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Electrical and electronics manufacturing in Thailand: Exploring challenges and good practices in the workplace

Lorenza Errighi and Charles Bodwell
September 2017



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Preface

The International Labour Organization (ILO) is devoted to advancing opportunities for women and men to obtain decent and productive work. It promotes rights at work, decent employment opportunities, more effective social protection and improved dialogue with respect to work-related issues. The *ILO Asia-Pacific Working Paper Series*, of which this paper is a part, is designed to improve the understanding of decent work issues, stimulate discussion and encourage knowledge sharing and further research that will promote decent work in Asia and the Pacific.

The electrical and electronics (E&E) sector provides millions of manufacturing jobs globally through one of the most extensive and geographically dispersed global supply chains (GSCs). Relying on a competitive labour force and export-oriented policies, Thailand has developed the largest manufacturing base for E&E production in the ASEAN region, with the sector accounting for a quarter of its export revenues. However, in a context of rising production costs and automation risks, Thailand can best continue generating decent jobs domestically by transitioning towards greater knowledge-intensive activities.

In the context of a “Fourth Industrial Revolution”, the Royal Thai Government has launched “Thailand 4.0” policy, identifying the E&E industry as a strategic sector within its industrial upgrading and human capital development plans. Related to this, a national dialogue on “Thailand 4.0 and the Future of Work” was organized in March 2017 by the ILO and the Ministry of Labour to discuss future employment trends, challenges and opportunities in the country. This report presents a review of the current skills upgrading challenges in the E&E sector and includes examples of skills upgrading practices instituted by major companies operating in Thailand.

Over a half of employees in Thailand’s E&E sector are women. However, although women outperform their male counterparts in science, technology, engineer and mathematics (STEM) educational fields, gender representation gaps are present for skilled managerial and technical positions in the industry. By providing an overview of the key challenges associated with gender biases in the sector, this report also serves as a background to the upcoming ILO project “Women in STEM Workforce Readiness Program”, aimed at strengthening employability and leadership skills of female employees, with a particular focus on the E&E industry for the project’s activities in Thailand.

The general discussion on “Decent Work in Global Supply Chains” at the 105th Session of the International Labour Conference in June 2016 considered how social upgrading may not always be tied to economic upgrading in GSCs. While the E&E industry has become a major employment contributor across countries in Asia, cost pressures and global fluctuations in demand have made some producers in the industry resort to labour cost-cutting mechanisms. This working paper reviews the main social challenges found in E&E manufacturing across Asia and provides practical examples of workplace challenges and good practices identified by E&E companies and social partners active in Thailand.

Further empirical research is encouraged on the subject. It is hoped that this paper will foster greater understanding, dialogue and cooperation among social partners in Thailand to mitigate the risks associated with global trends, such as automation and increased competition, in the E&E industry.

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Abstract

The industrial development of Thailand has been driven by export-oriented policies and the attraction of foreign direct investment (FDI) in labour-intensive manufacturing processes. The electronics and electrical (E&E) industry, strongly supported by international trade and investment, has been an important export revenue and employment contributor to the Thai economy over the last three decades. However, as the country develops and more cost-competitive regional neighbours emerge, the Thai E&E industry faces upgrading challenges related to skilled labour gaps. Also, competitive pressures increase the risk of poor working conditions and limit workers' voice and representation. This paper serves as an entry point to explore decent work challenges in Thailand's E&E industry. It is based on a desk review of employment-related challenges found at both industry and national level. This research is complemented with examples of good practices instituted by a group of multinational enterprises (MNEs) operating in Thailand as lead firms and suppliers to major players in the global E&E industry.

Key words: global supply chains (GSCs), electronics, Thailand, foreign direct investment (FDI), employment, working conditions, future of work, gender, core labour standards.

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The responsibility for opinions expressed in articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by the International Labour Office of the opinions expressed in them, or of any products, processes or geographical designations mentioned.

Acronyms and abbreviations

3C	computers, consumer goods and communications equipment
AEC	ASEAN Economic Community
AFTA	ASEAN Free Trade Area
ASEAN	Association of Southeast Asian Nations
BOI	Thailand Board of Investment
BUILD	BOI Unit for Industrial Linkage Development
CAD	computer-aided design
DOE	Department of Employment
E&E	electrical and electronics
EICC	Electronics Industry Code of Conduct
EMS	electronics manufacturing services
EU	European Union
FTA	free trade agreement
GDP	gross domestic product
GSC	global supply chain
GSP	Generalized System of Preferences
HDD	hard disk drive
HP	Hewlett Packard
IC	integrated circuit
ICRT	International Campaign for Responsible Technology
ICT	information and communication technology
IDEMA	International Disk Drive Equipment and Materials Association
IFA	international framework agreement
ILO	International Labour Organization
IP	intellectual property
ISIC	International Standard Industrial Classification
IT	information technology
ITUC	International Trade Union Confederation
JEITA	Japan Electronics and Information Technology Industry Association
LCD	liquid-crystal display
LED	light emitting diode
M&As	mergers and acquisitions
MNE	multinational enterprise
MOL	Ministry of Labour (Thailand)

MRA	mutual recognition arrangement
NECTEC	National Electronics and Computer Technology Center
NSTDA	National Science and Technology Development agency
ODM	original design manufacturers
OEM	original equipment manufacturers
OHSAS	Occupational Health and Safety Assessment Series
OSH	occupational safety and health
PC	personal computer
PISA	Programme for International Student Assessment
R&D	research and development
SEZ	special economic zone
SMEs	small and medium-sized enterprises
SOMO	Centre for Research on Multinational Corporations
SSD	solid state drives
STEM	science, technology, engineering and mathematics
STI	science, technology and innovation
THB	Thai Baht
TMEC	Thai Microelectronics Center
TOPIC	Thai Organic and Printed Electronics Innovation Center
TSP	Thailand's Science Park
TVET	technical vocational education and training
UNCTAD	United Nations Conference on Trade and Development
WiL	Work-Integrated Learning Programme

1. Introduction

Technological developments as well as lower trade barriers and increased foreign investment have turned electronics and electrical (E&E) products manufacturing into an industry with one of the most extensive and geographically dispersed global supply chains (GSCs). China, being the world's largest exporter of E&E goods and a major consumer, has established itself as a regional hub for E&E production. Emerging players across East and South-East Asia, endowed with a competitive labour force, have also become important actors in E&E GSCs by specializing in employment-intensive assembly and manufacturing activities and, in some cases, managing to move towards knowledge-intensive production stages. The industry employs more than 4.5 million workers in the ASEAN region alone.

Thailand, benefiting from a competitive labour force and strong investment incentives, has become a major manufacturing base in South-East Asia by attracting foreign direct investment (FDI) and integrating into existing GSCs for E&E production. The E&E industry in Thailand is the largest in the Association of Southeast Asian Nations (ASEAN), accounting for 15 per cent of the country's gross domestic product (GDP), generating a quarter of total export revenues and employing nearly 750,000 workers, over a half of whom are women. The Thai E&E industry, however, remains largely focused on assembly and manufacturing operations with limited value added content.

In a context of rising production costs and automation risks, Thailand needs to transition to knowledge-intensive activities if it is to retain its competitiveness regionally and globally, while generating decent jobs domestically. In this respect, the government has launched the "Thailand 4.0" policy, aimed at preparing the country for the so-called "Fourth Industrial Revolution" through industrial upgrading strategies and investment in human capital. The E&E industry has been identified as a key sector for the country's economic development.

In March 2017, a national dialogue on "Thailand 4.0 and the Future of Work" was organized by the ILO and the Ministry of Labour to discuss future employment trends, challenges and opportunities in the country. In presenting a review of the current skills upgrading challenges, this paper includes examples of good practices instituted by major companies operating in Thailand's E&E industry, to promote transition towards knowledge-intensive activities.

As highlighted in the general discussion of decent work in global supply chains at the 105th Session of the International Labour Conference in June 2016, economic upgrading may not always result in social upgrading of GSCs. For example, while the E&E industry has created millions of jobs across Asia, cost pressures and global fluctuations in demand have made some producers in the industry resort to cost-cutting mechanisms, including: the use of flexible forms of employment, excessive or forced overtime, bonded labour, restricted freedom of association and collective bargaining (ILO, 2014; Raj-Reicher, 2016; Verite 2014; Matsuzaki, 2015). Additional research is needed to assess working conditions in Thailand's E&E industry and to propose ad hoc recommendations on how to improve these. However, as the sector relies on low-skilled labour, it might not be exempt from social downgrading risks in a context of global competitive pressures. This working paper, serving as an entry point for further exploration, presents a review of social challenges found in the E&E industry across the region and provides examples of working conditions challenges and good practices identified by companies and social partners active in Thailand's E&E industry.

The paper is structured as follows: first, an overview of global trends in E&E industry is provided. Second, the E&E sector is presented in the context of the Thai economy. Third, attention is drawn to potential decent work challenges present in the Thai E&E industry, by considering the following aspects: (i) skills; (ii) job quality; and (iii) workers' voice and representation. Finally, concluding remarks are provided.

2. Global trends in the E&E industry

East and South-East Asian economies have become major production bases for E&E goods.

An estimated 62 per cent of LED/LCD televisions, 70 per cent of semiconductors, 76 per cent of car navigation systems, 86 per cent of mobiles and smartphones and 100 per cent of digital cameras are produced in Asia. Also, around 80 per cent of the world's production of hard disk drives (HDDs) is being carried out in ASEAN, with Thailand being the second largest producer (Matsuzaki, 2015). The E&E industry accounts for over 4.5 million workers in the ASEAN region alone (see figure 1; Rynhart et al., 2016).

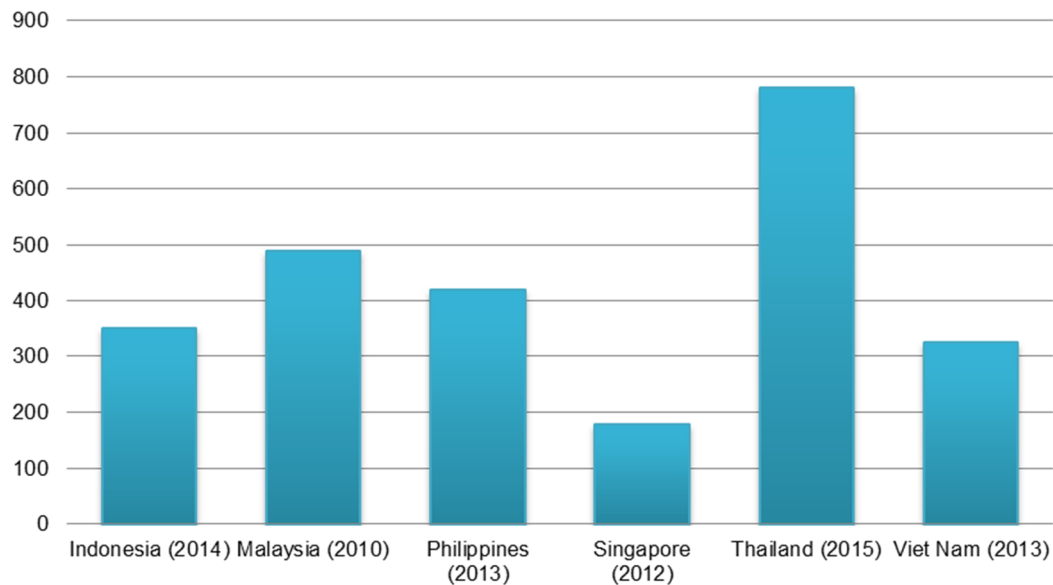
Box 1 Defining the E&E industry

This paper considers the E&E industry to be inclusive of computers, consumer goods and communications equipment (3C electronics) as well as televisions, radios and home electrical appliances (known as "white goods").

It follows the International Standard Industrial Classification (ISIC) classification under Rev.4, Divisions 26, 27 and 28, which represent the following macro categories: computer, electronics and optical products; electrical equipment; machinery and equipment.

China is currently the largest E&E producer, with an aggregate production of US\$2.4 trillion in 2015, 13 times larger than in 2000 (Lasinkas, 2016). In 2015, the Chinese economy alone exported 63 per cent of the world's mobile phones, 73 per cent of all computers and 37 per cent of transmission devices, including televisions (Delautre, 2017). In value terms, the country accounted for 42 per cent of all E&E production globally (Lasinkas, 2016). In addition to this, China has developed a large E&E consumer base and has overtaken the US as the biggest market for personal computers (Fletcher, 2011). This has contributed to the establishment of important production clusters within the country and, as a result of regional spillover effects, production bases in lower cost South-East Asian economies. In fact, as wages rise in China, labour-intensive production is being relocated to more competitive locations in the region, such as Viet Nam, where the world's largest smartphone factory was built, and Indonesia, where the relocation of important contract manufacturing operations is envisioned (Matsuzaki, 2015).

Figure 1: E&E employment (in thousands) across major ASEAN producers



Source: Estimates from Rynhart et al., 2016.

The growth of the E&E industry across Asia has been favoured by global outsourcing and relocation trends.

The industry has been facing fragmentation of production processes, which have become increasingly dispersed across various geographical locations. E&E is one of the sectors with the most extensive and dispersed GSCs. International outsourcing and foreign direct investment (FDI) trends taking place in the E&E industry since the 1980s can be explained largely by the following technology and trade trends (Sturgeon and Kawakami, 2011; Delautre, 2017; Baldwin, 2011; Notteboom and Rodrigue, 2008):

- **Process innovation through value chain modularity.** The industry has faced the development of de jure standards and codification for the definition of electronics components, system features and production processes. Standardization has thus allowed for a “plug and play” use of key product components.
- **Process innovation through digitalization** such as computer-aided design (CAD), production planning and logistics control software. This has facilitated lead firms to outsource and monitor production processes in distant geographical locations.
- **Product innovation and downsizing.** Technological innovation has brought about a substantial decrease in entry barriers for computer assembly, through the emergence of smaller and cheaper computer systems. The costs of manufacturing and assembly activities have fallen drastically. As a result, lower pricing strategies have been introduced by lead firms to exploit economies of scale emerging from mass production and consumption of electronics goods. This in turn has transformed the production of electronics into a low-margin and high-volume business.

- **Increasing trade integration and openness to FDI in developing countries.** Lowered trade barriers through multilateral and bilateral trade negotiations, coupled with a sustained trend for export-oriented policies in developing countries, have facilitated outsourcing and offshoring of labour-intensive production stages in locations with labour cost advantages and sufficient endowments in human and physical capital.
- **Key shipping innovations.** Transportation costs have fallen drastically with the introduction of materials handling systems, containers and other logistics innovations, which have simplified shipping operations and enabled a much faster delivery of products.

In the current context, the E&E industry involves a multitude of players, which can be divided into the following groups: brand firms, contract manufacturers and component suppliers.

As a result of technological innovations, lead electronics firms have tended to subcontract their labour-intensive activities to a network of first-tier suppliers, known as contract manufacturers. Contract manufacturers can be subdivided into electronics manufacturing services (EMS), concentrating on manufacturing processes for a limited number of customers, or original design manufacturers (ODMs), which also provide product design and engineering services (see box 2).

In contrast to electronics, the electrical appliances segment is characterized by shorter supply chains, where lead firms from developed countries – such as Bosch, Electrolux, LG Electronics, Whirlpool – have engaged in FDI to offshore their manufacturing activities to less costly production bases. Smaller players in developing countries act as first-tier and second-tier suppliers of parts and components or as direct assemblers. Given its stronger orientation towards the domestic market, the electrical sector faces a larger number of indigenous firms operating for local markets (Europe Economics, 2015). Benefiting from technology spillovers associated with FDI, some of these indigenous producers have turned into well-established international firms, such as the Chinese Haier Group, which is currently the largest home appliances producer in the world, operating both as a lead firm and supplier to major brands (Riggs and Scott, 2017).

Box 2 Participants in E&E GSCs

Lead firms, referred to as original equipment manufacturers (OEMs), are mostly responsible for research and development (R&D), innovation, marketing, and overseeing their supply chains. The majority of OEMs are located in mature markets, such as Japan, Europe and the United States. However, emerging economies (i.e. Republic of Korea, China and Taiwan, China) have also entered the market of high value added activities through technological spillovers and acquisitions. In the electrical appliances sector, OEMs tend to engage directly in manufacturing activities through foreign direct investment in low cost production bases (i.e. Electrolux, Bosch & Siemens).

Examples: Apple (US), Hewlett-Packard (US), Samsung Electronics (Republic of Korea).

Electronics manufacturing services (EMS) are normally responsible for component manufacturing, design services, high volume manufacturing, circuit board assembly, final product assembly, product testing, logistics and after sales services.

Examples: Flextronics (Singapore), Hon Hai Precision/Foxconn (Taiwan, China).

Original design manufacturers (ODMs) provide assembly services and some design, especially in PC monitor and notebook computers. They enable lead firms to launch new products for less investment.

Examples: Quanta computer (Taiwan, China), Compal (Taiwan, China).

Second-tier suppliers are subcontractors usually responsible for labour-intensive assembly processes and manufacturing of low-tech parts and components (i.e. printed circuit boards, motherboards). They tend to be located in low labour cost locations, mostly in Asia.

Platform leaders are a group of highly specialized suppliers, which are based in developed countries and capture a substantial share of profits in electronics GSCs.

Examples: Intel (US), Microsoft (US).

Source: ILO, 2007; Delautre, 2017.

Electronics contract manufacturers, operating under a high-volume and low-margin business model, have become increasingly consolidated through mergers and acquisitions (M&As). Consolidation and progressive upgrading of contract manufacturers has resulted in lead firms outsourcing a larger set of processes (i.e. design, purchasing, logistics, marketing) to a smaller group of key suppliers (Gereffi, 2014). For example, Hewlett-Packard (HP), previously having 700 direct suppliers and 400 contract manufacturers, turned to 26 final assembly manufacturers at 61 assembly sites and 38 commodity and component suppliers (Raj-Reichert, 2016). Following their consolidation, contract manufacturers have become the largest purchasers of electronics components in the world (Sturgeon and Kawakami, 2011).

In turn, contract manufacturers outsource part of their production to a diverse network of second-tier suppliers for parts and components. These suppliers range from indigenous small and medium-sized enterprises (SMEs) producing low value added “commodity components” (i.e. computer keyboards, cables and connectors); suppliers of “key components” such as HDDs; and producers of “secondary components” such as semiconductor chips and printed circuit boards (Curry and Kenney, 2004). A particular group of second-tier suppliers are known as “platform leaders”, such as Microsoft and Intel; they capture a substantial share of profits in the electronics supply chain by producing highly specialized and innovative components (ILO, 2014). Components producers may be involved in various electronics supply chains, acting as suppliers and customers to one another. This gives way to complex, collaborative networks (Ergon Associates, 2010).

The structure of the E&E industry could be subject to changing dynamics among some of the largest players. Box 3, below, presents the case of Samsung Electronics, which has opted for a vertically integrated model to better control for quality and time-to-market delivery factors.

Box 3
Reverse industry dynamics: The case for vertical integration

Tighter control over production processes through vertical integration can enable lead firms to achieve an advantage over their competitors by minimizing “time-to-market” in their production cycles, meaning a faster transition from a product’s design to its actual production and sale.

For example, Samsung has been able to achieve such time-to-market advantage by being one of the most vertically integrated players in the electronics sector and also a platform leader, as it sells its LCD screens and semiconductors to competitors. The company, capturing the largest market share for electronics goods and sales, is directly involved even in its most labour-intensive production stages, by owning subsidiaries responsible for assembly and manufacturing in cost competitive locations such as China and, more recently, Viet Nam (Raj-Reichert, 2016). This enables the firm to have stricter quality controls over its production, while meeting fast delivery targets (Korea Associates Business Consultancy, 2012).

Vertical integration, coupled with suppliers’ consolidation trends, may facilitate lead firms in controlling their supply chain also in terms of labour standards, as in the case of Hewlett Packard (HP). The firm has adopted a hybrid model consisting of both vertical FDI and outsourcing to a limited number of publicly listed suppliers. After evidence of poor working conditions was found across its suppliers in Mexico in 2004, HP increased its attention on supply chain governance. The company reduced its number of suppliers from over 1000 in 2006 to just over 100 in 2014. Also, in 2014, as a result of severe labour rights violations linked to labour subcontracting practices, HP was the first US electronics company to set a supply chain standard on direct hiring of foreign workers, one preventing workers from paying any recruitment-associated fee (Raj-Reichert, 2016).

Asian economies have benefited from outsourcing and FDI in the E&E sector. However, the nature of E&E GSCs provides challenges in terms of value capture for emerging players.

Increasing fragmentation in the production of E&Es has provided opportunities for newly industrialized economies to participate in GSCs, first through simple assembly activities and then as contract manufacturers and lead firms in selected market segments. This is the case, for example, of hardware production in Singapore and personal computer design in Taiwan (China), which occurred in the 1990s as a result of intensive technical training and knowledge transfers from multinational enterprises (MNEs) (Kawakami, 2011). Currently, the Taiwanese firm Foxconn and the Singaporean (formerly US-owned) firm Flextronics own the largest contract manufacturing facilities in the world (ILO, 2014). The emergence of E&E GSCs has contributed to significant employment creation in countries like China and Viet Nam, while the number of jobs has fallen in Japan and the United States. Currently, nearly two-thirds of all jobs in information and communication technology (ICT) manufacturing are located in China, up from one third in 2003 (Delautre, 2017).¹ Nevertheless, research indicates that simple participation in electronics GSCs does not automatically hinder higher value added capture by producers in developing countries. For example, considering the case of mobile phone production, there is evidence that participation in GSCs did not bring about value creation and wage increases in producing countries (i.e. China), despite having generated large-scale employment (Lee and Gereffi, 2013). What matters more for economic development is the position covered by participants in GSCs. In the electronics sector, lead firms from developed economies still tend to retain control of the most profitable activities such as product design, software development and marketing, where barriers to entry are the highest. Platform leaders, also referred to as “active component suppliers”, generate high profits due to intellectual property protection and R&D investment. On the other hand, the contract manufacturers and low-tech second-tier suppliers located in developing countries cover a less favourable position in GSCs, and therefore are subject to stronger cost pressures (Shin et al., 2012 in Delautre, 2017). However, there are cases of M&As enabling knowledge spillovers and global market share capture by established enterprises in developing countries. For example, the acquisition by Lenovo of IBM’s PC division has contributed to the expansion of value added production in the Chinese electronics industry (Sturgeon and Kawakami, 2011).

The electronics sector, in particular, is subject to short product life cycles and strong fluctuations in production. This has given rise to challenges among suppliers, turning into social downgrading trends.

Continuous innovation and competition among leading players in the industry have translated into shrinking product life cycles, which range from three to 18 months for consumer electronics goods (Burrus and Kuettner, 2002). Additionally, the sector has been subject to strong demand fluctuations, leading to inaccuracies in market forecasting (Sodhi and Lee, 2007). The phenomenon has created particular challenges for suppliers facing last minute orders from their consumers and very high targets to be met in periods of production peaks (ILO, 2014).

Uncertain market conditions and cost pressures haven given rise to social downgrading trends in the industry, particularly among contract manufactures and their suppliers in developing countries. In fact, excessive, forced overtime work and flexible employment agreements have been used as a response to global fluctuations in demand and last-minute orders from lead firms (ILO, 2014). Other challenges in the industry include exposure to dangerous chemicals and workers’ being prevented from joining unions by their employers (Bormann et al., 2010). Global union movements, labour activists, civil society groups and the media have persistently denounced abusive employment practices occurring across contract manufacturing facilities in China (China Labour Watch, 2011; Danwatch, 2015; Raj-Reicher, 2016). Moreover, in Malaysia, competitiveness challenges and labour shortages in the industry

¹ The paper quoted considers the ICT manufacturing industry to be the sum of communication equipment (including phones and network equipment), computing and peripheral equipment (including computers, office machinery, and servers), and consumer electronic equipment and components under ISIC rev.3, codes 3000, 3210, 3220 and 3230, in classification ISIC rev.3 and ISIC rev.4 codes 2610, 2620, 2630 and 2640.

have led to a strong reliance on migrant workers, some of whom have been found in forced labour (Verite, 2014; see box 4).

Box 4

Social downgrading trends in the Malaysian electronics sector

Competitiveness challenges, coupled with the challenge for Malaysia in engaging in higher value added production, have resulted in cost-cutting mechanisms in its electronics industry, which in turn has negatively affected its workforce. With rising living standards and wages, the country has relied on lower cost temporary migrant labour to fill labour shortages in the sector. Migrant workers in the electronics industry are estimated to represent 20-60 per cent of the total workforce, with 70-80 per cent of them being women (Verite, 2014; ILO, 2014; Bormann et al., 2010).

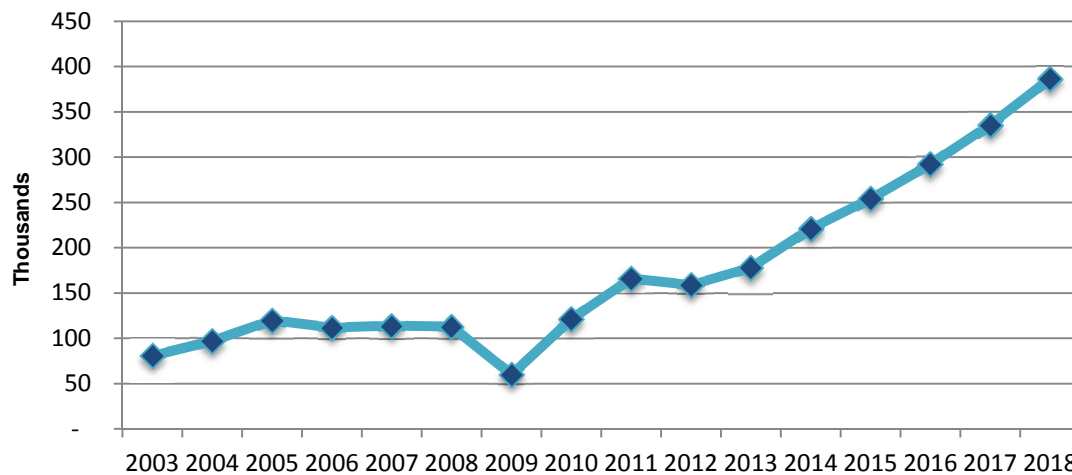
In order to quickly respond to the widening labour shortages across major economic sectors, Malaysian labour laws have been relaxed. For example, under-regulated labour subcontracting agencies have been allowed to recruit migrant workers. This situation, however, can lead to abusive recruitment practices, such as payment of high recruitment fees by foreign workers, confiscation of passports by employers, unfair treatment and discrimination, and workers' being prevented from joining unions (Verite 2014; ILO, 2014). Research by Verite, a non-governmental organization, found that one-third of the migrant workers surveyed in the industry were in forced labour (Verite, 2014).

More recently, following international pressure and the increasing awareness of the Malaysian government on the labour rights challenges in its economy, stronger regulations have been put in place in order to protect potential victims of forced labour and human trafficking. These include stronger regulatory requirements for labour subcontracting agencies, with the goal of phasing them out in the future. Also, a government-to-government official recruitment channel has been established between Malaysia and Bangladesh, in order to promote safer labour migration (ILO, 2016a).

A factor that could reverse the current employment growth trends in Asia's E&E production is the rise of industrial robotics.

Between 2010 and 2015, the average annual supply of industrial robots increased to about 183,000 units, with supply surpassing 250,000 units in 2015. The volume of industrial robots used in manufacturing is expected to grow by 15 per cent per year and reach a yearly average supply of around 400,000 units by 2018. E&E industry demand, accounting for 25 per cent of the total in 2015, is projected to be one of the major drivers behind such expansion (IFR, 2015; 2016; figure 2).

Figure 2: Global supply growth of industrial robots



Source: Estimates from IFR, 2015; 2016; and authors' calculations.

As global competition becomes more intense, as wages across producing countries increase, and as E&E manufacturing becomes more technologically complex, workers are starting to be replaced by increasingly low cost manufacturing robots. Robots for simple assembly activities can be purchased for as little as US\$10,000 (Mozur and Dou, 2013). By 2025, industrial robots are expected to be cheaper than human labour in increasingly costly producing countries: as much as 33 per cent of labour costs could be saved in the Republic of Korea, as compared to the global estimated average of 16 per cent (Boston Consulting Group, 2015). This trend also affects labour abundant economies like China, the biggest market for industrial robots (IFR, 2016). For example, while China is not expected to face complete relocation as it has developed important supply chains in the industry, the contract manufacturer Foxconn has created its Foxbots to assemble smartphones, which have already replaced 60,000 workers in its largest facilities in the country (Wakefield, 2016). In any case, manufacturing robots still do not have the capacity and precision to completely replace workers in the assembly of smartphones and similar products (Raj-Reicher, 2016).

The introduction of assembly robotics can improve productivity, as robots can work around the clock with no impact on performance: for example, automation has already increased productivity by 6 per cent in the German E&E industry (Lasinskas, 2016). Additionally, automation could help companies to tackle social pressures related to working conditions in assembly and manufacturing. In fact, artificial intelligence is expected to improve labour conditions for the remaining employees, those with the highest skills, who would work in cooperation with machines (Foresight Alliance, 2016).

However, such trends may be offset by the fact that automation in production increases capital investment and fixed costs. Hence, given high market volatility, offshoring to cost competitive locations might still be a less costly option for producers. Moreover, given continuous product innovation and the high turnover of consumer electronics goods, automation would require frequent upgrading of machinery as well. As a result, excessive capital expenditure could be a burden to producers, who already tend to capture low margins in GSCs (Rynhart et al., 2016). Automation in manufacturing could be more likely in the case of electrical goods, as these are more durable products with simpler manufacturing stages and supply chains.

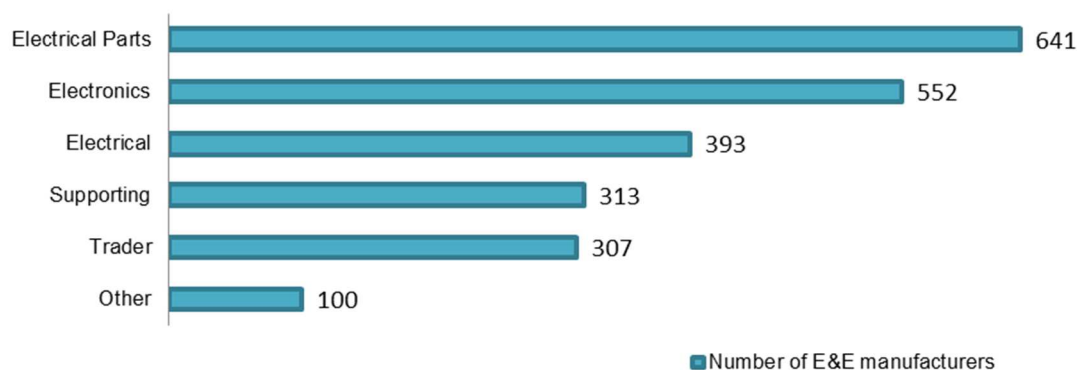
Other disruptive technologies that are expected to affect electronics production include: 3D printing, which could transform assembly and manufacturing stages into a one-time printing process; and the “Internet of Things”, connecting industrial equipment to production control networks and enabling better decision-making through information gathering. However, there are mixed opinions on when and how these technologies are likely to impact E&E producers in developing countries. One factor that could slow the adoption of these innovations in production is that they require the sufficient availability of highly skilled labour, a continuing challenge in the ASEAN region (Rynhart et al., 2016).

3. The E&E industry in Thailand

Thailand hosts the largest E&E manufacturing base in the ASEAN region.

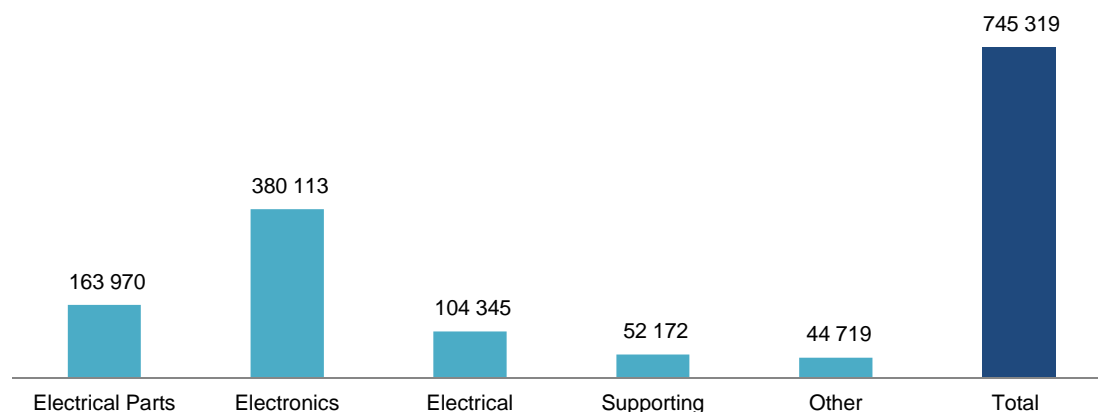
The E&E sector is estimated to account for 15 per cent of the country’s GDP and to represent 12 per cent of total employment in manufacturing in 2015 (Rynhart et al., 2016). There are over 2,300 manufacturers operating in the industry, employing nearly 750,000 workers as of September 2016 (Hotrakool, 2016). Figures 3 and 4 present the number of E&E facilities and employees disaggregated by subsector; we observe that the electronics subsector provides the highest number of jobs (over 650 per facility), while the electrical parts subsector provides the highest number of manufacturers (although individual facilities tend to be smaller in size).

Figure 3: Number of E&E manufacturing facilities in Thailand (September 2016)



Source: Hotrakool, 2016.

Figure 4: Number of employees across E&E subsectors in Thailand (September 2016)



Source: Hotrakool, 2016.

The country's main electronics products are semiconductor integrated circuits (ICs) and electronic hardware components, with Thailand being the second largest HDD exporter in the world, with an export value of US\$12 billion in 2015. These two categories account for approximately 56 per cent and 24 per cent of total electronics exports respectively. The major HDD companies present in Thailand include Seagate, Western Digital, Hitachi and Toshiba, which have attracted several specialized components suppliers into the country: Alps Electric, Hutchinson Technology, Magnecomp Precision Technology, Minebea, NHK, Nidec and Nitto Denko (BOI, 2015; 2016).

Thailand is also an important producer and exporter of electrical appliances, mostly air-conditioning units, refrigerators, washing machines and digital cameras/video recorders. With 61 million units of electrical appliances produced, the export value from the sector was US\$22 billion in 2015 (BOI, 2016). Major players include Fujitsu, LG, Haier, Electrolux, Daikin, Bosh & Siemens, Samsung, Sony and Panasonic. Japanese manufacturers constitute half of the electrical appliances companies in Thailand (BOI, 2015).

As technology spreads into every aspect of human life, expansionary opportunities could be created for Thailand's E&E industry. For example, innovations in the automobile sector are likely to bring tangible benefits: it is estimated that by 2020, the automotive electronics subsector will account for US\$314.4 billion in sales globally (BOI, 2015). Improved car safety, fuel efficiency and performance are likely to create a strong demand for vehicle-mounted electronic components and semiconductors, which could be particularly advantageous for Thailand, due to its large established base of automobile production (JEITA, 2015).

The industry has developed through trade and integration in global production networks.

In 2015, E&Es accounted for 25 per cent of Thailand's annual export revenues.² Thailand has become the major assembly base in South-East Asia by attracting FDI and integrating into existing GSCs by focusing on labour-intensive production stages. The industry, established in Thailand in the 1960s, took off as a result of a progressive move towards export-oriented development policies in the early 1980s, shifting the industrialization policy focus from the domestic to the international market. Government efforts were then aimed at creating E&E clusters in the economy and later, fostering R&D activities in the sector (UNCTAD, 2005).

As discussed in the first section of the next chapter, the promotion of R&D has shown limited results for the E&E industry, with the exception of the HDD subsector. More recently, on the one hand, the government has promoted the establishment of special economic zones (SEZs) in border areas to attract investors through tax incentives as well as the use of daily migrant workers in order to enhance competitiveness in labour-intensive production stages. On the other hand, under the "Thailand 4.0 policy", the government aims to transition to knowledge-intensive production through stronger investment in human capital, infrastructure and R&D projects. Box 5 provides more information on this strategy and other major industrialization policies in Thailand.

Box 5 Industrialization policies relevant to Thailand's E&E industry

Import-substitution (1960s). Foreign E&E enterprises (mostly Japanese) were invited to form joint ventures (JVs) with local business partners to serve the growing domestic market. During this early phase of development, the industry benefited from a large pool of low cost rural migrant workers.

Trade and investment incentives (1970s to early 1980s). The Thai Promotion Act in 1972 was amended to attract foreign enterprises through corporate tax holidays and zero tariffs on imported goods. In addition, Thailand introduced the Patent Act in 1979, to protect intellectual property rights for product design, thus encouraging foreign investors to establish their operations in the country. The E&E sector in Thailand also benefited from preferential access to the US market Generalized System of Preferences (GSP) scheme, under which only the foreign value added portion of US-fabricated E&E components was subject to import duties in the US market.

Removal of domestic ownership requirements and a competitive currency (late 1980s–1990s). In the late 1980s, foreign ownership restrictions in export manufacturing were eliminated, enabling foreign investors to have a majority control in their enterprises located in Thailand, which could reach 100 per cent if all of their production was exported. At the end of the 1990s, further liberalization led to the removal of local ownership requirements for firms serving the domestic market as well. These moves were favoured by increased competitiveness through the appreciation of the Japanese yen and then, following the countries' increasing industrialization, the Korean and Taiwanese currencies.

Cluster development and technology transfers (1990s). In 1992, the Board of Investment (BOI) Unit for Industrial Linkage Development (BUILD) was created to provide assistance to support industries, strengthen the relationships between local suppliers and international contractors and help SMEs to improve their productivity through training activities.

Research and Development (R&D) Programmes (1990s–2000s). In 1991, the National Science and Technology Development Agency (NSTDA) was established to promote research in science and technology and apply innovation to the Thai economy. The E&E industry has benefited from the support of specialized government agencies such as the Thai Microelectronics Center (TMEC), the National Electronics and Computer Technology Center (NECTEC), the Thai Organic and Printed Electronics Innovation Center (TOPIC), and the Thai Embedded System Association. Most of these agencies are located in Thailand's Science Park (TSP), launched in 1996, hosting 1800 researchers and 60 tenant enterprises, one third of which belong to the E&E industry.

Special economic zones (SEZs) (2014 and ongoing). The government is prioritizing infrastructure development in SEZs across border provinces to enable a stronger regional integration and to take advantage of lower cost labour from neighbouring countries. Twenty-three business groups are to be allowed to operate in SEZs, including the E&E industry. Employers are expected to benefit from tax exemptions and

² Source: United Nations (UN) COMTRADE database.

other investment incentives as well as a larger supply of migrant labour. Indeed, unskilled migrant workers are expected to work in SEZs and return to their countries on the same day. A pilot project was launched in 2014 for six of the thirteen SEZs; the development of five additional zones started in 2016.

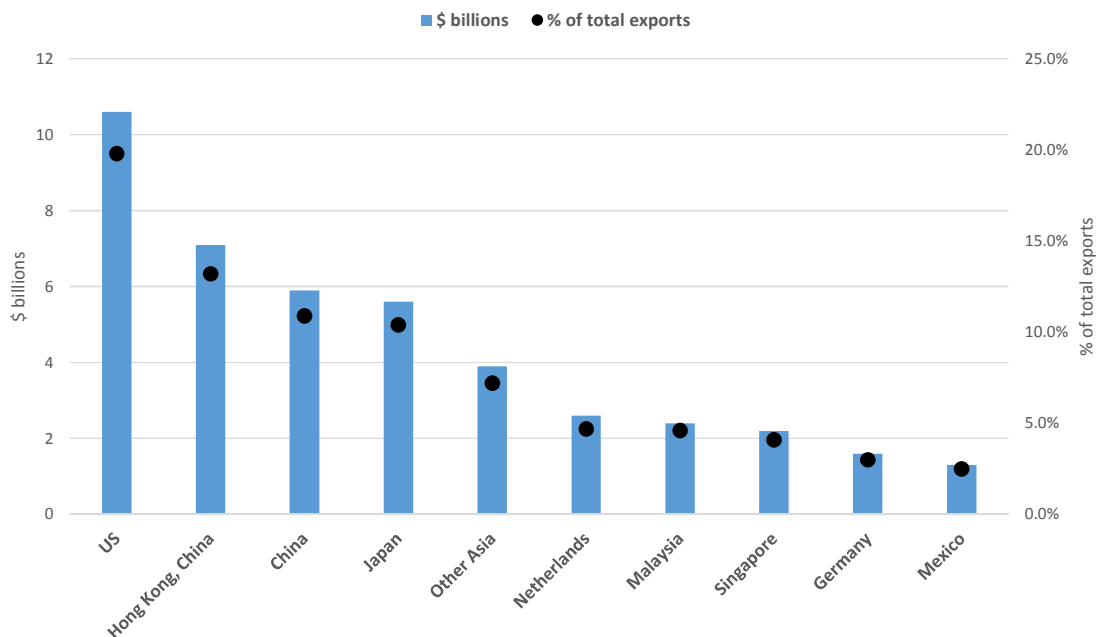
Thailand 4.0 Policy (2016 and ongoing): The government is currently promoting transition to a knowledge-based economy, with strategic importance given to the E&E industry and “smart factories”. The strategy will place emphasis on R&D investment, human capital development, automation and the digital economy under a 20-year national development plan. The strategy also envisages an equitable distribution of development gains and green growth.

Source: UNCTAD, 2005; 2015; BOI, 2015; 2015b; 2016; 2017.

As part of the ASEAN Economic Community (AEC), Thailand benefits from free trade agreements (FTAs) with ASEAN members as well as other countries, such as Australia, New Zealand, India, and Japan. Since 2010, through the ASEAN Free Trade Area (AFTA), most E&E parts and finished products are exempted from tariffs for exports within ASEAN. Moreover, under the ASEAN Sectoral Mutual Recognition Arrangement for Electrical and Electronic Equipment, member states have resolved to apply common standards for imported and exported electronics products with the aim of facilitating trade flows within the region (ASEAN, 2012).

As highlighted in figure 5, the major export destinations for Thailand’s E&E industry are the United States, Hong Kong (China), China and Japan. Electronics parts and components are mostly imported from China and Japan. Malaysia and Singapore are major ASEAN trading partners, while Viet Nam is growing as an emerging export market.³ Moreover, as a participant in GSCs, Thailand re-imports an important part of its E&E production, which accounts for 2.8 per cent of total E&E import value.⁴

Figure 5. Top ten export markets for Thai E&E products (2015)



Source: Authors’ calculations from UN COMTRADE database, using SITC Divisions 75–77 and 87–88 under Rev.3.

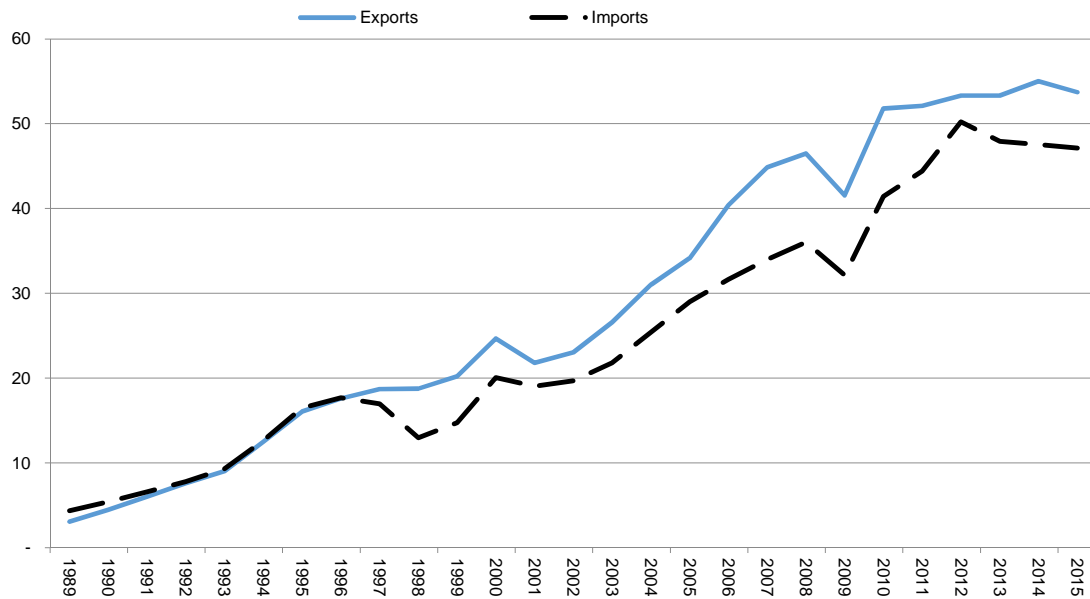
³ Source: COMTRADE database.

⁴ Source: COMTRADE database and authors’ calculations.

The Thai E&E industry has benefited from a trade surplus over the last two decades.

The Thai E&E industry has had a positive trade balance since 1997 (see figure 6). This is a dramatic improvement as compared to the first phases of the industry’s development, where imported parts and components accounted for 90 per cent of material costs and contributed to the generation of severe trade imbalances in the E&E sector (Prayoon and Waranya, 1987).

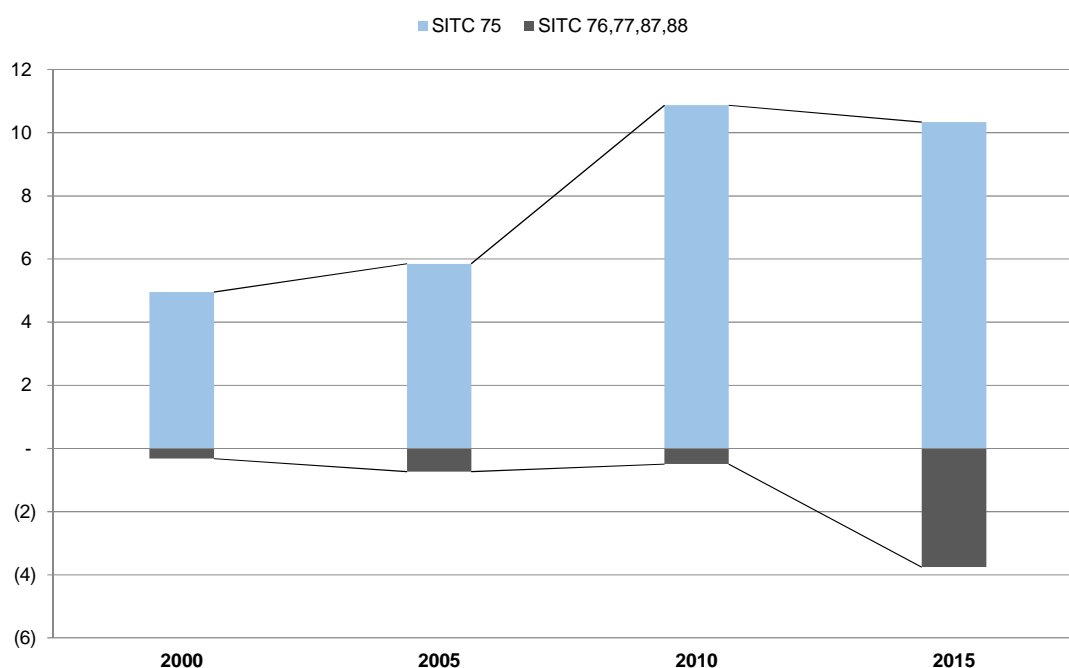
Figure 6: Export/import volumes for Thai E&Es (US\$ billion)



Source: UN COMTRADE database from national trade statistics, using SITC Divisions 75–77 and 87–88 under Rev.3.

However, as shown in figure 7, the surplus is strongly driven by goods under the SITIC category 75, which includes electronic office machines, data-processing equipment and storage units (HDDs). On the other hand, a trade deficit is present and has been widening for the total of the other E&E goods trade categories. For example, production of integrated circuits (ICs) has generated US\$8 billion exports, but required \$10 billion imports in 2014, thus leading to a trade imbalance of roughly \$2 billion (BOI, 2015). With continuous technology developments in the industry, the Thai E&E sector has been under pressure to develop and maintain the required capabilities to produce value added finished products and high-tech parts and components domestically.

Figure 7: Trade surpluses and deficits in the Thai E&E industry (US\$ billion)



Source: UN COMTRADE database from national trade statistics, using SITC Divisions 75–77; 87–88 under Rev.3.

Employment generated in the E&E industry is mostly low skilled.

When considering employment figures across occupations, we observe that in 2015, 80 per cent of the total workforce in the E&E industry was employed in low-skilled occupations, mostly as assembly workers, plant and machinery operators, with the remaining 20 per cent being employed in more skilled positions at a managerial, professional and technician level (see table 1). Looking at the data disaggregated across three large subsectors, we find that employment is the largest in computer, electronics and optical products manufacturing, constituting nearly 60 per cent of the total in the E&E sector. However, this is also the subsector where the share of unskilled workers is the highest (83.3 per cent), compared to both the electrical equipment and the machinery and equipment manufacturing segments (around 75 per cent on average; see table 1). As previously highlighted by trade trends, the labour-intensive computer, electronics and optical products manufacturing could be also associated with increased trade deficits.

Table 1. E&E manufacturing employment across subsectors and occupations (2015)

Occupation	Subsector			Total E&E
	Computer, electronics and optical products	Electrical equipment	Machinery and equipment n.e.c	
Managers	22 023	14 262	6 128	42 413
Professionals	22 558	15 978	10 167	48 702
Technicians and associate professionals	34 022	17 662	15 377	67 061
<i>More skilled workers</i>	78 602	47 902	31 671	158 176
<i>As % of total</i>	16.7%	25.6%	24.1%	20.0%
Clerical support workers	31 135	5 262	5 983	42 380
Service and sales workers	1 011	538	159	1 708
Skilled agricultural, forestry and fisheries workers	352	-	-	352
Craft and related trades workers	49 231	23 565	31 226	104 022
Plant and machine operators, and assembly workers	286 233	95 685	58 532	440 450
Elementary occupations	24 989	13 878	4 020	42 887
<i>Less skilled workers</i>	392 951	138 928	99 920	631 798
<i>As % of total</i>	83.3%	74.4%	75.9%	80.0%
TOTAL	471 553	186 830	131 591	789 974

Source: Authors' and ILO RESA calculations from Thailand's Labour Force Survey (LFS 2015). Note that data per subsector follows the ISIC Rev.4 classification (codes 26–28) and data per occupations follows the ISCO 1-digit classification (1–9).

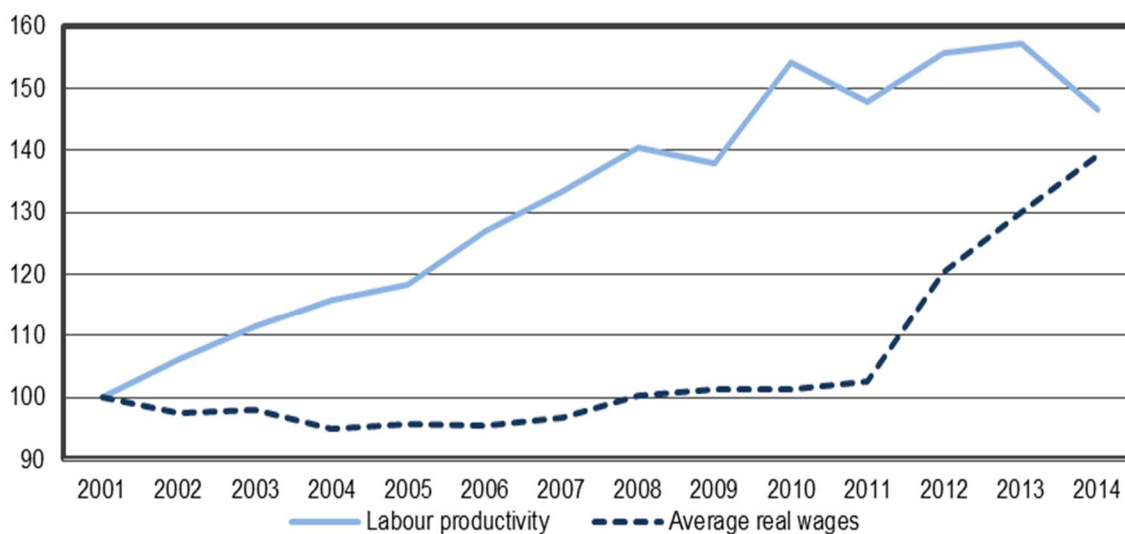
The competitiveness of the Thai manufacturing industry at large has been challenged.

As the economy grows, labour shortages and social pressures have increased, as have real wages in manufacturing.⁵ While the share of labour to capital in the manufacturing sector was on decline until 2011, it increased afterwards. In fact, Thailand introduced a minimum daily wage of 300 Thai baht (THB), or around US\$8.5, at a national level in 2013.⁶ However, productivity gains in manufacturing have been modest, averaging 4 per cent yearly growth between 2001 and 2013 (Techakanont, 2014). In the 2000s, most of the country's growth has been attributed to rising export prices and public investment, as opposed to improvements in productivity. From 2011 to 2013, while the average real wage increased by 20 per cent, productivity in the Thai economy increased only by 2 per cent (Techakanont, 2014). Figure 8 illustrates productivity and real wages growth in manufacturing in the 2001–14 period. It shows a marked deceleration in productivity growth since 2011 and a negative shock from 2013 to 2014 as a result of the nationwide increase in minimum wage.

⁵ Note that the characteristics of the Thai E&E industry (assembly-focused with low value added content) mirror those of the manufacturing industry at large in Thailand.

⁶ The minimum wage was increased in 2017 for most of Thailand's provinces. The daily wage increase ranges from THB5–10 according to the level of economic development in a given province.

Figure 8. Labour productivity and average real wages in manufacturing in Thailand (base year 2001 =100)



Note: Real wages are nominal wages adjusted for purchasing power, using the consumer price index. Labour productivity is measured in real terms.

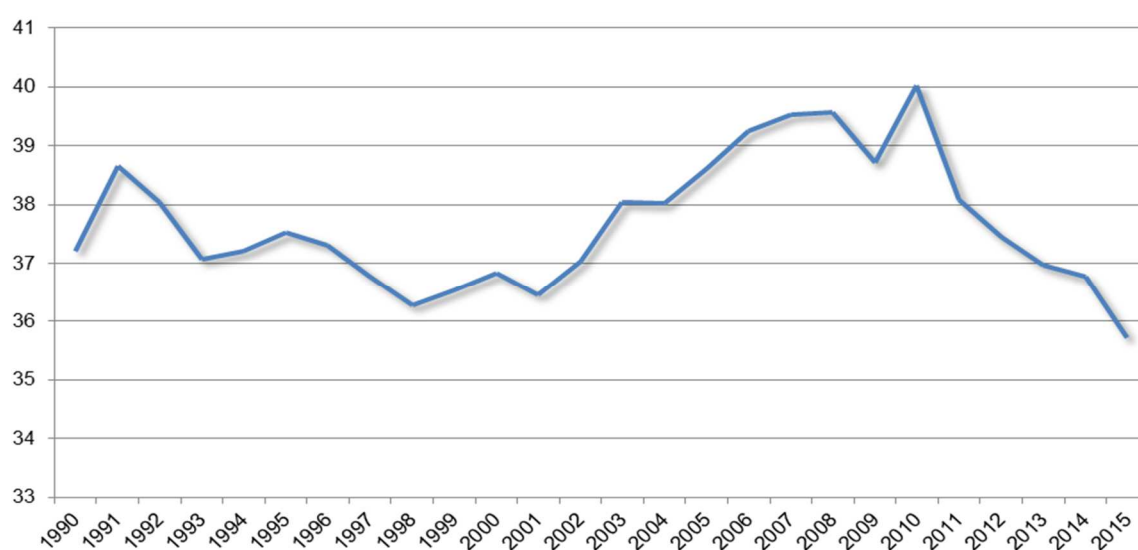
Sources: ILO, 2016b; Bank of Thailand: table EC_EI_029 and table EC_EI_027; National Statistical Office of Thailand: Labour Force Survey (Bangkok), various years.

Productivity growth challenges and increased production costs translate into a progressive loss of the country’s competitiveness. Figure 9 shows a decrease in industry value added content (as per cent of GDP)⁷ that has taken place since the great recession. This time, the Thai industry has not shown the same resilience as in the aftermath of the Asian financial crisis, when value added growth was restored.

This phenomenon, if not addressed, could result in the relocation of labour-intensive manufacturing activities to more competitive locations in the region in the future, as lower income countries in Asia continue along the path towards industrialization. Additionally, given a concentration on value added production, a large share of the Thai labour force in the E&E sector (estimated at 74 per cent) faces the risk of being replaced by machines through automation, as many workers perform repetitive, non-cognitive tasks that could be carried out by industrial robots (Rynhart et al., 2016).

⁷ Value added is calculated as follows: the difference between industry’s gross output (salaries, sales or receipts and other operating income, commodity taxes, and inventory change) and the cost of its intermediate inputs (i.e. energy, raw materials, semi-finished goods and services purchased) (United States Department of Commerce, 2006).

Figure 9. Industry value added (% of GDP) in Thailand



Source: World Development Indicators, World Bank.

4. Exploring decent work challenges and good practices in Thailand's E&E industry

This chapter is aimed at identifying decent work challenges that affect Thailand's E&E industry in order to serve as a basis for further research as well as an entry point for the ILO to provide technical assistance to the government of Thailand and its social partners.

This section is based on a review of the existing body of literature relevant to the sector, which includes a range of academic journal articles, policy reviews (i.e. by the ILO, World Bank, UNESCO, UNCTAD), industry and civil society reports, working papers and news articles. This qualitative assessment reveals that:

- Skills gaps and mismatches, insufficient university–industry linkages and a weak local supplier base challenge the socio-economic upgrading of the E&E industry in Thailand;
- The current competitiveness pressures in the industry risk negatively affecting job quality in Thailand through the use of unregulated agency and migrant workers, excessive or forced overtime, weak implementation and use of sub-optimal safety and health standards; and
- Workers' voice and representation challenges in the global E&E industry generally, and Thailand more specifically, may undermine the implementation and enforcement of international labour standards, freedom of association and collective bargaining in the sector.

In order to supplement existing findings and provide areas for further research, this section includes illustrative examples of firm-level challenges and the good practices instituted to address them. For this purpose, nine interviews were carried out with general and HR managers of major firms operating

in Thailand's E&E industry; employment at these companies totals 30,860 workers. Annex I provides additional information on the respondents and companies. Additionally, two labour activists and a lead third-party social auditor were invited to present their views and experiences on job quality, workers' voice and representation challenges related to the E&E sector and the Thai manufacturing industry at large.

It is important to note that due to the limited sample size, the interviews conducted are not intended to provide conclusive findings on Thailand's E&E industry at large but rather as highlighted examples of firm-level challenges and good practices implemented in the sector.

4.1 Skills for decent work

The E&E sector in Thailand suffers from skilled labour shortages and skill mismatches, undermining the transition to knowledge-intensive activities.

Global technology and outsourcing trends have made the E&E industry increasingly reliant on specialized professionals. This has led to a rise in demand for technical and soft skills in both developed and developing nations. Skills needs in the industry mostly require increasing the number of design, electronic, production and software engineers as well as skilled technicians with strong project management, problem-solving, teamwork, creative thinking and communication skills (Hillage et al, 2002; Best and Rasiah, 2003; Nordin, 2013).

Skills shortages and mismatches limit the ability of E&E manufacturing facilities in Thailand to increase their productivity and are considered an obstacle to gains from spillovers associated with FDI. According to findings from the 2015 Productivity and Investment Climate Survey (PICS), skilled labour shortages are regarded as the second most important barrier to growth (after political instability) for manufacturing firms operating in Thailand (World Bank, 2016). Skills gaps have persisted for over a decade, as shown by the 2007 PICS results, where 30 per cent of all manufacturers reported not having enough skilled workers; the figure rises to 32 per cent for companies in the E&E sector (World Bank, 2012).

Skills gaps could be widening as a result of the "fourth industrial revolution" brought about by reliance on industrial robots in manufacturing – which, as presented in chapter 2, is likely to affect the global E&E industry and, as a consequence, operations in Thailand in the future (Schwab, 2016). As one interviewee, a global head of operations at an HDD company, explained, "Artificial intelligence means that the decisions related to production, currently taken by engineers, will be automated: an IT system will be controlling the various production steps. Electronics manufacturing will require professionals with stronger IT and programming skills."

Skilled labour shortages in the E&E sector can be associated with a low number of students enrolled in engineering and science fields (20 per cent versus 40 per cent of engineering and science students in Singapore, Republic of Korea and Malaysia), as compared to those who pursue tertiary education in business, law and accounting (60 per cent versus 20–30 per cent in Singapore, Republic of Korea and Malaysia) (World Bank, 2012). Under its current National Science, Technology and Innovation (STI) plan, the government aims at increasing the number of science and technology graduates in Thailand by 2021 by 60 per cent. Attention should also be given to the quality of higher education: 40 per cent of Thailand's science and technology graduates work in areas different from those of their studies, suggesting skill mismatches between educational achievement, training and the needs of the labour market (UNCTAD, 2015).

Additionally, the quality and adaptability of general education is an issue in Thailand. Thai students scored below the international average in the 2015 Programme for International Student Assessment

(PISA) in all three areas of investigation: mathematics, science and reading. Despite a lower level of economic development, Viet Nam performed better in terms of PISA scores than Thailand (World Bank, 2016). PISA scores indicate that Thai students face challenges in adapting their knowledge to solve practical problems. Inequality in access to good quality education is another challenge, as PISA scores are higher in urban areas as compared to those in rural areas, where household income is 180 per cent lower as of 2013 (Fredrickson and Dumrongkiat, 2016). Moreover, the Thai workforce and students score poorly in terms of English language proficiency, ranking 62th out of 70 countries in the EF English Language Proficiency Index (World Bank, 2016).

However, gaps in soft skills, also referred to as “generic skills”, are regarded by private employers to be the most pervasive; these include: leadership, communication, creative thinking and other behavioural skills. Recent research has placed emphasis on soft skills, determining their importance to human capital development and employment outcomes (World Bank, 2012). Research also highlights that skills such as problem solving, teamwork and leadership are particularly relevant to upgrading in the E&E sector (Best and Rasiah, 2003). A respondent, who is a human resources manager at an automotive electronics firm, suggested that “Thai universities do little to enable students to bring about innovation, by making them think ‘out of the box’ through hands-on and project-oriented learning.”

Skills shortages translate into a high turnover among skilled professionals, who face a substantial salary premium in the Thai labour market: hourly wages of graduates with a master’s degree are four times those of upper secondary graduates; the wage premium for employees holding a tertiary degree in engineering and science is among the highest (Patmasiriwat, 2011).

Despite the high turnover and costs associated with it, most of the employers in manufacturing, including those in the E&E sector, find it necessary to provide formal training on their premises, with almost half of all employees benefiting from such trainings (World Bank, 2012). Additionally, training centres have been established by the Ministry of Labour with the purpose of providing pre-employment training, upgrading skills and facilitating job retention for those wishing to advance in their careers. However, despite having attracted 4.6 million employees as of 2013, these public centres have limited capacity and the quality of training provided diverges across them (UNCTAD, 2015). Also, Thailand’s formal technical and vocational education and training (TVET) system has been found to focus on quantity over quality of training, underperforming in important areas such as analytical thinking and entrepreneurship (Fredrickson and Dumrongkiat, 2016).

To address these shortcomings in the labour market, the National Science, Technology and Innovation Policy Office has recently launched the “Work-Integrated Learning Programme” (WiL), which aims to reduce labour shortages in the industry by supplying 50,000 skilled workers to the industrial sector over the next five years. These workers are expected to undergo vocational training or undergraduate education in line with industry needs (BOI, 2016).

Among the companies surveyed, expatriate engineers and senior managers are invited to Thailand to promote transitions to knowledge-intensive production stages. In some cases, in-company research and innovation centres have been set up. Continuous learning opportunities for workers are also offered, in order to enhance employees' retention and skills upgrading (see box 6).

Box 6

Firm-level skills upgrading strategies and on-going challenges

Support of expatriate engineers to enable knowledge transfers. The companies interviewed employ expatriate engineers and managers, which represent on average 5 to 10 per cent of the workforce and are normally under temporary assignments for knowledge transfer purposes. One company interviewed also sends Thai engineers to work temporarily in foreign facilities, so that they can master new technologies as well as improving their soft skills.

Continuous learning opportunities for workers. As part of their career development efforts, some of the companies surveyed give access to on-site courses to enable workers to complete their secondary education or to attend specific university courses and English classes at a subsidized rate. Internal promotion is normally favoured by giving priority to applications received by existing employees.

In-house R&D activities. A home appliances company interviewed is planning to set up a "knowledge centre" to enable project-based product development to occur. The semiconductor producer interviewed employs 170 PhD students internally for product testing and packaging processes. Producers operating in smaller facilities report facing constraints in their ability to promote large-scale innovation activities. Also, the interviews conducted suggest that, outside the scope of the HDD subsector, process and product development efforts remain quite limited: knowledge-intensive activities are mostly related to the adoption of existing innovations in production as well as product customization, mostly for clients operating locally. Interviewers also explained that there are few reasons to relocate high-tech parts and components (i.e. HDD wafers, which are high precision semiconductors) and products (i.e. solid state drives, or SSDs) manufacturing to Thailand, as these require production processes that are highly capital intensive, where labour cost considerations become less significant and logistics advantages play a minor role.

Skilled labour shortages could be counteracted by increased labour mobility in the region.

For the HDD components' producers interviewed, skill shortages are particularly present among skilled technicians (i.e. tooling professionals), who are recruited from countries with a larger supply of skilled and semi-skilled labour. At one of the companies, almost 30 per cent of the total workforce is of foreign nationality. In an interview, the managing director of an HDD components firm suggested: "The Thai education system has not invested in the development of the required skills, and at the same time, Thai students do not consider the profession prestigious enough, as opposed to getting the title of 'engineer'. However, they do not take into account that, given the labour shortages for tooling professionals, the salary received is higher than the one of a regular engineer."

When considering this example, skilled labour shortages in the Thai E&E industry could be attenuated by regional labour market integration. Mutual recognition agreements (MRAs) for skilled professionals under the AEC could be an opportunity for knowledge transfers and upgrading to take place in the industry, but could also prove a challenge for the Thai workforce unless absorption capacity is improved at the national level (World Bank, 2016). Statistics from the Department of Employment (DOE) show that Thailand is already a popular destination for Filipino skilled workers: these make up almost 15,000 out of a total of 500,000 skilled workers and technicians in Thailand, as of February 2017 (*Bangkok Post*, 2017). Box 7 provides some insights into the challenges and opportunities related to skilled labour mobility under the AEC envisioned by the E&E industry executives surveyed.

Box 7
What challenges and opportunities under the AEC?

Overall, the E&E executives interviewed expressed uncertainty about the benefits brought by the free movement of skilled labour under the ASEAN Economic Community (AEC). Although most of those interviewed acknowledged potential advantages from free movement within the AEC, it is not clear to what extent deeper liberalization related to the movement of professionals is likely to take place.

An interviewee stated that the larger availability of skilled professionals at lower costs in the Philippines and Malaysia might pose a competitive threat to Thailand in the future under the AEC. However, the interviewee also commented that Thailand, being a country sufficiently large in size, has still the potential to develop a competitive skilled labour force, provided that the quality of education is improved in the country. Another respondent commented that the AEC could give the Thai government an incentive to invest more in R&D and education in order to maintain the country's competitiveness vis-à-vis its neighbours.

Gender representation gaps at the high end of the skill spectrum.

Women employees have played a major role in supporting the rapid expansion of the E&E sector in across South-East Asia (Kaur, 2004). In Thailand, as of 2015, over half (55.4 per cent) of employees in the E&E industry are women (see table 2 and figure 10). Previous research pointed out that the majority of workers in the E&E industry are young women in the age group 18–31 (Bais, Overeem and Gehrt, 2012).

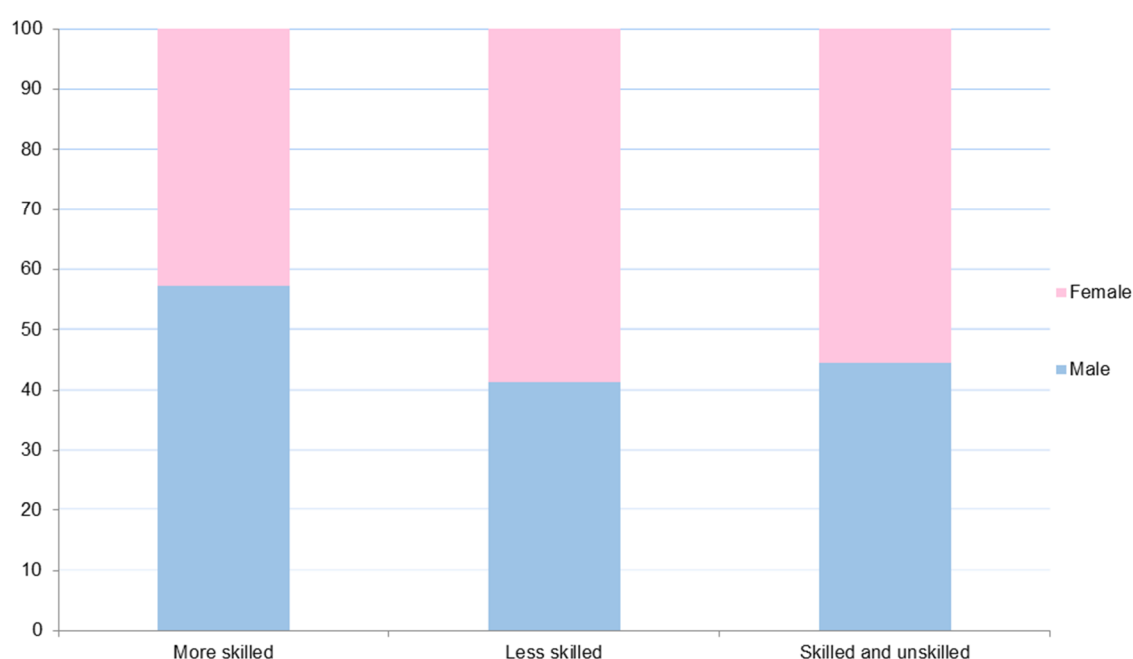
Table 2: Employment by occupation in Thailand's E&E industry (2015)

Occupation	Male	Female	Male (%) share	Female (%) share
Managers	30 450	11 963	71.8	28.2
Professionals	25 125	23 578	51.6	48.4
Technicians and associate professionals	35 131	31 930	52.4	47.6
<i>More skilled workers total</i>	90 706	67 470	57.3	42.7
<i>As % of total employment by gender</i>	25.8%	15.4%		
Clerical support workers	10 730	31 650	25.3	74.7
Service and sales workers	621	1 086	36.4	63.6
Skilled agricultural, forestry and fisheries	352		100.0	0.0
Craft and related trades workers	69 749	34 273	67.1	32.9
Plant and machine operators, and assembly workers	169 745	270 705	38.5	61.5
Elementary occupations	10 289	32 598	24.0	76.0
<i>Less skilled workers total</i>	261 486	370 312	41.4	58.6
<i>As % of total employment by gender</i>	74.2%	84.6%		
TOTAL	352 192	437 782	44.6	55.4

Source: Authors' and ILO RESA calculations based on Thailand's Labour Force Survey (LFS, 2015), using ISIC Rev.4 Codes 26, 27, 28 and ISCO 1-digit codes 1–9.

However, as shown in table 2, female employment is concentrated in low-skilled categories – in particular, clerical work, service and sales work, elementary occupations, and assembly and manufacturing – with 85 per cent of total female labour being relatively unskilled. In contrast, 74 per cent of total male employment is relatively unskilled: a difference of over 10 percentage points. Gender representation gaps are the largest at the high end of the skills spectrum, as women represent just over a quarter of managers in the industry, with managers accounting for only 3 per cent of total female employment. In contrast, the female-to-male ratio for professionals, technicians and associate professionals is more balanced, with male employment being just over 50 per cent for these two skilled and semi-skilled occupational categories.

Figure 10. Gender distribution across skills categories (%)



Source: Authors' and ILO RESA calculations based on Thailand's Labour Force Survey (LFS, 21015), using ISIC Rev.4 Codes 26–28 and ISCO 1-digit codes 1–9.

When considering academic achievements in science, technology and innovation (STEM) fields, Thai female students outperform males in international assessments. Also, 59 per cent of researchers in Thailand are female (UNESCO, 2015). Additionally, in 2015, 57 per cent of the total students enrolled in tertiary education were women (Iwamoto, 2017).⁸

Less is known about earnings and the quality of jobs covered by these women in E&E workplaces. National-level statistics indicate that women were paid on average 16 per cent less than their male counterparts in 2013. Such a pay gap can be explained in part by the lower number of women in highly skilled positions: most of Thailand's female workforce is hired in positions at the lowest occupation level (World Bank, 2016). As shown by gender-disaggregated statistics, this is likely to affect outcomes in the E&E industry as well (see box 8), but more research is needed to clearly define the employment challenges in the sector from a gender perspective.

⁸Source: UNESCO Statistics.

Box 8
Gender skills gaps in Thailand's E&E industry

At the companies surveyed, female employment ranges from 50 to 80 per cent of the total, although, as in the E&E industry at large, women employees tend to be concentrated in low-skilled positions. For example, when considering unskilled workers engaged in manufacturing processes (i.e. direct labour), around 95 per cent of are women at one of the companies interviewed, while the figure drops to 40 per cent when considering the percentage of women employed in managerial and engineering positions. On average, women tend to cover 30 to 45 per cent of the managerial and engineering positions at the firms interviewed.

These explorative findings are in line with a larger trend characterizing Thailand's E&E industry, where women tend to be underrepresented in highly skilled positions. In spite of this, the companies interviewed do not pursue any own initiative aimed at attracting more female skilled labour. Again, further research would help to identify barriers to female employment in highly skilled occupation for the E&E industry.

Weak university–industry linkages pose challenges to industrial upgrading in Thailand and its E&E sector.

Research shows that limited linkages between national university institutions and the private sector have hindered innovation in the Thai manufacturing industry (Brimble and Doner, 2007). In Thailand, most R&D activities are conducted at universities and public research institutions. Public R&D expenditure represents only 0.25 per cent of GDP, but is expected to reach a 2 per cent expenditure target by 2021, with 60 per cent of it being financed by the private sector, under Thailand's science, technology and innovation (STI) national policy plan (UNCTAD, 2015). But, in the current context, public institutions have mostly promoted a supply-driven approach to innovation, focusing on knowledge accumulation rather than knowledge transfers and upgrading. Hence, industry needs have often been neglected. The fragmented nature of the Thai bureaucracy has challenged high-level political commitment and coordination among government bodies, while at the same time, innovation activities promoted by industry associations have also been limited (Brimble and Doner, 2007; UNCTAD, 2015).

Collaboration with Thai universities has been sought by large firms, while only a minor share of SMEs benefits from relations with higher education institutions. The benefits of most of these collaborative efforts are confined to employees' training initiatives, conferences and meetings rather than the sharing of analytical and technical services (UNCTAD, 2015). In fact, the majority of private companies in Thailand are not actively engaged in R&D; the share of researchers working in the private sector has declined steadily, currently representing only 20 per cent of the total number of researchers active nationally, with the rest being employed by government and university institutions (UNCTAD, 2015).

In order to foster Thailand's university–industry linkages, the government has launched two pilot initiatives. These are the “Researchers for Research Industry Program”, providing funding for PhD students to carry out research related to the private sector, and the “Talent Mobility Scheme”, a voluntary programme under which researchers spend 20 per cent of their time working in industry (UNCTAD, 2015).

The HDD subsector, where university–industry initiatives are well established and have been supported by the government, may serve as an example of supporting such private-public linkages. A cluster development study was first promoted by the global HDD industry association (the International Disk Drive Equipment and Materials Association, or IDEMA), which was then adopted by national authorities, highlighting the growth of the subsector as a priority for the country's development (Brimble and Doner, 2007). In 2005, the HDD Institute was established to support technological upgrading of the industry by acting as an intermediary in the promotion of joint research

initiatives among HDD companies and universities (UNCTAD, 2015). As a result, the Thai HDD subsector has managed to develop process and product development capabilities over the last two decades. Industrial upgrading has mostly taken place through process development as HDD production has become fully automated; automation in production has required a higher level of technical skills and productivity improvements throughout the HDD supply chain. The situation was very different during the early stages of development of this subsector in the 1980s and 1990s, when only low-skilled and low-tech activities were carried out and reliance on foreign inputs was high.⁹

Box 9 presents E&E firm-level strategies to promote university–industry linkages through internship programmes, scholarships, university curriculum development initiatives and joint R&D efforts in the HDD subsector.

Box 9
Promoting university–industry linkages

Strengthened R&D efforts through continuous cooperation with universities and the government in the HDD subsector. Given Thailand's proven capacity to innovate in HDD process development, one HDD company interviewed is transitioning to product development activities in the country, through cooperation with local universities as well as the government's National Science and Technology Development Agency (NSTDA) and its sub-agency NECTEC. As part of these efforts, the firm is aiming to hire a larger number of PhD researchers. Moreover, benefits are expected from the Talent Mobility Scheme. Ad hoc research projects in universities are also being supported by the HDD companies surveyed. However, one of the smaller-sized HDD component companies surveyed abandoned its partnership with NECTEC due to intellectual property (IP) strategic considerations: if it were to partner with NECTEC, it would have had to share its IP rights with the agency.

Internship programmes and other hands-on opportunities. University–industry partnerships carried out by most of the companies interviewed include internship programmes that provide students with hands-on experience as they develop skills that fit corporate needs in terms of recruitment. One company cooperates with universities in organizing robotics development challenges and provides sponsorship to the best Thai university students to compete worldwide in robotics contests. In these competitions, the participating Thai engineering students have proven to be as skilled as their Western counterparts. Moreover, some of the companies provide scholarships to high-performing Thai engineering students; scholarships are either fully funded by the firms themselves or co-sponsored with the government. These companies also collaborate with selected Thai universities to improve their curricula.

Despite the development of important clusters, the Thai E&E industry is challenged by a weak local supplier base.

Unlike the case in Singapore and Malaysia, in Thailand FDI in the E&E industry has not resulted in the development of a strong local supplier base. In fact, the large majority of parts and components suppliers present in the sector are US and Japanese firms, which have been attracted to Thailand by competitive labour costs and major cluster development incentives by the government (Hiratsuka, 2011). Currently, there are well established E&E clusters across seven of Thailand's provinces (Rynhart, Chang and Huynh, 2016). However, these clusters are dominated by foreign enterprises, as the lack of well-designed sectoral policies has constrained the growth of domestic capabilities through knowledge transfers. With the exception of the automobile industry, industrialization policies throughout the 1980s and 1990s have prioritized the achievement of trade surpluses and the maximization of employment outcomes through FDI rather than the development of an indigenous

⁹ Interview with the global head of operations of an HDD manufacturing company.

suppliers' base through local content requirements. In contrast, the state government of Penang (Malaysia) successfully promoted business linkages in the E&E sector among MNEs and local firms through the promotion of collaborative networks and targeted policies which responded to industry needs (UNCTAD, 2015).

Research argues that the transition to higher value added activities is more of a challenge unless an autonomous local supplier base is present (Humphrey and Schmitz, 2000). Economic development has rendered this transition process more difficult in Thailand, as the productivity gap between SMEs – which represent the vast majority of locally owned firms – and larger firms has widened. As a result, the contribution of SMEs to the country's GDP has fallen from 41.3 per cent in 2002 to 37.4 per cent in 2013, while their contribution to total employment remains at 80 per cent (World Bank, 2016).

The companies surveyed largely rely on international suppliers operating locally (mostly Japanese and US-owned firms) as well as on the import of high-tech parts and components from the United States, European Union, Republic of Korea, Singapore, Taiwan (China) and China. Reliance on local enterprises is mostly for indirect materials (i.e. cleaning products), logistics (i.e. transport and warehousing) and machinery parts. The use of local suppliers is higher, however, for the respondents in the home appliances subsector: one of the companies interviewed sources 90 per cent of its refrigerator parts from local suppliers. This might be due to lower skills and technology requirements in production. In an interview, the plant manager at a semiconductor company commented that “No local supplier base is likely to develop in Thailand for high-tech production, as Thai companies lack the sufficient scale to do so, while the electronics industry is already mature and is facing increasing consolidation through M&As.”

As new products and markets develop in the E&E industry, however, opportunities for local innovative SMEs could still be present. For this, Thailand's NSTDA Business Incubator Center would need to incentivize the development of technology-based start-ups, paying attention to their particular financing needs. Moreover, as discussed, entrepreneurial skills need to be strengthened in the Thai education system (UNCTAD, 2015).

Some of the companies interviewed have attempted to promote the development of local suppliers through knowledge transfers (see box 10). However, these tend to be confined to low-tech enterprises, somewhat falling outside the scope of the E&E sector.

Box 10
Supporting knowledge transfers to local suppliers

Co-creation with suppliers. One of the HDD component manufacturers surveyed has actively supported local suppliers in the development of machinery equipment, giving the required specifications and working with these SMEs to improve their capabilities. The interviewee noted that production and assembly of machinery requires lower technology capabilities as compared to the firm's core operations and hence, permits easier knowledge transfers.

Strengthening managerial capabilities. One of the companies surveyed cooperates with the government to share best management practices with local small-scale suppliers in a 2-day seminar that takes place twice a year. These events are held in Thai to facilitate interaction with local producers and include topics such as human resource management, finance and accounting and socially responsible practices.

4.2 Job quality

Recruitment and employment practices associated with the E&E industry can affect not only job quality, but also fundamental rights at work.

The use of flexible forms of employment in the industry has been adapted as a common response to cost pressures and demand volatility, which occur in Thailand and several other Asian countries that focus on labour-intensive production stages (ILO, 2014; AMRC, 2013). However, the use of non-standard forms of employment has often led to an erosion in job quality and workers' rights, for example, by shifting workers to labour subcontracting agencies or other subsidiaries, thus imposing new employment terms and conditions without involving unions in consultations (AMRC, 2013).

Practices adopted by employers to decrease risks associated with fixed labour costs also include employing vulnerable groups of migrant workers, women and youth on a temporary basis, with restricted rights and benefits. For example, the expansion of the consumer electronics sector in Asia has relied in some cases on young students in internships being subject to compulsory overtime, no social security benefits and involvement in activities not matching their areas of study (Finnwatch et al., 2009; Danwatch, 2015; China Labour Watch, 2011). Young women are another important group of workers in the E&E industry across Asia; they face discrimination in the workplace in documented cases (Kaur, 2004; China Labour Watch, 2011; Bormann et al., 2010; Bais et al., 2012). Additionally, findings in the neighbouring Malaysian electronics industry underline the vulnerability of temporary migrant workers to abusive labour practices, including forced labour. (Box 2; Verite, 2014). In the case of Malaysia, research also suggests that there is a correlation between labour subcontracting practices and the probability of agency workers to be in forced labour (Verite, 2014).

In Thailand, nearly half of the employees in the E&E industry were reported to be agency workers, hired by recruitment agencies instead of directly by employers (SOMO, 2012). An important share of these are young women and migrant workers (Holdcroft, 2012; Bais et al., 2012). Agency workers can be hired either as "regular agency workers" or as casual temporary workers. While the former enjoy similar benefits to permanent employees, temporary workers can face very limited benefits and no access to social protection.¹⁰

Unskilled migrant workers in Thailand can only be hired under temporary work permits and often fall in the category of agency workers (SOMO, 2012). Thailand hosts an estimated 3.7 million migrant workers, representing 5.6 per cent of the population and 9.6 per cent of the total workforce. Coming mainly from Myanmar, Cambodia and Lao People's Democratic Republic, these workers cover unskilled positions in construction, agriculture, fishing, food and seafood processing (ILO, 2016b). Given the demand for temporary labour in low-skilled assembly processes of the E&E industry, a significant share of migrants is also attracted to the E&E sector (Bais et al., 2012).

The population of migrants in Thailand includes over 1 million undocumented workers, who, having very limited legal protection, are subject to human trafficking and forced labour risks (UNDP, 2014). However, even documented migrants coming through official bilateral migration agreements face risks of extortion, confiscation of personal documents, and paying excessively high recruitment fees to recruitment agencies and unregulated networks of brokers operating across borders. As migrants often cannot afford these fees, they often enter into debt bondage with their recruiters and face monthly wage deductions¹¹ (ILO, 2013). Since August 2016, the Thai government has implemented the Royal Ordinance "Bringing migrant workers to work with employers in Thailand", which

¹⁰ Interview with a Thai labour activist who is a representative of Good Electronics Network and former union spokesperson.

¹¹ While such issues have occurred across sectors in Thailand, there have been cases specific to the E&E industry, as reported by Electronics Watch in "Workers Right Alert, November 25, 2016", a report accessible to Electronics Watch affiliates and selected stakeholders.

explicitly prohibits employers from charging migrant workers in Thailand any recruitment fee (ILO, 2016c). However, as the provision only applies to Thailand, migrant workers may still face excessive recruitment fees in their countries of origin.

In order to respond to regulatory gaps in host countries and external stakeholders' pressures, major players in the E&E sector, including the companies interviewed, have resorted to industry-wide initiatives to consistently adopt fairer recruitment practices across their supply chains. Box 11 introduces labour standards, monitoring mechanisms, potential challenges and gaps under the Electronics Industry Code of Conduct (EICC), an industry-led initiative that promotes the respect of human rights, international labour and environmental standards.

Box 11
The EICC

Recruitment and employment-related standards. The companies interviewed operating in the consumer electronics segment (HDD, HDD parts and components, semiconductors) asserted their companies strictly follow provisions under the EICC, where employers:

- do not engage in any form of bonded labour;
- do not make employees pay for their recruitment fees;
- do not confiscate workers' identity documents;
- do not restrict workers' freedom of movement and their decision to leave their job;
- do not engage in wage deductions for disciplinary and other reasons; and
- provide a written employment contract in the workers' native languages, specifying terms and conditions before employees leave their country of origin.

Monitoring. The EICC may go beyond firms' codes of conduct and other social compliance initiatives as, in addition to generally stricter standards, it requires firms to undergo independent third-party social audits internally as well as throughout their supply chains. However, although the EICC states that companies "must regard the Code as a total supply chain initiative", in reality, the Code is generally applied only to first- and second-tier suppliers (Raj-Reichert, 2011).

Potential pitfalls in Thailand. A major non-compliance issue reported by the lead EICC third-party auditor interviewed is related to the recruitment fees paid by migrant workers, as they tend to be hired by labour agencies outside their home country and hence face limited legal protection in Thailand. Moreover, the social auditor found that migrant workers were not being fully repatriated to their home countries at the end of their work stay in Thailand and hence, had to pay for their own repatriation expenses.

Gaps. It should be noted that the EICC, as an industry developed and managed initiative, has itself faced considerable criticism (further explored in sub-section 3), including in a 2012 report by the Center for Research on Multinational Corporations (SOMO) stating: "Civil society organisations, including trade unions, have criticized the code for not including the right to collective bargaining, for using ambiguous language and for referring specifically to local laws, which could curtail the right to association." Moreover, the Code has been also criticized for being vague, generic and open to interpretation by the adopting companies (Martin and Bravo, 2016).

Additionally, box 12 provides examples of firm-level fair recruitment responses that go beyond the scope of the EICC, as they involve direct hiring and integration of workers with disabilities.

Box 12

Recruitment practices among players in Thailand's E&E industry

Direct hiring. Players in the electronics sector have resorted to the promotion of direct hiring in their supply chains to reduce exploitation risks associated with labour subcontracting (Biron, 2014). At the companies interviewed, the majority of employees (70–95 per cent) are hired under full-time, permanent or long-term contracts and granted full social protection. A small share of workers (10 per cent or below) are hired by labour subcontracting agencies as regular workers in order to deal with the challenges created by fluctuations in demand and employees' turnover. In contrast, at the companies belonging to the automotive electronics and home appliances subsectors, half of the labour force is employed as agency workers by labour subcontracting agencies. These include migrant workers.

One of the labour activists interviewed reported cases of unions in Thailand that succeeded in integrating fixed-term agency workers as regular and full-time employees, after they had spent at least two years with their employers.

Hiring workers with disabilities. One firm interviewed has been successful in integrating workers with disabilities in its operations, with this group currently constituting 1 per cent of its total labour force. This was made possible because the company, with the support of the provincial government, was able to make modifications to its workplace and processes to better facilitate participation by such workers.

Global fluctuation in demand can lead to excessive and unwanted overtime work.

Market uncertainties in the E&E industry have often led to an excessive use of overtime work by manufacturers to meet production targets during periods of demand peaks (ILO, 2014). In Thailand, this practice is reinforced by the fact that unskilled workers in the industry earn a low basic salary, normally set at the industry minimum. Salaries can be substantially increased through bonuses, allowances and overtime work. Under Thai labour law, the hourly rate for overtime should be 150 per cent or higher than for normal working hours. Therefore, it is common for workers to engage in longer working hours – sometimes going beyond the maximum amount of overtime work allowed legally – to better cover their living expenses and household debt. A minimum basic salary is claimed to be an advantage to employers since the practice lowers the cost of laying-off workers: according to the Labour Protection Act, an employer is only required to pay a six-month salary, without considering overtime, to employees who have worked for the company for over five years. Hence, the lower the base salary, the lower the risks for businesses. Additionally, this practice also decreases the contribution employers have to pay to their workers' pension or retirement fund, again linked to regular rather than overtime earnings (AMRC, 2013).

Excessive overtime work can lead to fatigue and strain, be detrimental to workers' well being and have negative consequences on their productivity (Harrington, 2001). It may also disrupt employees' work-life balance, as highlighted in an interview with a Thai labour activist and Good Electronics Network representative, who emphasized the linkage to long commutes to worker housing: "Thai workers tend to suffer from a work-life imbalance, as limited time is spent on recreational activities and with families: while a working day can be as long as 12 hours, up to four additional hours may be required for commuting."

Despite these challenges, improvements in this area may have materialized. Some companies surveyed reported that the introduction of the national minimum wage policy has reduced the demand for overtime work by workers in their premises. Additionally, following pressure from labour activists regarding the use of excessive working hours, players in the industry have responded by limiting and strongly regulating overtime work, through compliance to standards and practices above national legislation, such as the EICC (see box 13).

Box 13
Restricting overtime work

Provisions under the EICC. The companies surveyed in the electronics segment follow the Code by ensuring that their employees do not work more than 60 hours per week (including overtime) and that any overtime work is voluntary. Also, workers should be entitled to at least one day off every seven days. In adapting the Code, these companies have gone beyond compliance to national legislation in Thailand, under which workers are allowed to work 48 hours per week and 36 hours overtime.

However, the social auditor interviewed stated that, based on the audits conducted in the industry, overtime work was found to be a common cause of non-compliance to the EICC. As mentioned previously, further investigation is needed to determine how widespread such practices are. The introduction of the 60-hour limit was reported to be an initial challenge for some of the companies surveyed: as the 2011 flood in Thailand disrupted several operations, compliance to the EICC was delayed by some firms as they had to catch up with their production targets.

The use of a “clock system”. In order to ensure effective enforcement of the working hours limit, one producer interviewed introduced a “clock system”, a computerized system through which workers have to “sign up” for overtime work requests. Overtime work requests must be evaluated by supervisors and approved based on the performance and seniority of workers. The “clock system” was presented to the Ministry of Labour as an example of good labour practice in the workplace, which other companies in Thailand have been invited to follow.

Further research is encouraged to identify occupational safety and health issues in the context of Thailand’s E&E sector.

If not tackled appropriately, production processes in the sector may expose workers to dangerous chemicals substances, such as rosin (colophony) fumes, which lead to severe respiratory diseases, as well as acetone and isopropyl alcohol solvents that can cause permanent effects to the nervous system (SOMO, 2010). Excessive and inappropriate exposure to chemical substances may also cause leukaemia, cancers and unintended deaths (Raj-Reicher, 2016; ITUC, 2016). Other health risks include headaches, dizziness and reproductive problems. Thousands of chemicals are used in the industry, but only a limited number have been tested for toxicity. Additionally, linking long-term health effects to exposure to dangerous substances in the workplace can be a challenge (Bartlett, 2015). The International Campaign for Responsible Technology (ICRT) and the Good Electronics Network, an international coalition of NGOs, academics and trade unions, have for over a decade been challenging MNEs in the industry regarding their use of dangerous chemicals. Activists claim that the OSH standards set by the industry, including those under the EICC, have proven insufficient to protect workers, communities and the environment (GoodElectronics, 2016). Among other things, the coalition advocates increased transparency, the use of safer substances as well as setting stronger measures to protect workers (GoodElectronics, 2015).

Less is known about OSH challenges specific to the E&E industry in Thailand, in part due to the limited representation of workers in the sector, which in turn limits their ability to raise concerns and have them addressed: “In Thailand, low union and civil society involvement in the electronics industry does not allow to appropriately assess safety and health risks,” in the words of a Thai labour activist and Good Electronics Network representative in an interview.

Box 14 provides examples of firm-level practices implemented to minimize OSH risks across E&E manufacturing operations in Thailand.

Box 14
OSH practices and challenges

Strict compliance with international standards. Several of the companies interviewed comply with international standards (such as the Occupational Health and Safety Assessment Series, or OHSAS 18001) as well as their own corporate policies, which tend to be stricter than OSH provisions under the EICC and national legislation. Two of the companies interviewed have among the best scores in terms of safety records and have been given recognition by national and international authorities. Best OSH practices include constant monitoring of dust and noise levels and regular assessment of potential physical and chemical hazards. The social auditor interviewed stated that the companies audited scored quite well in terms of compliance to OSH standards. This is because, according to the interviewee, these are visible, outcome-based standards, which are relatively simple to implement.

Annual health checks. Companies surveyed provide annual health checks for their employees and keep track of their health history through a medical surveillance programme. Special health checks are also available for women during their pregnancy, when they are forbidden to engage in heavy work. However, one labour activist interviewed stated that little is known about long term health effects related to exposure to dangerous chemical substances across E&E factories in Thailand.

OSH training for workers. One company in the home appliances sector reported challenges related to workers found not wearing safety equipment at times; this issue is being addressed through safety training and continuous communication over safety practices by management.

Automation. The interviewed companies operating in the HDD subsector have largely automated production systems, meaning that workers are only engaged in quality control and technical support roles. Interviewees at these companies commented that automation has the potential to increase compliance to OSH standards, as it enables companies to better control related risks.

4.3 Workers' voice and representation

Workers' voice and representation in the E&E industry tends to be a challenge for several producing countries across Asia, where employers may actively discourage their workforce to join or form unions, and where freedom of association and collective bargaining rights may be subject to nationwide restrictions (IndustriALL, 2015a; ITUC, 2016; Raj-Reicher, 2016). Moreover, weak unionization in the E&E industry can be attributed in part to the widespread use of agency labour as well as workers under fixed- and short-term contracts in the sector, which render collective bargaining a challenge, particularly in countries where enterprise-level bargaining is predominant (ILO, 2014). Another aspect limiting E&E workers' ability to stand for their rights in the region is the limited capacity of unions to attract members, organize, collect fees and promote leadership (IndustriALL, 2015a). International labour rights groups, including the global union IndustriALL, have played an important role in advocating for and supporting workers' rights in the E&E industry, as observed in Malaysia and the Philippines (Matsuzaki, 2015). Moreover, positive outcomes stemming from tripartite cooperation can be identified in the region: in the E&E industry of Singapore, strong union activity and effective social dialogue between the government, workers and employers' organizations enabled the country's transition to higher value added activities in the sector (Raj-Reichert, 2016).

In Thailand, unionization is among the lowest in the world, estimated at around 1.5 per cent of the total workforce (IndustriALL, 2015b). Unions exist in only 34 out of 76 provinces, implying that there is no workers' representation in tripartite committees at a provincial level for provinces without

unions (ILO, 2017). In the 2017 International Trade Union Confederation (ITUC) Global Rights Index, Thailand has a rating of 4 on a scale of 1 to 5, with 1 indicating “no regular violations of rights” and 5 implying no guarantee of workers’ rights.¹² Such a rating indicates that systemic labour rights violations are present in the country, meaning that there is weak enforcement of labour rights despite basic frameworks to protect workers being in place (ITUC, 2017). However, the current legal framework on workers’ rights, found in the Thai Labour Protection Act, falls below international labour standards. In fact, Thailand has yet to ratify ILO Fundamental Conventions 87 and 98 on freedom of association and collective bargaining. This particularly harms migrant workers as, under national legislation, they are allowed to join but not to create their own unions. Thai Ministry of Labour (MOL) Working Committee has been working to reform the current national legal framework to better protect workers’ interests (ILO, 2017). Another challenge identified is the weakness in the current dispute resolution machinery (ILO, 2017). The labour activist interviewed explained that workers’ access to legal remedy is challenged by the length of judicial procedures: it can take as long as 15 years to solve a labour dispute in a Thai court.¹³

With regard to Thailand’s workers’ voice and representation issues in the E&E industry, two important cases of worker–management disputes have been observed at a factory level over the past few years, attracting the attention of international social partners. One of these disputes involved workers’ demands for a higher compensation to better match their years of experience, as a result of the raise in the minimum wage, while the other dealt with workers’ opposition to a unilateral decision by management to re-organize the work schedule (i.e. introduce mandatory 12-hour “4x2” shifts) to better meet just-in-time production targets required by international buyers (Remmers and Shipper, 2015; Swedwatch, undated). Unions’ protests resulted in workers’ lockout and dismissal. At a later stage, there were cases of compensation and reintegration (Swedwatch, undated).

Among the companies interviewed, most of the recent complaints raised by unions relate to the working environment (including food, transport, and access to facilities.), which tend to be addressed relatively quickly by management. At one of the firms surveyed, there are on-going negotiations with union representatives on raising wages as well as improving benefit packages. These demands tend to reflect the challenges faced among employees in the E&E industry in the region and globally (ILO, 2014; Raj-Reicher, 2016).

Another challenge observed in the Thai E&E industry and beyond is a general lack of workers’ awareness on how to access their rights, meaning that employees are not fully aware of the benefits of organizing and collective bargaining with employers, while unions often lack the resources to effectively mobilize workers (IndustriALL, 2015a). One executive, the head of operations for an HDD component supplier, commented in an interview: “In Thailand, there is no culture and education on the advantages of joining a union. No real social dialogue and collective bargaining is taking place at my company.”

In contrast, the labour activist interviewed made the following remark: “While workers are not fully aware of their benefits, employers do not encourage workers to express their concerns. There is a general fear of union activities by employers, who do not consider unions as partners.”

To help meet these challenges, the global union IndustriALL, with support from the European Union, is organizing and training E&E workers in South-East Asia in order to strengthen their capacity of association and collective bargaining. The project targets Thailand as well as Indonesia, Malaysia, Viet Nam, the Philippines and Taiwan (China), and activities will be delivered by 2018 (IndustriALL, 2015a).

If unions are not in place, Thai labour legislation mandates companies with more than 50 employees to organize a welfare committee. A human resources director of an HDD company stated: “The

¹² The rating of “5+” is also possible for countries with no guarantees of labour rights due to breakdown of the rule of law.

¹³ Interview with a Thai labour activist who is a representative of Good Electronics Network.

introduction of a welfare committee has substantially improved trust among our workers and management. As result, no strike was held by workers.”

However, under Thailand’s Labour Protection Act of 1998, welfare committees are of consultative nature only. Therefore, a welfare committee can only issue non-binding recommendations, related to the improvement of conditions at the workplace. Generally, the companies interviewed reported that complaints by welfare committees have mostly been related to issues such as the quality of food, transport, access to facilities, and recreational facilities in the workplace.

Firm-level practices have also been introduced by the companies and social actors interviewed to strengthen workers’ voice in the workplace. Examples are provided in box 15.

Box 15
Firm-level workers’ voice initiatives

Open communication between workers and management. A practice commonly adopted by employers at the companies interviewed, regardless of the existence of a union in the workplace, is to have regular meetings, where management openly communicates to its employees the potential challenges their company might face and where open discussion is encouraged.

Company-level complaint mechanisms. Other means used by the interviewed companies to address workers’ complaints are an “open door policy”, an anonymous complaint box and a 24/7 helpline, where employees are invited to communicate with management anytime they face an issue. However, the labour activists interviewed questioned the effectiveness of such practices. For example, workers exposed to vulnerabilities, such as women facing sexual harassment or migrant workers challenged by communication barriers, may be reluctant to use such mechanisms out of fear of losing their employment position. Third party service providers, such as Labor Link in the Malaysian electronics industry, may overcome trust challenges by not being directly associated with the companies by which workers are hired.

Workers’ and employers’ education on the benefits of social dialogue. One of the labour activists interviewed reports a positive success story about awareness-raising activities regarding social dialogue in a Thai manufacturing firm, in which his NGO was involved. Under this initiative, workers are empowered to express their concerns, while employers become aware of the benefits of actively encouraging social dialogue and collective bargaining in the workplace.

Under leading industry initiatives such as the EICC, no explicit policy is present to grant employees the right to join independent unions or to negotiate for improved working conditions. The Code requires companies to follow national legislation on issues related to workers’ representation and collective bargaining. The Good Electronics Network has challenged the EICC for not going “above the law” by incorporating ILO Conventions No. 87 and No. 98 to ensure a better protection of workers’ rights. Additionally, Good Electronics calls EICC members to ensure the setup of effective, accessible grievance mechanisms (Ethical Consumer, 2014).

International framework agreements (IFAs) between MNEs and trade unions can play a role in solving accountability issues of private sector governance mechanisms (i.e. the EICC), where workers are not involved in the setting, monitoring or enforcement of social standards. In the E&E industry in Thailand, IFAs include those signed by Siemens, Electrolux and Bosch with IndustriALL. However, limitations exist and are related to the localization of these social governance initiatives in countries where workers’ rights in terms of association and collective bargaining remain weak, such as Thailand (ILO, 2016d).

5. Concluding remarks

Economic development challenges persist in Thailand's E&E industry and beyond. These are related to a general failure to embrace skill-intensive production to counteract global competitive pressures in the industry. The case studies presented provide examples of good practices in favouring transition to higher value added production, which include but are not confined to: partnerships with universities on research projects; the establishment of in-house research and training centres; and the presence of expatriate engineers to favour knowledge transfers and co-creation with local suppliers.

However, as envisioned in Thailand's 4.0 policy, the transition to higher value added activities in the E&E industry as a whole requires large-scale and sustained efforts. These may include closing skills gaps related to both labour supply and demand mismatches by improving the quality of the national education system, both in technical and non-technical areas. The development of stronger university–industry linkages can equip Thai students and researchers with the adequate skills to meet employers' demands in the E&E industry as well as facing the challenges and opportunities brought about by future technology developments. In order to achieve a transition to more knowledge-intensive production, effective and continuous dialogue is needed between the E&E enterprises present in Thailand, the government and social partners. This would require stronger industry and workers' representation in the Thai E&E sector, on the one hand, and less fragmentation within the Thai bureaucracy, on the other.

Another potential barrier to the upgrading of the E&E sector is the fact that women, despite being the majority in the sector and obtaining higher educational achievements in STEM fields than their male counterparts in Thailand, tend to be underrepresented in most skilled positions in the industry. The upcoming ILO project “Women in STEM Workforce Readiness Program” will take an E&E sector perspective for its activities in Thailand, with the purpose to strengthen employability and leadership of female employees active and entering the industry.

While the E&E industry has provided large-scale employment to emerging economies in Asia, global fluctuations in demand and cost pressures on producers make the sector vulnerable to social downgrading trends. This applies to the electronics segment in particular. Over the past years, labour rights issues were raised across the region, including: use of flexible forms of employment and vulnerable workers (i.e. agency workers and student workers); excessive, forced overtime; exposure to dangerous substances in the workplace; and restricted freedom of association and collective bargaining (Verite; 2014; AMRC, 2013; Danwatch, 2015; ILO, 2014; Raj-Reichert; 2016; Matsuzaki, 2015; ITUC, 2016). Given Thailand's current competitiveness challenges and its reliance on often unregulated migrant and subcontracted labour for low skilled production, the government, workers and employers' organizations should consider that the industry might not be exempted from social downgrading risks. As illustrated by the interviews conducted, leading industry players have responded to such risks by instituting good practices, such as direct hiring, adherence to international standards to limit overtime work, and continuous monitoring of OSH risks. Further research is needed to investigate working conditions in Thailand's E&E industry at large and to provide specific recommendations on the subject.

Workers' voice and representation remains limited in E&E manufacturing across Asia generally and in Thailand specifically, where the disputes observed suggest that workers' bargaining power is rather low. Strengthened union activity would require ratification, implementation and enforcement of ILO Fundamental Conventions No. 87 and No. 98 in Thailand as well as continuing to build the required capacity to improve workers' and employers' awareness about the benefits of social dialogue and collective bargaining. The firm-level initiatives presented can also play an important role in complementing nationwide efforts. International framework agreements (IFAs) could also be used more extensively to strengthen workers' representation and access to remedy in Thailand's E&E industry.

Effective social dialogue and collective bargaining through stronger employers' and workers' representation in Thailand's E&E industry can support transition to higher value added production activities on the one hand, and fair working conditions on the other.

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Annex I: List of interviewees for E&E companies in Thailand

Interviewee	Headquarters	Subsector	Activities	Position in supply chain	No. of employees
Company A					
Interviewee 1: Global head of operations	US	HDDs	Manufacturing of parts and components, assembly, R&D (product and process at initial stage)	2nd tier supplier; lead firm for own products	15,000
Interviewee 2: HR country director					
Interviewee 3: Plant manager					
Company B					
Interviewee 4: Head of operations	Japan	HDDs (component)	Assembly of HDD suspensions, R&D (product and process)	3rd tier supplier; 1st tier supplier to HDD producers	7,500
Company C					
Interviewee 5: Managing director	US	HDDs (component)	Assembly of HDD suspensions	3rd tier supplier: 1st tier supplier to HDD producers	1,200
Company D					
Interviewee 6: Plant manager	Netherlands	Semiconductors	Assembly, product testing and packaging	2nd tier supplier	3,800
Company E					
Interviewee 7: HR country director	US	Automotive electronics	Assembly and product customization	1st tier supplier to automobile industry	210
Company F					
Interviewee 8: Former HR manager	China	Home appliances	Assembly	Lead firm with manufacturing operations in Thailand and 1st tier supplier	1,500
Company G					
Interviewee 9: HR manager	Sweden	Home appliances	Assembly and parts manufacturing	Lead firms with manufacturing operations in Thailand	1,650

Electrical and electronics manufacturing in Thailand: Exploring challenges and good practices in the workplace

The industrial development of Thailand has been driven by export-oriented policies and the attraction of foreign direct investment (FDI) in labour-intensive manufacturing processes. The electronics and electrical (E&E) industry, strongly supported by international trade and investment, has been an important source of export revenue and employment contributor to the Thai economy over the last three decades. However, as the country develops and more cost-competitive regional neighbours emerge, the Thai E&E industry faces upgrading challenges related to skilled labour gaps. Also, competitive pressures increase the risk of poor working conditions and limit workers' voice and representation. This paper serves as an entry point to explore decent work challenges in Thailand's E&E industry. It is based on a desk review of employment-related challenges found at both the industry and national level. This research is complemented with examples of good practices instituted by a group of multinational enterprises (MNEs) operating in Thailand as lead firms and suppliers to major players in the global E&E industry.

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