fertilizer and inputs crowd out higher-priced commercial fertilizer and make it financially unattractive for the private sector to invest in the sector. The FISP is also associated with leakages before the subsidies reach the farmers.

The e-voucher system offers a potential solution to these challenges. Other countries' experiences

[ii] *Currency conversion based on ZMW10/US$.*

with e-voucher programs have produced positive results. For example, in Zimbabwe, a similar e-voucher program contributed to reducing corruption and increasing linkages between retailers, farmers and wholesalers.[19] In Malawi, the technology-based agricultural subsidy system proved to be an effective way to target the population eligible to receive subsidies.[20] These experiences in other countries underscore the potential for the e-voucher to improve the administration of agricultural subsidies in Zambia.

How does the new e-voucher technology work?

The government explored the new e-voucher technology as an alternative approach to resolve long-standing concerns about the FISP; including concerns such as beneficiary targeting and selection, delays in inputs distribution, corruption, high administrative and logistical overhead costs, and limited private sector or agro dealer participation.

The e-voucher is a card similar to a debit card, powered by Visa, that farmers can use to purchase subsidized inputs (see **Figure 1**). Each card is linked to farmers' names and National Registration Card (NRC) numbers. The government, through a financial institution, usually a bank, loads money onto the card. The amount loaded on the card is equal to the per beneficiary subsidy contribution for a particular year. Registered beneficiaries also have to deposit a personal contribution, which would be on top of the subsidy amount, into the same bank which loads the additional amount onto the card. The card is then activated and issued to the farmer to acquire inputs at a local agro dealer at her/his convenience.

In the 2015-16 farming season, the government subsidized farm inputs up to 80 percent of the total cost, the equivalent of approximately US$ 170.[iii] To this amount, beneficiaries were required to add another US$ 40 as an upfront personal contribution, bringing the total value loaded on the card to US$ 210 to be used for the entire farming season.

Registration of beneficiaries starts at the village level where small-scale but "viable farmers" are identified. The FISP defines "viable farmers" as those farmers who demonstrate commercial

[iii] *Information obtained from the Zambia National Farmers Union officials who are helping government implement the e-voucher program. The exchange rate used is ZMW10/US$.*

sense in their farming activities or those who run their farming activities for business purposes rather than for subsistence. Once the FISP prepares a list of viable farmers, they send it to the District Office where a register of beneficiaries is produced. The register is then sent to the Ministry of Agriculture in the capital, Lusaka. The Ministry of Agriculture provides the register to a bank, or multiple banks, and authorizes them to produce cards for each beneficiary on the register to load the pre-determined amount of money. Once the cards are ready, the Ministry of Agriculture sends them to the district offices who in turn distribute them to local registered farmers. In order for the farmers to use the cards, they have to deposit their personal contribution at the bank to have it loaded on the card. The bank activates the card, after which it is ready for use by the beneficiaries.

The Ministry of Agriculture shortlists agro dealers who meet the minimum requirements for supplying inputs to farmers in various localities through a tender process. Minimum requirements include certification from regulatory bodies such as the Zambia Bureau of Standards, the Zambia Environmental Management Agency and the Zambia Public Procurement Authority. The government expects agro dealers or their agents to be present in localities where the farmers are found and have a range of agricultural and livestock inputs such as day-old chicks, livestock feed, drugs, chemicals, seed and fertilizers to be shortlisted. Additionally, all agro dealers should have and operate Visa Point-of-Sale facilities without which farmers would not be able to complete the transaction.

Figure 1

Sample of the E-voucher visa card

Source: Zambia National Farmers Union (ZNFU).

How is technology improving the disbursement of subsidies in Zambia?

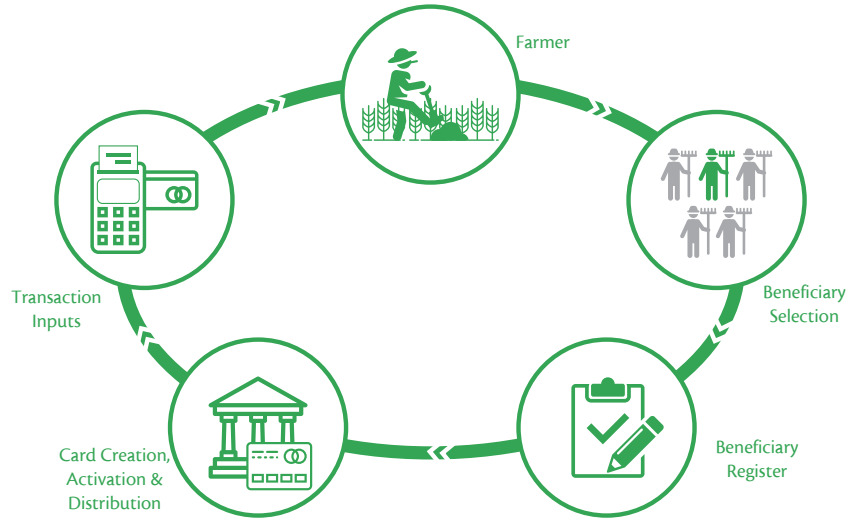
Although the e-voucher system has only been active for less than a year with limited geographic coverage, its design offers several improvements over the FISP system in Zambia.

First, payments for supplies have improved and are now made in real time. Once the farmer purchases inputs using her/his e-voucher at the agro dealer, the money is immediately transferred into the agro dealer's account at the bank. In the past, agro dealers would need to wait for a considerable period of time after supplying inputs for the government to make the payment. Second, farmers are required to be physically present with their identity documents and have their photos taken as part of farmer profiling at the time of e-voucher collection. This aspect alone has eliminated ghost beneficiaries. Only those who have registered in advance and have been verified are permitted to collect the cards.

In contrast, under the old FISP system, inputs were issued even in the name of those who did not qualify or had already passed away. In one of the districts where the e-voucher technology has been implemented, only 13,000 out of a total of 23,000 beneficiaries that had initially been registered were confirmed as eligible to

Figure 2

How the E-voucher system works



Source: Zambia National Farmers Union (ZNFU).

receive inputs, highlighting the more extensive verification process.[iv] The rest were either deceased or under-age children, and many had duplicate names or simply could not be identified.

Third, under the new e-voucher system, beneficiaries as well as agro-dealers can produce online weekly, monthly or quarterly transaction reports, making it easy to monitor subsidy-related activities. This is rich information that can be used for various purposes such as monitoring the frequency of input purchases by geographic location, timeliness with which inputs become available at various points of sale, and the mix of inputs obtained in each district. Similarly, it is much easier to obtain corresponding bank statements whenever necessary. In the absence of an electronic system, obtaining such information is a tedious and drawn-out process.

Although the e-voucher system has only been active for less than a year with limited geographic coverage, its design offers several improvements over the FISP system in Zambia.

Fourth, the e-voucher system is more cost-effective for the government as they do not have to incur transportation costs. Agro dealers also have the responsibility of delivering inputs to localities under the new system. Since they face competition from other agro-dealers in providing inputs to various localities, they try reducing costs to attract farmers. The government no longer has to bear the cost of transportation as is the case under FISP where the government not only has to contract inputs suppliers but also transporters.

Fifth, the e-voucher system shifts decision-making power to farmers with respect to the type of farming activities they engage in rather than incentivizing them to produce maize by subsidizing maize production and fertilizers only. This, in theory, should help promote agricultural diversification. The money loaded on the card can be used to purchase a range of inputs from seeds to chemicals. Nevertheless, the diversification benefit of e-vouchers has not been realized yet – a point that the chapter will elaborate on in the next section.

The e-voucher system is being introduced to improve the way agricultural subsidies are administered and disbursed. The new system is expected to be rolled out to more than 75 districts in the country over the next few years.

[iv] *This information is obtained from field officers from the Zambia National Farmers Union who monitor the e-voucher operations on behalf of the Government.*

Results from the e-voucher pilot

Data from the e-voucher pilot from 13 districts highlight how the new system administered subsidies in the 2015-16 season.[v] Although the new technology had significant benefits, the pilot identified some limitations that should be addressed as the technology is scaled up.

The e-voucher system, its greater efficiency and ease of use, increased private sector and farmer participation in the agricultural sector. During the season, 230 new agro-dealers registered with the government as a result of the e-voucher. From the perspective of the farmers, uptake was high. About 90 percent of beneficiaries who received e-voucher cards had activated them by February 2016.[vi,21]

Although the new technology had significant benefits, the pilot identified some limitations that should be overcome as the technology is scaled up.

The new system reduced leakages but still led to some wealthier beneficiaries getting more subsidies than poorer ones. Due to the in-person collection requirements and security measures, the system managed to decrease leakages. The Ministry of Agriculture estimated that more than 20,000 ghost beneficiaries were eliminated from the list of those eligible to receive subsidies.[22] However, since farmers had to load a personal contribution, or down payment, onto the card in order to activate it, the system disproportionately favored richer households with the means to make this payment. Further, since they had the means to make multiple down payments, richer families often had more than one beneficiary. About 24 percent of households interviewed in the baseline survey conducted by the Ministry of Agriculture reported having two or more beneficiaries.

The new system did not lead to significant crop diversification away from maize, which was a key goal. About 85 percent of households redeemed their e-cards for maize seed and fertilizer. Of the remaining 15 percent, the highest share of households redeemed livestock inputs such as veterinary drugs. Data also show that almost half of households redeemed their vouchers on one type of input, 41.5 percent bought two types of inputs and a small share

[v] The Ministry of Agriculture, together with the IAPRI, monitored the implementation of the e-voucher pilot program. The monitoring exercise includes interviews with government officials, focus group discussions with smallholder farmers to collect data on initial e-voucher use in May 2016 and interviews with cooperatives.

[vi] The Ministry of Agriculture reported that 198,004 e-voucher cards were activated out of 219,891 cards by February 2016.

(9.5 percent) bought three or more inputs. This highlights that they intend to produce a single crop, which was most commonly maize.

Beyond beneficiaries' purchasing patterns, the timing of the e-voucher rollout was also biased toward maize production. The start and end period for redemption of the voucher coincided with maize production season. There may therefore be more variation as time goes by when farmers purchase inputs in different seasons, but this remains to be seen.

Price volatility limited the effectiveness of the system, and the government had to provide additional funds to counter rising input prices. Between the time the card was distributed, loaded, and then utilized, rising fertilizer prices and a depreciating Zambian Kwacha made it unaffordable for farmers to purchase a sufficient amount of inputs. The government ultimately provided additional funds to counter the volatility, increasing the value of the voucher from 1,400 to 2,100 Kwacha, inclusive of the farmer's contribution of 400 Kwacha.

Figure 3

Pilot districts for E-voucher program in Zambia

Source: Ministry of Agriculture, Zambia.

The e-voucher pilot faced operational challenges such as limited awareness of the voucher's benefits and slow issuing and activation of e-cards. Although about 90 percent of interviewed farmers reported being aware of the e-voucher system, not all of them were familiar with its specific provisions. From the supply side, about half of beneficiaries had experienced difficulties in redeeming their inputs due to delays in the issuing and activation of cards by the government. These delays originated because district personnel had not submitted beneficiary names to the central agency in Lusaka. In addition to delays in issuing cards, lags in activation also posed a challenge. About 92 percent of interviewed farmers said they perceived delayed card activation as a major problem. Forty-six percent did not know whether or not their card had been activated. Card activation was also delayed by incorrect beneficiary information on the cards.

The way forward: Expanding the e-voucher system in Zambia

As the Zambian government implements the e-voucher program beyond the 13 pilot districts to the rest of the country, policymakers should take into account lessons from the pilot, other countries' experiences in using e-vouchers in agriculture and Zambia's economic landscape.

1. Promote crop diversification through increased awareness and flexibility in the timing of e-voucher rollouts.

The persistence of maize-farming by many farmers despite the e-voucher providing for other crops and livestock inputs reflects Zambia's past agriculture policy, which has always been biased towards maize. Various stakeholders, including the government, have been advocating to move away from growing maize as the sole crop. Dependence on maize affects agriculture productivity. Unlike other crops such as cotton, tobacco and soy beans, maize is a low value-added crop.

In order for the e-voucher to be successful in promoting a diverse agriculture sector, the Ministry should build in flexibility in the timing of the e-voucher rollout policy, and policy makers should spread awareness among farmers on the benefits of diversification and higher earning

potential from other crops. If the provision of the subsidy does not coincide with the beginning of the maize production season, farmers will have more options with respect to what to produce. The Ministry of Agriculture can conduct campaigns to educate farmers on these benefits through agriculture extension officers who are situated in every district.

2. Designate community leaders to verify beneficiaries for improved targeting.

The problem of targeting relatively wealthier beneficiaries was not fully resolved with the e-voucher. The Ministry of Agriculture can draw lessons from other poverty reduction programs in Zambia such as the Social Cash Transfer Scheme, which has well-defined eligibility criteria.[vii] The selection process of beneficiaries under the Cash Transfer Scheme also involves community leaders who can verify the eligibility of households and beneficiaries per household who are eligible for benefits under the scheme. This approach can be used under the e-voucher system.

Flexibility in when the e-voucher is rolled out, and more information on the higher earning potential of other crops will help promote diversity in agriculture.

3. Encourage domestic production of farm inputs, regularly reassess the subsidy amount, and designate contingency funds to protect against uncertainty .

Price volatility, especially with respect to fertilizer, affects the ability of the farmer to buy inputs. The depreciation of the Zambian Kwacha in December 2015 put inflationary pressure on a number of goods and services in the economy, especially imported goods. As most of the fertilizer and many inputs are imported, price and currency volatility will continue to affect the operations of the e-voucher in the future. As a longer term solution, the government should encourage domestic production of farm inputs in order to reduce dependence on imported inputs and lower its exposure to currency fluctuations. As a medium- term solution, the Ministry of Agriculture should regularly reassess the subsidy amount by taking into account inflation and economic trends. As a more immediate solution, the government should set aside a contingency fund to factor in any price or currency fluctuations.

[vii] *The conditions that households must meet to be eligible for the cash transfer scheme include a female-headed household keeping orphans; a household with a disabled member; or an elderly-headed household (over 60 years old) keeping orphans. There is also the category of a special case which is for cases that are critical, but do not qualify under the other categories; for example, a household of two elderly people who are unable to look after themselves.*

4. Provide training to increase farmer awareness of the provisions of the e-voucher and foster familiarity with the technology.

The low levels of knowledge on the specific provisions of the e-voucher among farmers also reflect low levels of general technological adoption and poor schooling. Many farmers lack the basic education needed to understand and use new technologies such as the e-voucher. Policymakers should implement non-formal education programs designed specifically for farmers. These programs should educate them on how to use new technologies such as the e-voucher. Communities can implement such programs at the local level to ensure that they are acquainted with the benefits of the technology before it is scaled up.

As a longer term solution, the government should encourage domestic production of farm inputs in order to reduce dependence on imported inputs and lower its exposure to currency fluctuations.

The above policy recommendations will help promote crop diversification, address leakages, reduce volatility and increase awareness with respect to the e-voucher. Other challenges such as delays in issuing and activating the e-voucher cards by the government will likely improve as implementers become more familiar with the system and processes.

Despite the current challenges in the e-voucher system in Zambia, it is a much improved method of delivering agricultural subsidies for the purchase of farm inputs. In time, this technology based intervention offers the potential to deliver greater efficiency in farming and better incomes for farmers toward improving food security and decreasing poverty in Zambia.

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ASSESSING THE SOCIAL DIMENSION OF THE DIGITAL ECONOMY

Policy frameworks for quality jobs of tomorrow

Sharan Burrow, International Trade Union Confederation (ITUC)
Anna Byhovskaya, Trade Union Advisory Committee to the OECD (TUAC)

The International Trade Union Confederation (ITUC) is the global voice of the world's working people. The ITUC's primary mission is the promotion and defense of workers' rights and interests, through international cooperation between trade unions, global campaigning and advocacy within the major global institutions. Its main areas of activity include trade union and human rights; economy, society and the workplace; equality and non-discrimination; and international solidarity. The ITUC adheres to the principles of trade union democracy and independence.

The Trade Union Advisory Committee (TUAC) is the interface for trade unions with the Organisation for Economic Co-operation and Development. It represents 58 national trade union centers and 66 million workers in OECD countries along with associate members in Brazil, Indonesia, the Russian Federation and South Africa. TUAC closely monitors policies on economic development, employment, investment, financial markets, corporate governance, taxation, innovation and the digital economy, skills, development and climate change.

WORLD

31,934

GDP per person employed (constant 1990 PPP $)

44

Internet users (per 100 people)

99

Mobile cellular subscriptions (per 100 people)

2.12

Research and development expenditure (% of GDP)

17

High-technology exports (% of manufactured exports)

CHAPTER 09

ASSESSING THE SOCIAL DIMENSION OF THE DIGITAL ECONOMY

Policy frameworks for quality jobs of tomorrow

Sharan Burrow, International Trade Union Confederation (ITUC)
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New technologies and their impact on jobs are spreading at an increasingly rapid pace. The future of work will bring opportunities and challenges that will need to be addressed by all stakeholders: governments, businesses, international organizations, the internet governance community, and trade unions – in both industrialized and developing countries. A long-term scenario, where technological progress results in positive change for both workers and consumers, begins with a careful assessment of the present situation: 1) the scope of the impact of technological change on jobs; 2) the policy challenges it poses; and 3) corresponding solutions.

While estimates of the market share and job effects of the digital economy vary widely, a mid-term rise in labor market polarizationi is likely. But it is also preventable.

The expansion of the digital economy has tangible effects on labor markets. This is true for industrialized countries as well as for developing economies, depending on the extent to which their economies and infrastructure support digitalization. Complex networks and technologies, including big data, cloud computing, robotics and the Internet of Things (see **Table 1**) enable new business and employment models in both manufacturing and services. New forms of non-standard work in the online platform economy and mobile work are creating a growing gap between digital innovation and decent work, which includes fair wages, social protection and the right to bargain

collectively. While estimates of the market share and job effects of the digital economy vary widely, a mid-term rise in labor market polarization[i] is likely. But it is also preventable.

So, how can the profits from digitalization be channeled into social gains and greater productivity for all workers? How can regulatory frameworks be used to reduce inequalities and improve living standards in the long term?

This chapter provides an overview of the short- and medium-term effects of digitalization on workers. It then seeks to map out the effects of digitalization on existing jobs as well as the implications of the growing platform economy for employment relationships and working conditions. It links these impacts to potential policy frameworks and the role of trade unions. In doing so, the chapter considers how to align technological innovation with appropriate regulatory and labor market policies and standards to ensure a fair transition toward quality jobs in the digital era.

Table 1

Glossary of key terms

ICT	Information and Communication Technology (ICT) including ICT infrastructure, ICT products and information and electronic content.[1]
Automation	Any process that leads to functions in production or service systems being performed automatically. Automation affects a range of industries and sectors, enabled by different technologies, including robotics, sensors, and IT applications.
Big Data	Techniques and technologies for processing and analyzing large volumes of data.[2]
Cloud Computing	Storage of data on multiple web servers.
Digitalization	Processes leading to the gradual adoption or use of digital or ICT by an organization, industry, or society.
Robotics	Application of robots, leading to an increased automation of tasks through machines and process systems.
Internet of Things	A form of IT infrastructure involving interconnecting (physical and virtual) objects and devices, based on existing and evolving interoperable ICTs.[3]

[i] *Labor market polarization refers to a decline in the number of middle-class jobs requiring a moderate skill level relative to low-paying jobs requiring a low skill level and high-paying jobs requiring a high skill level. .*

Introduction

The "digital economy" is ubiquitous. Linking it only to the Information and Communication Technology (ICT) sector is too limited as digitalization now penetrates most aspects of economies and societies. The digital economy is built on connectivity and networks, resulting in integrated systems that enable rapid production, instant transmission and sharing of content in virtually all spheres of economic and social activity.

Business models rely on the free flow of data, cross-border transactions, and the mobility of intangible resources. As a result, the location of economic activities is becoming more fragmented and the attribution of a company's rights and duties to particular jurisdictions more difficult.

Business models rely on the free flow of data, cross-border transactions, and the mobility of intangible resources. As a result, the location of economic activities is becoming more fragmented and the attribution of a company's rights and duties to particular jurisdictions more difficult.

Digital change in industrialized and developing economies

Disruptive innovation refers to new goods and services replacing existing structures and competitors. In the absence or non-application of appropriate regulations and policies to govern the new structures, this rapid transformation can have adverse effects on employment and working conditions, such as displacement of workers and increasing skill gaps in occupational tasks. While the digital economy is growing fast – mobile broadband is, for example, considered the fastest growing technology to date[ii,4] – its scope and effects on economies are hard to determine.

The digital sector's share in global Gross Domestic Product (GDP) is projected to increase up to 3 percentage points by 2020 in some advanced economies.[5] The digital economy itself contributes up to 8 percent of GDP in G-20 economies, according to the European Commission.[6] An exponential rise in private investment in key technologies, such as Artificial Intelligence (AI), is driving this trend.[7]

Successful firms in the digital economy can reach global scale quickly without a lot of physical infrastructure and human resources. For

[ii] *Forecasts estimate that by 2020, there will be 5.6 billion unique mobile subscribers globally – more than the number of people with electricity at home (5.3 billion), bank accounts (4.5 billion) or running water (3.5 billion).*

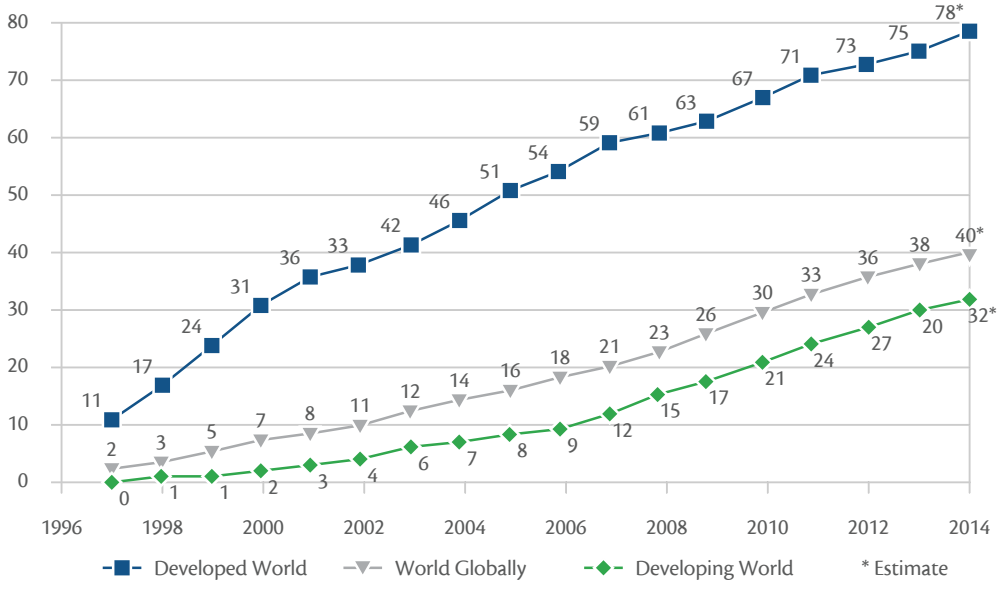
developing countries in particular, this enables companies to integrate into global value chains more effectively and easily, creating new market linkages or altering existing ones. This is true for production of goods and the provision of services, since workers in any location can be contracted to complete online tasks. This poses its own challenges for working conditions. As broadband access in developing countries is also growing, regulatory challenges should be addressed at an early stage to ensure that digital divides close in tandem with decent job creation.

For now, more than half of the world's population does not have access to the internet, a vast majority living in developing countries (see **Figure 1**). With increased penetration of ICT, this raises the specter of deepening development gaps between countries, as well as within emerging economies, where investment in broadband is significant but highly uneven.

Bridging such digital divides – within and between countries – can be achieved with public policies and investments that promote ICT

Figure 1

Internet users/100 people



Source: "Internet users per 100 inhabitants 1997 to 2014", ICT Data and Statistics (IDS), International Telecommunication Union (ITU). Retrieved 25 May 2015.

diffusion and universal broadband access and support developing countries, rural regions and vulnerable groups in accessing ICT services.

This chapter will concentrate on the effects of the digital economy in industrialized countries, as they are more amplified and data is more readily available. However, these effects demonstrate the impact that can be expected globally from greater digitalization, especially given that investment, competition and labor regulations governing – especially their enforcement – are often weaker in the developing world.

The scope of digital change and labor market implications

Digital content and products are sweeping the globe. The scale and pace of innovation in digital technology is unprecedented (see **Figure 2**). This can be attributed to several factors. First, low and decreasing costs of data collection, storage – consider the "Cloud" – and processing are driving adoption of digital products and contents. Internet penetration has become faster and networks are now more sophisticated, from internet to mobile networks to virtual reality. Meanwhile, the amount of data circulating online and collected is growing – think of "Big Data". This allows for more efficient data analysis, but bears considerable privacy concerns. Algorithms are increasingly smarter – seen with the rise of Artificial Intelligence Interfaces and pattern recognition software.

These factors will speed up automation processes and re-structure service delivery and the functioning of global value chains. This will in turn transform the way people work and the competencies required by workers. Existing processes will become more efficient, bearing opportunities for productivity growth, but also posing the threat of job displacement. This will more likely affect workers who perform routine-intensive, repetitive tasks. Digitalization could also lead to increased "casualization" of work, the fragmentation of jobs into tasks, and the transformation of entire sectors like transport and hospitality. This is already visible with the provision of urban transport or rooms and holiday homes via web-based applications.

Bridging such digital divides – within and between countries – can be achieved with public policies and investments that promote ICT diffusion and universal broadband access and support developing countries, rural regions and vulnerable groups in their ability to access ICT services.

The effects of digital diffusion – the spread and use of ICT tools – on jobs are multi-layered: an ongoing process of greater automation in manufacturing; the creation of sophisticated online training and online public services (e-government); a rise in self-employment, enabled by online platforms; and working arrangements based on increased ability of employees to work remotely and across borders.

The expansion of mobile work is a good example of how digitalization is changing the way we work right now, as "workers can do their job from any place at any time, supported by modern technologies."[8] ICT-enabled mobile work increases the flexibility and autonomy of workers, in particular for those who want to work from a different location, or from their place of residence, which may be remote or rural.

But other effects of "teleworking" and flexible working arrangements may not be as positive: employers may shirk their responsibilities. For example, employers may not adequately ensure health and safety for mobile workers, including insurance, ergonometric and/or secure equipment and workplace inspections. Working conditions and hours become difficult to regulate

Figure 2

Diffusion of selected ICT tools and activities across OECD countries as a percentage of enterprises with ten of more persons employed:

Source: OECD (2015), OECD Science, Technology and Industry Scoreboard 2015, OECD Publishing (figure 4 - page 32)

and oversee for mobile workers. At the same time, employees working remotely on a regular or permanent basis may be excluded from company discussions and decisions involuntarily if no remote communication channels or face-to-face meetings are arranged. This not only limits their knowledge about internal processes but their access to a community and ability to raise and share concerns.

Beyond that, technically advanced monitoring can result in several issues, including privacy violations, "as systems […] capture whether a worker is logged on to the company network and how long they work on each task."[9] Such monitoring exacerbates the existing trend of task-based payment rather than payment based on working hours, depriving more workers of traditional compensation schemes and enhancing the possibility of income insecurity. Mobile work needs to abide by the same standards as regular employment – social security, minimum wage, and agreed upon working hours. Otherwise, there will be additional pressure on workers to compete for tasks, be constantly available, and work faster to satisfy the client or their employer.

Other effects of "teleworking" and flexible working arrangements may not be as positive: employers may shirk their responsibilities.

Social dialogue is essential to bring flexibility gains from technology advances together with worker well-being and protection. Agreements on working time and design – agreements to protect workers from any repercussions on their health, safety and welfare – should be integral to governing mobile work.

More broadly, at least two impacts must be considered in the context of digital change and the world of work. First, job losses could accelerate if no fair transition strategies are put in place to address the replacement of routine-intensive jobs brought on by automation. Second, the upward trend of increases in the number of non-standard jobs could be amplified by the rise of online platform enabled work. Both trends might lead to training deficits and growing income inequalities.

The policy response

Policymakers, trade unions, civil society and businesses need to respond to different dimensions of the digitalization of work. Technological change presents great potential for job creation in sectors related to science, technology, engineering, and

mathematics (STEM), including ICT, health and services. Technologies that shift economies to a more "low-carbon" growth trajectory will also generate opportunities for employment. There are now more than 8 million workers worldwide employed in renewable energy. The G20 countries have committed to infrastructure spending of 1 percent of GDP to enable green infrastructure to meet the climate change challenge. This will lead to job creation. As past industrial transformations have demonstrated, investment in research, development and innovation can boost jobs in all sectors.

As industrial transformations have demonstrated in the past, investment in research and development and innovation can boost jobs in all sectors.

Yet the evolution of new digital technologies could also potentially displace large numbers of workers and affect the nature of work in some occupations. A balanced, critical assessment is necessary.

This chapter takes a systematic approach, looking at present employment dynamics across two dimensions: first, the effects of digitalization on occupational tasks in existing jobs; and second, the nature of new jobs created directly by the digital economy, focusing on online platform-enabled work.

Traditional jobs affected by digitalization

Digitalization will impact production, resource management, and service delivery. According to recent studies, jobs in a diverse set of sectors and occupations will experience digitalization to varying degrees. From manufacturing and retail, to translation and financial services, to logistics and transport, workers across a large swathe of the economy will be affected. In some cases, jobs will disappear completely, while for most occupations only specific tasks will change.

Big Data and sensors for real-time, remote monitoring of processes will optimize logistics and shape general production and maintenance tasks. Advanced manufacturing, where automation has long been underway, is witnessing increased use of man-machine collaboration and 3-D printing. Utilizing intelligent systems to achieve more effective, tailor-made production is good, but concomitant training, health and safety at work will help ensure that workers benefit as well.

Predictions vary on the number of jobs that could be displaced by such processes. An Oxford Martin School study claimed that 47 percent of jobs in the United States are at risk of automation over the next two decades.[10]

Such estimates involve significant uncertainties. What is more important to examine is the extent to which the tasks in a given occupation are, or can be, automated. The OECD finds that "a relatively higher ICT intensity can substitute for part of the more routine jobs."[11] In other words, depending on the sector and sophistication of the enterprise, occupations performed through a set of discrete tasks can be partly automated or modified through the use of ICT systems.

Just 9 percent of jobs are at high risk of being displaced through automation, as over 70 percent of the tasks they involve can be automated. Another 25 percent of jobs would be transformed but not necessarily eliminated, since only half of the involved tasks can be automated.

As a recent study pointed out, just 9 percent of jobs are at high risk of being displaced through automation, as over 70 percent of the tasks they involve can be automated. Another 25 percent of jobs would be transformed but not necessarily eliminated, since only half of the involved tasks can be automated.[12]

The World Bank predicts that certain tasks will always require capabilities that humans possess and computers do not – such as complex reasoning, socio-emotional skills, tacit knowledge and judgment.[13]

Other experts and observers are less optimistic about the job displacement effects of automation. Erik Brynjolfsson and Andrew McAfee from the MIT Sloan School of Management suggest that "the second machine age" will affect a wide range of cognitive, non-routine tasks amid a "great decoupling" of economic growth and job creation.[14] As Nouriel Roubini points out, "unless the proper policies to nurture job growth are put in place, it remains uncertain whether demand for labor will continue to grow as technology marches forward."[15]

Such theories are likely too simplistic. Any automation process and the introduction of new technologies can enhance productivity while maintaining or even increasing the size of a company's or sector's workforce, or else create new jobs elsewhere in the economy.

The most likely scenario is that new technologies will make dealing with complex tasks more efficient, while other, more simple or repetitive tasks will become fully or partially automated. In between, as technology advances, there is a significant opportunity to create new jobs and to adapt existing jobs to leverage the benefits of digital change. Such opportunities need to be explored and a transition to such jobs facilitated.

However, if the transition to a more digitized world is not managed carefully, labor markets will become increasingly polarized – with high-wage, stable jobs for those with specialized skills, low-wage service sector jobs that are hard to automate but easy to place under non-standard employment relationships, and not much left in the middle. As the Oxford Martin report notes, "wages and educational attainment exhibit a strong negative relationship with the probability of computerization." Such non-standard jobs "tend to have fewer rights to social protection, receive less training, often have weaker career progression, lack access to mortgage and other forms of credit, and face greater insecurity."[16]

Any automation process and the introduction of new technologies can enhance productivity while maintaining or even increasing the size of a company's or sector's workforce, or else create new jobs elsewhere in the economy.

In this context, active labor market policies and investments in re-training schemes and employer-promoted work-based learning should be designed to help workers who are displaced by digitalization adapt to technology through the acquisition of other skills that open doors to high-quality jobs. Moreover, such programs can help workers who have maintained their jobs learn new skills and perform new functions in their current work, as a way of preventing displacement and remaining employable in the digital era. Beyond training programs, labor standards and policies need to be applied to prevent the spread of precarious non-standard work facilitated by technological change.[19]

Social dialogue is a well-proven method for managing processes of change and should be a central element of policymaking and implementation. Consultations with worker representatives are central to developing fair transition strategies and designing working arrangements and training. It is essential to discuss employment conditions, training needs and potentially new job profiles with trade unions

and employees at an early stage. Input from workers benefits business processes. Committed employees who know how to effectively utilize new technologies will contribute to a firm's overall productivity. A workforce in regular employment will earn better and consume more of the firm's goods and services.

It is essential to discuss employment conditions, training needs and potentially new job profiles with trade unions and employees at an early stage. Input from workers benefits business processes.

At present, trade unions take part in policy discussions on innovation and industrial frameworks in some countries, especially in Europe due to a strong model of social dialogue.[20] They accompany workers in steering the introduction of new technologies through collective bargaining to ensure fair wages and transition arrangements, training and career guidance. Governments and businesses should support such models and engage workers in the process of technology adoption.

Non-standard forms of work

"Non-standard work refers to jobs that fall outside of the realm of standard work arrangements, including temporary or fixed-term contracts, temporary agency or dispatched work, dependent self-employment, as well as part-time work, including marginal part-time work, which is characterized by short, variable, and often unpredictable hours. It can be both formal and informal."[17]

Employment relationship

"The employment relationship is a legal notion widely used in countries around the world to refer to the relationship between a person called an "employee" (frequently referred to as "a worker") and an "employer" for whom the "employee" performs work under certain conditions in return for remuneration. It is through the employment relationship, however defined, that reciprocal rights and obligations are created between the employee and the employer."[18]

Jobs in the digital economy

When discussing jobs created through the digital economy, policy attention is currently focused heavily on the "platform economy." Every day, a new mobile application or online platform emerges promising to deliver a service faster and cheaper than before. Certain digital economy companies dominate the news cycle, whether because of large-scale product launches and service expansions (e.g. Google and Amazon), intense competition (e.g. Apple vs. Microsoft), or controversies surrounding lawsuits or workers' protests (e.g. Uber).

Platforms are growing exponentially and expanding to new sectors. More traditional companies have also begun acquiring or investing heavily in platforms, leading to a potential proliferation of these business models.

Online platforms operate on different business models,[21] including non-profit platforms that enable interactions between online users and for-profit peer-to-peer platforms that enable exchanges of resources or co-financing pledges between them.

This section focuses on the for-profit platform economy, which can be differentiated from the collaborative sharing economy. The chapter focuses specifically on platforms operating as for-profit businesses that bring together workers and consumers – a so-called business-worker-user business model. Such companies monetize the transactions and service delivery that take place, impose fees and often set wages, rules and standards.

Jobs on such platforms can be divided into two categories: on-demand jobs and crowd work (see **Table 2**). In both cases, platform companies assume an intermediary role in connecting workers that provide services to clients. The difference lies in the nature and location of the work performed, and the organizational structures of the platforms. On-demand jobs refer to traditional work, such as driving, cleaning, and administrative tasks, offered via mobile or web applications. Crowd work refers to tasks completed remotely, for which the worker need not be in any particular location.[22] Location is indeed an important distinction affecting the way work is performed, as a recent European Trade Union Institute (ETUI) report argues.[23]

Both types of platforms can also serve as a vehicle for outsourcing. Previously, tasks such as design, translation or accounting would have been

carried out by in-house employees or freelancers based on contractual arrangements. Now firms can outsource these tasks to platform economy workers to reduce labor costs.

Both types of platform economy work – on-demand and crowd work – are likely to become a much broader phenomenon. Platforms are growing exponentially and expanding to new sectors – for example, UberHealth for care work and UberEat for food delivery. More traditional companies have also begun acquiring or investing heavily in platforms, leading to a potential proliferation of these business models.

Ensuing challenges

The main issue with platform economy work is the fact that companies often skirt regulatory standards. Like other firms, online platforms profit from demand for certain goods and services, but unlike traditional companies, they often avoid regulatory obligations – especially regulations related to labor, consumer protection and taxation. The dissolution of employment relationships and the risk of increased income insecurity are two major outcomes of this regulatory arbitrage.

While not all platform companies are operating in the same way, there are prominent challenges. First, business models often rely on short-term financing with high pressure on profit margins, motivating firms to skirt regulations around the employment relationship and taxation. In this context, firms shift the risk of entrepreneurship to the workers – no demand, no work – along with the burden of taxation and social protection. Even though workers take on these burdens, they often

Table 2

On-demand jobs vs. crowd work

	On-demand jobs	Crowd work
Description	Traditional, often physical and location-based work facilitated through mobile applications or web platforms that often set the terms of service (including prices and fees) for both the consumers and workers.	Tasks that are performed online across borders through web platforms.
Examples of Work/Tasks	Driving, cleaning, care or repair work, delivery services, clerical work.	Website development, graphic design, ghost writing, translation, photo tagging.
Examples of Platform Economy Firms	Uber, Lyft, Care.com, Handy, Deliveroo, TaskRabbit.	UpWork, Crowdflower, Amazon Mechanical Turk, Crowdsource, 99Designs.

lack control over decisions around pricing, service delivery, and working hours, making their work distinct from other forms of entrepreneurship. At the same time, crowd workers are often forced to compete for tasks across borders, and are unable to claim their rights or contest their working conditions – whether because of fear, lack of information, or active discouragement from the company.

Workers feel forced to provide services at below-market price in order to attract work and establish a good reputation on the platform. The system relies on the fact that there is not enough demand, but an oversupply of workers willing to take on tasks. With criticism rising, TaskRabbit – an online platform for services such as cleaning, running errands or repair work operating since 2008 pre-dominantly in the United States and United Kingdom – recently introduced a minimum wage of US$ 11.20, higher than the minimum wage in many U.S. states. Nonetheless, the company still denies its "Taskers" an employment relationship.

By avoiding employer responsibilities, including contributions to social security benefits, and by preventing workers from organizing collectively or obtaining any rights, such as those around sick, maternity and/or paid leave, some of these companies drive precarious work. Companies in this field are spending substantial resources on lobbying for relaxation or removal of regulations that hinder their business models and could potentially force them to establish an employment relationship with workers. The same applies to preventing new regulations or legal frameworks tailored specifically to the platform economy.

Many observers and trade unions are raising the issue of online platforms classifying their employees as independent contractors. Workers on these platforms need to pay taxes and social security contributions as would any other self-employed worker, while firms like Uber – an on-demand transportation provider – take commissions from their earnings.

The dissolution of employment relationships and the risk of increased income insecurity are two major outcomes of this regulatory arbitrage.

One of Uber's arguments for not granting employee status to its workforce is the immeasurability of hours worked. However, on-demand, app-based platforms are a data mine, tracking every step of service delivery. As the Economic Policy Institute has pointed out: "Uber can and does measure the time drivers have their apps on, to the minute."[24] In some U.S. cities, Uber

guarantees average wages per hour if a driver is working most of the time on the application within a certain time period. The wages are above the statutory minimum wage, but once social security, insurance costs and potential payments on loans taken to buy a car are deducted, they slip below the minimum wage. In addition, unpredictable demand, volatile price settings and rating systems affect engagement rates and thus exclude drivers from the guaranteed wage program and predictable, regular earnings more generally.

Most online platforms like Uber determine the fees and prices without consulting their workers. At the same time, service delivery is rated by the clients, who might not always be objective. Uber can then block a driver if the ratings are bad or if she/he does not respond to a request fast enough. This does not fit well with the company's assertion that drivers are independent contractors or freelancers.

Platform economy workers lack fundamental labor standards and rights at work.

What about the scale and prevalence of platform economy work?

According to a 2016 JP Morgan Chase report, 4 percent of American adults earned income from the online platform economy between 2012 and 2015, a 47-fold increase over the last three years.[25] For most individuals, platform work is not their principal source of income. Those working on labor platforms, such as Uber or TaskRabbit, earned an average of 33 percent of their total monthly income through the platform. For those earning through capital platforms, such as eBay or Airbnb, the average was 20 percent of monthly income. The share of income earned is higher among low- and medium-income workers in labor platforms – pointing to the fact platform economy work might be a last resort for those struggling to make ends meet.

There is thus a distinction between workers only using the platforms irregularly to top up their income, which nonetheless points to the fact that wages may be insufficient, and those who need to engage on platforms more regularly in addition to their regular job. The latter results in overtime work, and points to the fact that these workers cannot find another source of income in the formal economy. There are also those who are at first attracted by the accessibility of this type of work but are not aware of its downsides. All in all, the platform economy for low- and medium-income workers is a manifestation of rising income inequality more than freedom of choice.

With employment levels yet to return to pre-crisis levels in most industrialized economies, the platform economy emerges as the only recourse for some workers. When they are not recognized as employees, their economic situation remains unstable and they lack training and other opportunities to find more permanent, regular employment. In developing countries, where informal employment is still high, such opportunities present a chance to earn more income. However, in the long-term, they do not lead to achieving decent work and standard employment relationships in these economies, and instead create a new category of non-standard work. To avoid such a precarious cycle, platforms should provide a threshold of hours worked that would allow for an employment relationship with all labor rights in place.

The long-term consequences of the trends described here are manifold. First of all, those who work part- or full-time in the platform economy, like other non-standard workers, generally earn less than those in similar jobs with standard employment relationships. In the OECD, median annual earnings of non-standard workers are about half the level of those for standard workers.[26] These low earnings have short- and long-term consequences for economic growth. Low wages lead to weak aggregate demand, preventing the global economy from getting back on track.

The share of income earned is higher among low- and medium-income workers in labor platforms – pointing to the fact platform economy work might be a last resort for those struggling to make ends meet.

In the long run, the growth of non-standard work will impact the skill levels and productivity of the workforce, since training is often insufficient or absent altogether. On the other hand, a commitment to workers through standard employment relationships can boost productivity, leading not only to lower levels of inequality but also more sustainable economic growth.[iii,27]

The challenges at hand might present an opportunity to identify and bring together workers now assembled through large online platforms. For example, tradespeople like plumbers and electricians, who have long worked as self-employed independent contractors, may

[iii] *A stronger commitment to employees exercised through regular employment contracts can lead to less need for monitoring of their work; greater loyalty and thus less likelihood of "leakages" of sensitive company information; and greater utilization of employees' tacit knowledge to build innovation potential and expand operations.*

now be easier to organize if a large proportion are working though a single platform.[28] This may offer scope for establishing collective bargaining rights for these workers.

Policy pathways toward a more equitable digital economy and quality jobs

As outlined above, the technologies enabling the digital economy and digitalization processes result in employment challenges that are not new, but are amplified and spread at a faster pace. Policies and regulatory frameworks do not need to be completely revised or reinvented. Instead they need to take into account the changing dynamics of work.

The challenges at hand might present an opportunity to identify and bring together workers now assembled through large online platforms.

The potential of automation of certain tasks within jobs demands fair transition strategies: increased funding for public education and training systems, including support and training for teaching staff; investment in technical and vocational education and training (TVET) and apprenticeship programs; and on-the-job training to enable people to acquire basic, advanced and/or specialized digital skills depending on their professional needs. Moreover, social safety nets and active labor market policies are necessary to bring workers into new quality jobs.

Companies deploying new business models in the digital economy need to be held to the same standards as more traditional firms when it comes to workers' rights. In this context, effective regulatory frameworks around investment, competition and taxation are also essential.

Finally, in addition to a more robust strategy to improve employment outcomes for workers affected by digitalization, greater equality of access to the digital economy needs to be ensured. This requires investments in ICT and broadband infrastructure development to bridge digital divides and allow for local content development in developing countries and among vulnerable groups.

An action plan for quality jobs in the digital economy[29]

Ensuring good working conditions through:

1. Working hours regulation, including overtime regulation.
2. New rules for mobile work .
3. Innovative work practices that enhance labor productivity and employee satisfaction .
4. Data protection – personal and commercial – including machine-collected data at the workplace.
5. Lifelong learning: on-the-job training and strengthened TVET systems.

Promoting employment relationships and a rights-based approach:

1. Extend rights and protections to all workers, regardless of the type of labor contract.
2. Reattach employer responsibilities, such as contributions to social security benefits.[iv]
3. Establish binding corporate accountability for lead firms, including transparency criteria on budgets, labor practices and workers in supply chains.
4. Strengthen social safety nets for platform economy workers by ensuring similar coverage including health, disability, pensions and unemployment benefits as other workers.
5. Enforce minimum wage legislation .
6. Strengthen collective bargaining coverage and effective social dialogue.

Developing systemic policies based on:

1. Union involvement in all national, sectoral and local digital transition processes.
2. Social protection systems that provide universal and portable coverage.
3. Commitment to quality jobs, including fair wages, social protection coverage, upskilling and stronger labor market institutions.
4. Public investment in universal broadband access.
5. Education and training systems across all age groups to prepare workers for technological changes .
6. Automation processes that render production more efficient without displacing workers.
7. Job creation in the ICT sector and STEM-related fields, in health and services sectors, and through the transformation of industries to low-carbon pathways.

Establishing preventative mechanisms including:

1. Fair transition strategies for workers in sectors prone to automation and digitalization – including a whole-of-government approach that features technology, industrial, employment, social and training policies .
2. Predicting shifts in job profiles and identifying new employment opportunities.
3. Anticipating future skill needs by occupational task.
4. Analyzing the spread and effects of new technology on production, service delivery and working conditions.

[iv] *In countries where such benefits are provided in regular employment.*

Strengthening workers' voice in the digital economy and digitalization processes

Healthy industrial relations generally result in greater income stability and distribution, and are critical for managing the transition to more digitalized economies. Evidence shows that strong labor market institutions, including collective bargaining and hence unions, are essential to ensuring fair wages and an equitable distribution of productivity gains. In a 2015 paper, the International Monetary Fund's research department made the case for trade unions and collective bargaining as a powerful tool to keep income inequality in check.[30]

Healthy industrial relations result in greater income stability and distribution, and are critical for managing the transition to more digitalized economies.

Unions are at the forefront in guaranteeing good working conditions and overseeing and managing the effects of outsourcing and displacements resulting from technological change.

It is therefore crucial to expand union membership and collective bargaining coverage in the context of the digital economy rather than allow it to weaken. Unions do not only react to disruptive processes; they also contribute to the development of future company strategies and support employee-driven innovation and further development of workforce skills. They negotiate the introduction of new organizational models – including those that promote data protection and workers' health and safety – and technology, such as advanced ICT and robotics, through meaningful social dialogue.

Trade unions at the national and global level are developing principles, engaging directly in the digital economy, and participating where possible in the development of industrial and innovation policies. For example, trade unions and the International Transport Workers' Federation (ITF) are supporting Uber workers in their effort to organize and establish an employment relationship. IG Metall in Germany created the Fair Crowd Work website that allows platform economy workers to rank their wages, rate their working conditions, and obtain information on their rights.

Moreover, trade union action compels government action to improve the quality of work. The California Labor Commission ruled in June 2015 that an Uber driver is an employee, not an independent contractor,[31] and the U.S. city of Seattle passed a bill giving on-demand drivers the right to unionize.[32]

We cannot yet foresee all the consequences from digital change. What is needed now is to examine the opportunities and challenges arising and shape legal instruments and regulatory frameworks toward reaping the benefits and minimizing the costs of a large-scale transition to digital work. Unions are integral to the process of ensuring that economies of the future are inclusive.

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SPOTLIGHT: AN IMF AGENDA FOR BALANCING EFFICIENCY AND EQUITY

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"…the time is not far distant when everything that machinery and cheap labor can produce will crowd every market. The millions of China, with the millions of India, will offer the cup of cheap machine labor, filled to the brim, to our lips, and force us to drink it to the dregs, if we do not learn wisdom."
(The Atlantic, volume 44, 1879*)*

"We are being afflicted with a new disease ... technological unemployment."
*(*John Maynard Keynes, 1930*)*

Fear of "others" taking "our" jobs is a staple of economic discourse. Sometimes it is a fear of China, sometimes of robots; today it is a fear of the effects of Chinese investment in robots. Digital technology and the 'sharing' economy have transformed the world of work, but they have also fueled familiar fears about the impact of technology on jobs.

Technological advancements boost productivity, the demand for labor and the quantity and quality of jobs. They contribute to national and global long-run efficiency and more arguably, to long-run equity at a global level.

But along with these benefits, policymakers must acknowledge and address the displacement that results from the use of new technology. Without appropriate policy frameworks to manage these changes, fears about the short-run job losses will trump the longer-run benefits of technology adoption.

In the last few years, the International Monetary Fund's (IMF) policy advice is increasingly geared toward balancing the efficiency and equity effects of labor market developments. The evolution in its thinking and advice has three aspects, and is pertinent to how policymakers deal with labor market impacts of new technology.

First, more so now than in the past, the IMF is paying attention to the distributional consequences of economic developments and policies. Second,

its framework for thinking about labor market policies is one that increasingly recognizes that many policies need to strike a balance between promoting efficiency and protecting the basic needs of workers. Third, the institution has tried to elevate the importance of job creation in policy discussions with a 'two-handed' approach – one that recognizes the importance of both aggregate demand and aggregate supply, and advocates policies to boost both.

This evolution bodes well for the IMF's ability to offer good advice on employment, including how to manage the effects of technology on the quantity and quality of jobs.

Evolution in IMF thought

1. Who gets what: paying attention to distribution

The focus of traditional macroeconomics has been on growth rather than distribution; on the size of the pie rather than how it is split up among people. Partly, the rationale is that distributional issues are less vexing when the pie is growing; and partly it is that in a market economy, some degree of inequality is unavoidable, and perhaps even desirable. This outlook supports capital-intensive investments in technology irrespective of their impact on employment.

Over the past decade, however, issues of distribution have become prominent in macroeconomics, with even the IMF acknowledging the adverse effects of inequality on economic growth. Ostry et al. in their widely cited work show that increases in inequality can lower the durability of growth. They also find that redistribution, unless extreme, does not inhibit growth.[1]

IMF research has also looked into the impacts of developments and policies on inequality. One study found that a decline in unionization is associated with increases in inequality.[2] Loungani et al. also show how capital account liberalization and fiscal consolidation are both associated with increases in inequality.[3] This does not mean that these policies may not be desirable or necessary in some instances. But policymakers have to be aware of the efficiency-equity tradeoffs they entail. This is also true for technology adoption.

2. 'Protect workers, not jobs': Labor market flexibility

The second evolution in IMF thought is on the role of labor market policies. A paper by Blanchard, Jaumotte and Loungani suggests that a purely market fundamentalist approach will not provide enough protection to workers; the role of labor market policies is thus to promote efficiency, but not at the cost of jeopardizing adequate protection of workers.[4] This is particularly pertinent in light of the churn that technology brings.

Blanchard, Jaumotte and Loungani distinguish between two types of flexibility that labor markets need. The first is "micro flexibility" the reallocation of workers to jobs as comparative advantage shifts. According to the authors, generous unemployment benefits combined with employment protection that is not excessive should ensure this. Generous unemployment benefits cushion workers and their families from the immense costs of job loss and allow workers time to find a job for which they are suited. Trying to support workers through excessive employment protection is counter-productive: it prevents the required reallocation and overtime, it leads to the setting up of dual labor markets – one consisting of workers with protection and the other consisting of those without.

Economies also need "macro flexibility", which is the ability of the economy to make adjustments in response to large national-level shocks. Here collective bargaining institutions play a key role. Initially the authors were somewhat prescriptive on what form these collective bargaining institutions ought to take. But subsequently the authors have acknowledged that trust among social partners is just as important in ensuring macro flexibility as the precise design of collective bargaining institutions, if not more.

3. Bring 'jobs' back on to the policy agenda

The third aspect of the evolution is to elevate the importance of labor market issues, particularly job creation, in policy discussions. In 2011, the IMF organized a landmark conference with the International Labor Organization in Oslo to show that the two institutions had a common appreciation of the importance of jobs to the economic and social fabric of countries. In 2015, the IMF partnered with the JustJobs Network in Ankara to draw the attention of G20 policymakers to the need to balanced wage growth and competitiveness.

The IMF has argued that the promotion of full employment requires a 'two-handed approach', one that stresses the importance of aggregate

demand as much as aggregate supply. This view has led the IMF to policy positions in recent years that have surprised many:

- The IMF supported actions taken by the major central banks during the Great Recession to stimulate aggregate demand.
- It supported the coordinated global fiscal stimulus provided at the onset of the Great Recession and advocated a phased withdrawal of it according to the extent of economy recovery in various countries.
- It called for an increase in public investment, which can both add to aggregate demand in the short run and improve the economy's aggregate supply response over the longer run.

Dealing with the sharing economy

This evolution in IMF thought offers important insights for policymakers on how to address the labor market changes brought about by technology.

One theme in the JustJobs Network's flagship volume is how to address the digital economy's potential threat to jobs. Similar to their attitudes about trade, workers sometimes resist technology due to fear of the potential adverse impact it may have. Yet both trade and technology contribute to enhancing global and national efficiency and – more arguably – to equity also, in the long run.

Mainstream economists tend to advocate that instead of trying to resist these long-run trends, policymakers should put in place long-term solutions to create jobs for everyone. The frequently advocated solutions are education, migration and redistribution. But none of them is easy or offers a full solution. Migration and redistribution, in particular, also lack sufficient political support.

Education would allow the gains from technology to accrue to a broader base of the population than has been the case. This volume provides concrete examples of the actions that firms, trade associations and governments can take to foster the new skills needed to participate in the sharing economy. But education and skills cannot be acquired overnight and those displaced by technology will need some help to get by in the interim.

In principle, migration could function as an important solution to the challenge of global job creation. High-skilled workers from China and India could alleviate shortages in the United States. Nurses from other Asian countries could help take care of Japan's aging population. Migration remains at very low levels compared to what is desirable from an economic standpoint. But despite the considerable benefits that immigrants bring to home countries, the opposition to migration is strong and mounting.

To help those who could lose out—or not gain as much—from migration, as well as those displaced by technology, increased redistribution from those who do gain from these trends must be part of the policy response. And for displaced workers near the end of their working lives, redistribution may be a more practical solution than the acquisition of new skills. But despite concerns about increased inequality, redistribution does not appear to be gaining political traction in most countries.

In short, the recommendations by mainstream economists would not seriously deal with adverse consequences from technology for a number of people in the short- to medium-run. Policy advice should reflect some of the findings of the evolution in the IMF's research.

Concretely, this means:

- Policymakers should treat the unemployment that results from displacement due to technology as a serious development that poses grave costs for the individual, his or her family, and society.
- They should support adequate unemployment benefits or other forms of assistance to replace some of the lost income of those displaced. The long-run solution lies not in such benefits but in active labor market policies, including re-training. But the effects of these policies do not kick in immediately and the unemployed and their families need support in the interim.
- They should also recognize that even if supply-side remedies - such as provision of re-training and skills development - are the desired solution, these will not work well in an environment of weak aggregate demand. The best skills program will be a waste if the person is just waiting for too long in an unemployment queue.
- They should look not just at the aggregate or efficiency effects of the prescribed remedies but also at their distributional or equity effects. Policymakers should not be fearful of redistribution as one of the remedies to consider in order to compensate those who lose out.

It is important of course to research the precise impacts of technology. In case of the effects of the digital economy, that research is already being undertaken, as evident in many of the chapters in this flagship volume. The research can guide us to specific targeted steps that may be needed.

But the point this chapter makes is that there is a need for a broader change in mindset. Policymakers need to take seriously the job loss that occurs due to displacement from technology, or any other developments for that matter. Otherwise, they run the risk that fears about the short-run displacements from technology adoption will undermine the potential efficiency and equity benefits it can bring in the long term.

Endnotes

[1] Ostry, J. D., A. Berg, & Tsangarides C. (2014). *Redistribution, inequality, and growth*. IMF Staff Discussion Note 14/02. Washington, DC: IMF.

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[3] Furceri, D. and Loungani, P. (2015). *Capital account liberalisation and inequality*. Working Paper 243. Washington, DC: IMF.

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Description of indicators

GDP per person employed (constant 2011 PPP US$)

GDP per person employed is gross domestic product (GDP) divided by total employment in the economy. Purchasing power parity (PPP) GDP is the GDP converted to 2011 constant international dollars using PPP rates. An international dollar has the same purchasing power over GDP that a U.S. dollar has in the United States.

GDP per person employed is a measure of labor productivity, and is used to assess a country's ability to create and sustain productive employment opportunities. Productivity increases obtained through investment, trade, technological progress, or changes in work organization can increase social protection and reduce poverty.

Internet users (per 100 people)

Internet users are individuals who have used the internet (from any location) in the last 12 months. The internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.

The indicator points to the penetration of new Information and Communications Technologies (ICT) in an economy. ICTs offer vast opportunities for progress in all walks of life in all countries - opportunities for economic growth, improved health, better service delivery, learning through distance education, and social and cultural advances.

Mobile cellular subscriptions (per 100 people)

Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to the public switched telephone network (PSTN) using cellular technology. The indicator applies to all mobile cellular subscriptions that offer voice communications.

The indicator reflects the quality of an economy's infrastructure, including power and communications. The rapid development of mobile telephony is recognized as an essential tool for development, contributing to global integration and enhancing public sector effectiveness, efficiency, and transparency. Mobile phone technologies also increase opportunities for entrepreneurship.

Research and development expenditure (% of GDP)

Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge. R&D covers basic research, applied research, and experimental development.

Expenditure on R&D is a key indicator of government and private sector efforts to obtain a competitive advantage in science and technology.

It is expressed here as percentage of the gross domestic product (GDP) of the respective country.

High-technology exports (% of manufactured exports)

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. It is expressed here as a percentage of total manufactured exports of the respective country.

Note: All figures and indicator definitions have been sourced from the World Bank's World Development Indicators, and are from the most recent year when data were available.

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JustJobs

WORKING FOR SHARED PROSPERITY

JustJobs Network is a private, nonpartisan organization finding evidence-based solutions to one of the most pressing challenges of our time: How to create more and better jobs worldwide. We produce empirical research on good job creation, focusing our work on the critical knowledge gaps in the global employment landscape.

JustJobs convenes a global network of diverse stakeholders—including policy shapers, academics, and grassroots leaders — to deepen the practical implications of our research endeavors and amplify their impact. Through the combination of cutting-edge research and global knowledge sharing, we aim to forge a fresh, dynamic channel for policy dialogue on employment at national, regional and international levels. Our team members are based in New Delhi and Washington, D.C.

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