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DIGITAL ECONOMY CHALLENGE: HIDDEN EXPLOITATION OF CHILD LABOUR THROUGH THE USE OF DIGITAL DEVICES

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Abstract

This study focuses on child labour working hours for children aged 5-14, utilising National Labor Force Survey (*Sakernas*) data collected in August 2023. Specifically, it examines the impact of the use of digital devices on the working hours for child labourers. Applying ordinary least squares (OLS) regression to the data, our findings indicate that digital tools increase working hours by 1.12 per week, even after controlling for various explanatory variables. This effect is particularly pronounced for child workers aged 12-14. Factors such as low levels of education and employment in the service sector were identified as contributors to extended working hours for child labour. However, digital tools and the internet have become essential for everyone, including children. Therefore, reducing child labour and working hours requires a multifaceted approach involving strengthening regulations, restoring disrupted children's education, and enhancing overall well-being.

Keywords: *child labour, digital devices, working hours*

I. INTRODUCTION

The persistence of child labour remains a challenge. Over the 20 years from 2000 to 2020, there was a notable 85.5 million reduction in child labour or an annual decrease of 4.26 million.[1] However, without adequate measures and strategies, the likelihood of an increase in child labour was projected to reach 8.9 million in 2022 based on the last available data in 2020[2] The existence of a crises can impede efforts to eradicate child labour, as historical evidence

[1] International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward* (New York: License: CC BY 4.0, 2021).

[2] UN, "Child Labour: Global Estimate & Trends," *Infographics*, 2023.

indicates an increase in child labour during periods of crisis.[3] In 2021 alone, approximately 3.3 million children were subjected to forced labour.

Child labour continues to exist in the digital era. Although developments in information, communication, and technology (ICT) have the potential to enhance well-being,[4] they can also exacerbate inequality and widen existing income gaps, leaving behind those who are unable to compete.[5] The lack of access to ICT for economically disadvantaged individuals may result in a lack of benefits therefrom. Poor people often cannot improve productivity due to their reliance on manual labour. Poverty can also contribute to an increase in child labour.[6]

Driven by the rapid development of ICT as well as declining costs and large investments in the digital sector,[7] Indonesia's digital economy has grown substantially in recent decades. The size of the country's digital economy was estimated at US$194 billion in 2022.[8] This has had a significant impact on Indonesia's labour system[9] including children's participation in the labour force. The digital environment can facilitate the economic exploitation, allowing children to become a family's source of income through work as influencers, professional e-sports players, or engaging in other types of digital-only work.[10] To respond to this threat, Indonesia needs to improve its digital labour policy, particularly regarding children's economic exploitation through the use of

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[3] Claudia Marcela and Umaña Aponte, "Child Labour and the Economic Recession of 1999 in Colombia," *Revista de Economia Del Rosario* 6, no. 2 (2003): 139–78; Navpreet Kaur and Roger W. Byard, "Prevalence and Potential Consequences of Child Labour in India and the Possible Impact of COVID-19 – a Contemporary Overview," *Medicine, Science and the Law* 61, no. 3 (2021), https://doi.org/10.1177/0025802421993364.

[4] Dibyendu Maiti and Akshara Awasthi, "ICT Exposure and the Level of Wellbeing and Progress: A Cross Country Analysis," *Social Indicators Research* 147, no. 1 (2020): 311–43, https://doi.org/10.1007/s11205-019-02153-5.

[5] Özcan Dağdemir, and Hakan Acaroğlu, "The Effects of Globalization on Child Labor in Developing Countries," vol. 2 (2010) www.pieb.cz; Jabbar Ul-Haq, Sana Khanum et al., "The Impact of Trade Liberalization on Child Labor in Pakistan," *International Review of Applied Economics* 34, no. 6 (2020): 769–84, https://doi.org/10.1080/02692171.2020.1782853.

[6] Olivier Thévenon and Eric Edmonds, "Child Labour: Causes, Consequences and Policies to Tackle It," *OECD Social, Employment and Migration Working Papers* 235 (2019), https://doi.org/10.1787/f6883e26-en.

[7] Maria Monica Wihardja et al., "Digital Transformation in Indonesia's Labour Market: Gainers and Losers," *ISEAS Perspective*, no. 6 (2024).

[8] Siwage Dharma Negara and Astrid Meilasari-Sugiana, "The State of Indonesia's Digital Economy in 2022," *Fulcrum Analysis on Southeast Asia* (2022).

[9] Gati Gayatri et al., "The Indonesian Digital Workforce Gaps in 2021–2025," *Sustainability* 15, no. 754 (2023), https://doi.org/10.3390/su15010754.

[10] Simone Van Der Hof et al., "The Child's Right to Protection against Economic Exploitation in the Digital World," *International Journal of Children's Rights* 28, no. 4 (2020): 833–59, https://doi.org/10.1163/15718182-28040003.

digital devices. The improvement must begin with specific regulations. Menurut Kasiyanto et al.[11] argue that while digital and internet regulations may differ from conventional legal frameworks, it is still feasible to develop appropriate governance structures for the digital sphere. Unfortunately, there is no part of the existing legal framework specifically written to protect children from possible economic exploitation. Indonesian Law Number 35 of 2014 on Child Protection do not regulate specifically the potential economic exploitation of children in a digital environment, could be hazardous for their development and overall futures.[12] Children could be economically exploited in the digital environment for example through the use of digital devices. This phenomenon and the negative therefrom tends to be "hidden" amidst a child's growth and development.

I.A. Child labour in Indonesia

Child labour is defined as work performed by individuals under the age of 18 that may harm their health, safety, or morals.[13] However, not all of children work is legally categorised as child labour. This distinction is outlined in Indonesia's Law No. 13 of 2003,[14] specifically in Chapter X (protections, wages, and welfare), Paragraph 2, Articles 68–75, which addresses children in employment. The law permits children to engage in light work, particularly activities aimed at developing talents or aligning with school curricula, provided that certain conditions are met, including age restrictions, limited working hours, and parental consent.

The International Labour Organization (ILO) and the United Nations Children's Fund (UNICEF)[15] have highlighted three major international frameworks addressing child labour: the Convention on the Rights of the Child; the ILO Minimum Age for Admission to Employment Convention (No. 138); and the universally ratified ILO Worst Forms of Child Labour Convention (No. 182). These frameworks have been adopted in Indonesia through Presidential Decree No. 36 of 1990 on the ratification of the Convention on the Rights of the Child, Law No. 20 of 1999 on the ratification of ILO C138, and Law No. 1 of 2000 on the ratification of ILO C182. Furthermore, the Ministry

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[11] Safari Kasiyanto and Mustafa R. Kilinc, "Legal Conundrums of the Metaverse," *Journal of Central Banking Law and Institutions* 1, no. 2 (2022), https://doi.org/10.21098/jcli.v1i2.25.

[12] Law on Child Protection, No 24, 2014 (Indonesia)

[13] International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward.*

[14] Law on Manpower, No.13, 2003 (Indonesia).

[15] International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward.*

of Manpower[16] identifies additional national legislation relevant to addressing child labour, including Law No. 23 of 2002 on Child Protection, Law No. 13 of 2003 on Manpower; Law No. 21 of 2007 on the Eradication of Human Trafficking, and Law No. 35 of 2014 (amendment to Law No. 23 of 2002 on Child Protection), as well as Presidential Decree No. 59 of 2002 on the National Action Plan for the Elimination of the Worst Forms of Child Labor.

The complexity of measuring child labour under this legal framework remains a challenge. Consequently, accurate global indicators for child labour remain limited, focusing primarily on age and working hours. According to the UNSTAT,[17] child labour is defined as all children aged 5–11 engaged in any type of work, children aged 12–14 working for 14 hours or more per week, and children aged 15–17 working for 43 hours or more per week. However, at the national level, these thresholds can be adjusted to fit the specific context of each country. In Indonesia, the classification of child labour is based on Law No. 13 of 2003. It defines child labour as all children aged 5–12 who work, children aged 13–14 working more than 15 hours per week, and children aged 15–17 working more than 40 hours per week.[18]

Figure 1 illustrates the current state of child labour in Indonesia. The proportion of child labour in Indonesia declined to 1.72% in 2023 after a substantial increase of around 2.3 per cent in 2020 due to the impact of the Covid-19 pandemic. In the global context, Indonesia's percentage of child labour is relatively low. Globally, about 9.6% of children aged 5-17 are engaged in child labour, while Southeast Asia overall reached 6.2% in 2020.[19]

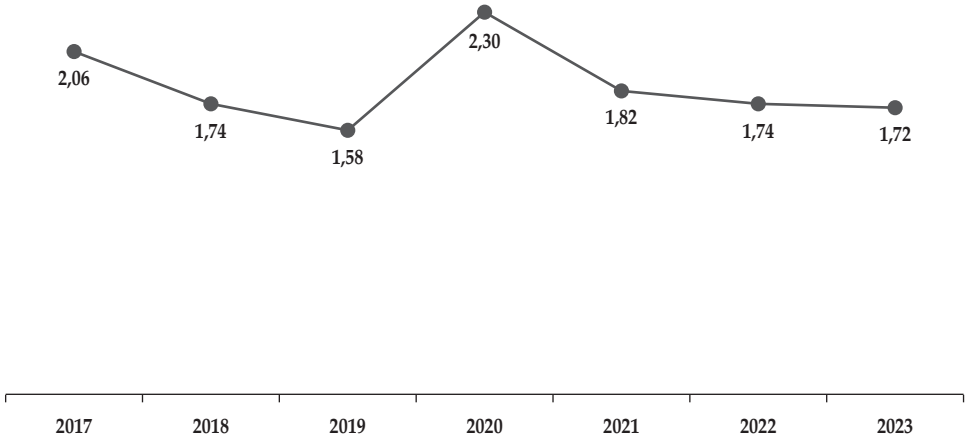
[16] Ministry of Manpower, "Peta Jalan (Roadmap) Menuju Indonesia Bebas Pekerja Anak Tahun 2022," (Jakarta, December 2022).

[17] UNSTAT, "Indicator 8.7.1: Proportion and Number of Children Aged 5-17 Years Engaged in Child Labour, by Sex and Age," SDG Indicators: Metadata repository, 2024, https://unstats.un.org/sdgs/metadata/.

[18] Law on Manpower.

[19] International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward.*

Figure 1.
Percentage of child labourers aged 5-17 years in Indonesia, 2017-2023



Source: BPS[20] and Authors' calculation from Sakernas for 2023

In pursuing the Sustainable Development Goals (SDGs), Indonesia is taking significant steps to come closer to eradicating child labour. However, it is imperative to delve into the factors influencing child labour, notably from 2021 to 2022, where there was an increase in the percentage of child workers who are not attending school, rising from 14.46% to 16.32%.[21] Pandey and Nayak[22] argue that the involvement of children in labour can contribute to their separation from formal education. Consequently, the surge in child labour without school attendance needs further exploration.

Figure 2 illustrates that more than half of child labourers are employed in the service sector, including the trade sector. Ab-Rahim and Tariq[23] assert that child labour involved in the trade sector tends to be more domestic than international. It is noteworthy that over 99% of businesses in Indonesia fall into the category of Micro, Small, and Medium Enterprises (MSMEs), with a minimal participation ratio in the global supply chain, standing at only 4.1%, and contributing only 15.6% to Indonesia's non-oil and gas exports in 2019.[24]

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[20] BPS, "Booklet Pekerja Anak di Indonesia 2022: Sebelum Dan Semasa Pandemi COVID-19," BPS RI 2022; BPS, "Indikator Pekerjaan Layak Di Indonesia 2022" (2023).

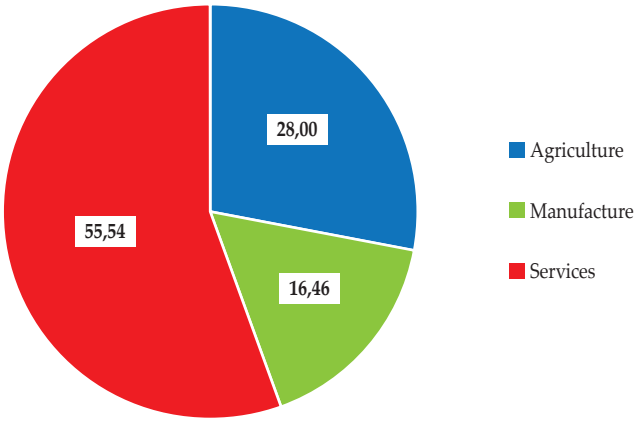
[21] BPS, "Indikator Pekerjaan Layak Di Indonesia 2022."

[22] Vartika Pandey and Bandana Nayak, "Child Labour Among School Dropouts and Its Social Impact on The Working Child," *Journal of Emerging Technologies and Innovative Research* 6, no. 6 (2019): 147–51, www.jetir.org.

[23] Rossazana Ab-Rahim and Bilal Tariq, "The Impact of Trade on Child Labor: Evidence from Selected SAARC and ASEAN Countries," *Journal of Indonesian Economy and Business* 32, no. 1 (2017): 1–18.

[24] Kemenkop UKM, "Gambaran UMKM Indonesia," *KUMKM Dalam Angka*, accessed February 7, 2024, https://www.kemenkopukm.go.id/kumkm-dalam-angka/?type=indikator-umkm&sub=0.

Figure 2.
Distribution of child labour aged 5-17 years according to field employment in Indonesia (%), 2023



Source: Authors' calculation based on 2023 Sakernas August Data

Child labour is prevalent in the informal sector, often as a consequence of poverty.[25] In Indonesia, a substantial percentage of the workforce is still engaged in informal activities, accounting for 59.11% of the total workforce.[26] Based on the currently published indicators of informal workers from Sakernas, the classification of workers into formal/informal activities is determined by a simple categorisation according to employment status. Formal workers are defined as workers with the employment status of fixed-employee and employer, while informal workers are defined as workers with the employment status of self-employed workers (independent contractors), casual employees, and family workers. Child labourers employed as family workers are the most numerous of these categories.[27] Therefore, based on this classification, child workers are more likely to be involved in informal activities. Table 1 illustrates that the concentration of informal workers is notably high in the agriculture and services sectors, where workers have relatively longer average working hours. Specifically, the working hours of informal workers in the services sector average of 42.71 hours per week. In this sector, child labourers are also predominantly engaged in manual labour, which often leads to extended working hours.

[25] Thévenon and Edmonds, "Child Labour: Causes."; International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward.*
[26] BPS, "Telecommunication Statistics in Indonesia 2022," August 2023.
[27] BPS, "Indikator Pekerjaan Layak Di Indonesia 2022."

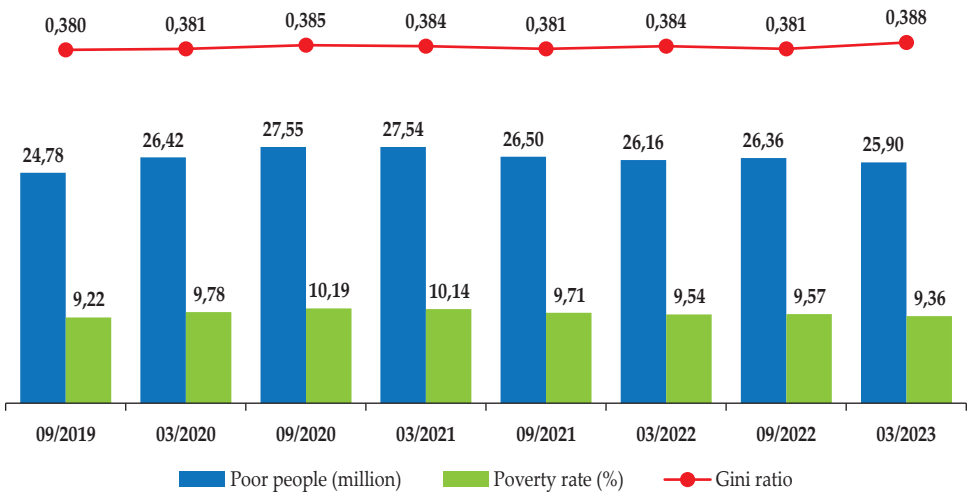
Table 1.
Informal Workers by Sector, 2023

Sector	Percentage of informal workers	Average actual working hours of informal workers in a week
Agriculture	42.19	30.58
Manufacturing	15.99	39.35
Services	41.82	42.71

Source: Authors' calculation from 2023 Sakernas August Data

On the other hand, the poverty rate in Indonesia was projected to reach 25.90 million people or around 9.36% of the total population in 2023 (Figure 3). Although this poverty rate was lower than in earlier periods, it is still relatively high. Specifically, it is higher than the rate recorded in September 2019 before the onset of the Covid-19 pandemic. Despite the positive economic indicators, such as the economic growth which reached 5.03% in the first quarter of 2023,[28] the nation has not yet fully overcome challenges at the grassroots level. The slow decline in poverty, coupled with an increase in the Gini ratio to 0.388 in March 2023, triggered other social problems, including those associated with child labour.

Figure 3.
Number of poor people, poverty rate and Gini ratio in Indonesia, September 2019 – March 2023



Source : BPS[29]

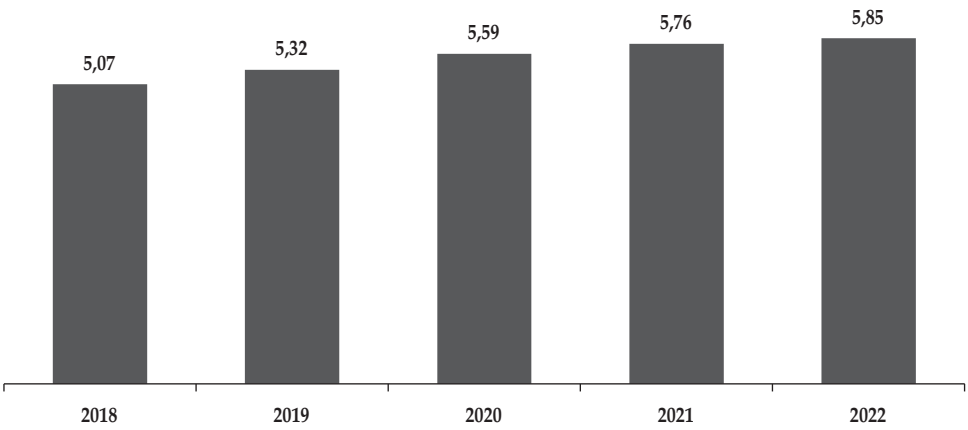
[28] BPS, "Pertumbuhan Ekonomi Indonesia Triwulan I-2023," May 5, 2023, https://www.bps.go.id/id/pressrelease/2023/05/05/1998/ekonomi-indonesia-triwulan-i-2023-tumbuh-5-03-persen--y-on-y-.html.

[29] BPS, "Berita Resmi Statistik," July 17, 2023, https://www.bps.go.id/id/pressrelease/2023/07/17/2016/profil-kemiskinan-di-indonesia-maret-2023.html.

I.B. The Digital Context in Indonesia

The ownership of personal computers in households witnessed a decline from 2018 to 2022. In contrast, there was a notable increase in mobile phone ownership, rising from 62.41% in 2018 to 67.88% in 2022. The number of mobile phone users reached 342.61 million in 2022.[30] This suggests that a significant portion of customers possess more than one mobile phone SIM card. Additionally, the increase in the Information and Communication Technology (ICT) Development index was projected to reach 5.85 in 2022 (Figure 4). This presents an opportunity for substantial growth in digital inclusion.

Figure 4.
Development index Indonesian ICT development, 2018-2022



Source : BPS[31]

Over the past decade, substantial progress has been made in connectivity development worldwide.[32] As of early 2023, Indonesia's internet users reached 212.9 million, accounting for 77% of the total population. The median internet speed stands at 24.32 Mbps, while mobile network speeds reach 17.27 Mbps.[33] Projections for 2028 anticipate an increase in internet users to 269.09 million.[34]

[30] BPS, "Telecommunication Statistics in Indonesia 2022."

[31] BPS, "INDEKS PEMBANGUNAN INFORMASI DAN KOMUNIKASI 2022" (Jakarta, September 2023).

[32] The World Bank, "Beyond Unicorns Harnessing Digital Technologies for Inclusion in Indonesia" (WASHINGTON DC, 2021).

[33] Simon Kemp, "DIGITAL 2023: INDONESIA," DataReportal – Global Digital Insights, February 9, 2023, https://datareportal.com/reports/digital-2023-indonesia.

[34] Statista, "Number of Internet Users in Indonesia from 2017 to 2022 with Forecast until 2028," Demographics & Use, 2024, https://www...com/statistics/254456/number-of-internet-users-in-indonesia/.

These conditions provide fertile ground for the growth of the digital economy, particularly in the realm of e-commerce.

In 2022, the total revenue from e-commerce in Indonesia was estimated to reach USD 51.9 billion, equivalent to approximately IDR 778.8 trillion.[35] By 2023, 37.46% of businesses were engaged in e-commerce activities, with a concentration on Java Island.[36] The majority of e-commerce businesses are found in trade, accommodations, and food and beverage, as well as the processing industry. Furthermore, e-commerce serves as a hub for MSMEs, with 65.38% of e-commerce workers employed by MSMEs by 2022.[37]

The participation of women in e-commerce is notable, surpassing their engagement in offline businesses. Female MSME entrepreneurs made up around 35% to the e-commerce sector in 2017, rising to 45.42% in 2022.[38] However, despite these positive trends, challenges persist in the digital landscape, including long working hours, low wages, and inadequate social protections.[39] The involvement of child labour in these enterprises is also a concern, amplified in household businesses or small businesses unable to afford regular employees.

The digital era poses challenges for the creation of decent jobs, particularly in MSMEs, which remain dominant in Indonesia. These enterprises often focus on the domestic market, contributing to a prevalence of informal workers and persistent poverty-related issues. Although the percentage of child labour has declined since 2020, the issue of long working hours for those child labourers persists. Child labour in gig work or e-commerce may require extended hours without legal certainty and protection. In activities like in-person sales or sales on platforms like Shopee, TikTok, and Lazada, there are clear registration rules on each platform's website that require participants be 18 years of age or older. Even the requirements to become a content creator on Instagram Live or to participate in YouTube AdSense are limited to individuals aged 18 and above, requiring identity verification. However, behind the scenes activities – such as assisting with packing goods, operating applications, and production activities in e-commerce businesses, especially in family-run enterprises – are more challenging to monitor, making it difficult to distinguish who is involved. This opacity illustrates that there are still instances of children engaging in these

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[35] International Trade Administration, "Indonesia - ECommerce," Indonesia-Country Commercial Guide, January 9, 2024, https://www.trade.gov/country-commercial-guides/indonesia-ecommerce1/8.

[36] BPS, "Statistik ECommerce 2022/2023," (Jakarta, September 9, 2023).

[37] Kaushik Das et al., "The Digital Archipelago: How Online Commerce Is Driving Indonesia's Economic Development," *Mckinsey &Company,* 2018.

[38] BPS, "Statistik eCommerce 2022/2023;" Das et al., "Digital Archipelago."

[39] Arif Novianto et al., "Searching for a Better Job : Indonesian Gig Workers and the Limits of Decent Work Agendas," *Work Organisation, Labour and Globalisation* 17, no. 2 (2023): 71–90, https://doi.org/10.13169/workorgalaboglob.17.2.0071.

activities. Aside from e-commerce, the exploitation of children in terms of excessive working hours can also occur in other sectors. Children tend to be involved as family workers.[40] Even in small family businesses, the use of digital technology has become common, especially after the COVID-19 pandemic.[41] As a result, child labour engaged in digital activities may go unrecorded, leading to potential exploitation of children through excessive working hours.

This study analyses the impact of the use of digital devices on child labour. Specifically, it examines the impact of digital device use on the working hours of children in Indonesia. Long working hours for children constitutes one form of economic exploitation of children.[42] Previous studies have indicated that social media influences the length of a child's working hours, particularly for those involved in content creation such as vlogging.[43] The length of a child's working hours can have both short-term and long-term impacts, affecting school attendance and physical health.[44]

Most current studies on child labour in the digital era mainly discuss the exploitation of children as influencers in social media through making content about their daily lives. Sometimes, children also get involved in product selling on social media as endorsers.[45] Children participating as content creators may experience working without time limits. Moreover, some studies focus on the relationship between e-commerce and the increase in child labour due to illegal practices through document falsification or subcontracting.[46] Studies on child labour in the digital context are very limited in Indonesia.

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[40] BPS, "Indikator Pekerjaan Layak di Indonesia 2022."

[41] Ricky Adrian Gunawan et al., "The Business Digitalization Model to Enhance Family Business Performance," *Journal of Applied Engineering and Technological Science (JAETS)* 5, no. 1 (December 10, 2023): 197–212, https://doi.org/10.37385/jaets.v5i1.2049.

[42] International Labour Office and United Nations Children's Fund, *Child Labour: Global Estimates 2020, Trends and the Road Forward.*

[43] Mengqian Ruan, "Play-Working: Study on Phenomenon of Children Digital Work as Chair Grabbing Games on Micro-Video Platforms," *Journal of Education, Humanities and Social* Sciences 7 (2023): 92–96; Huang Zhouzheng, "Digital Child Labor: Kid-Influencer and Legal Countermeasure in China," in *Online Conference on Combating Child Labour in ASEAN/Southeast Asia*, 2021; Melissa Morris, "Kidfluencers and Conundrums: The Rising Need for Internet Policy That Addresses Child Labour and Safety," *The Motley Undergraduate Journal* 1, no. 1 (2023): 116–26; Bayan Kojok, "Reinventing Child Labour: A Contemporary Analysis of Children's Participation in the Digital Labour Economy," *Major Papers* 226 (2022), https://scholar.uwindsor.ca/major-papers/226.

[44] Jihye Kim and Wendy Olsen, "Harmful Forms of Child Labour in India from a Time-Use Perspective," *Development in Practice* 33, no. 2 (2023): 190–204, https://doi.org/10.1080/09614524.2022.2155620; L. Guarcello et al., "Impact of Working Time on Children's Health," *O-IPEC International Programme on the Elimination of Child Labour*, September 2004; Thévenon and Edmonds, "Child Labour: Causes."

[45] Kojok, "Reinventing Child Labour"; Morris, "Kidfluencers and Conundrums"; Zhouzheng, "Digital Child Labor."

[46] H.M.K.T. Gunawardhana et al., "Use of Random Forest Classifier to Identify Counterfeited E-Commerce Listings," in *12th Annual Research Sessions of the Sabaragamuwa University of Sri Lanka*, 2022; Fan Lulu and Boy Luethje, "Taobao Villages: Rural E-Commerce and Low-End Manufacturing in China," *East West Wire,* July 31, 2019.

Previous studies have confirmed exploitation of children working on social media and e-commerce. However, amidst the possibility that digitalisation may imply longer working hours among child labourers due to exploitation, to the best of our knowledge, until recently there has been no well-documented study dedicated to examining the impact of digital tools on working hours length in Indonesia. Therefore, this study is dedicated to closing that gap.

For analysis, we utilised data from the Indonesia Labour Force Survey, commonly referred to as the National Labour Force Survey (Sakernas). Sakernas has been publishing continuous indicators of the general workforce situation in Indonesia since 1986 and has included employment information for individuals aged five and above since 2016. This study contributes substantially to the existing literature on child labour in the context of the digital economy. Additionally, the study provides insights into the appropriate utilisation of digital tools for children.

The structure of this study comprises an introduction addressing the problems and context in Indonesia, followed by an explanation of the data and methodology employed. The third section presents the results of the model used, accompanied by descriptive data, and is further complemented by a discussion of these results. The final section provides conclusions from the study, along with policy recommendations.

II. DATA AND METHODOLOGY

The data utilised in this study is derived from the National Labor Force Survey (Sakernas) for August 2023. Sakernas collects employment information through routine household surveys conducted twice a year by the *Badan Pusat Statistik* (BPS). With a sample size of approximately 300 thousand households, the August 2023 Sakernas survey also gathered employment data for individuals aged five years and above. Thus, this dataset allows for the generation of information on child labour. The Sakernas survey employs a stratified two-stage sampling method, involving (1) systematic block census sampling in both urban and rural areas within each district, and (2) the selection of 10 systematically sampled households within each selected block census. This sampling design enables the estimation of employment indicators at the municipality level.

This study focuses on children ages 5-14, with a total of 4,821 individuals identified as engaging in child labour. While child labour, in general, encompasses ages 5-17, this study focuses on the 5-14 age group. This decision is based on the recognition that individuals aged 15 and above in Indonesia are considered of working age,[47] leading this study to concentrate on child labour below the

[47] Law on Manpower No.13, 2003 (Indonesia).

working age range. The definition of child labour in this study refers to ILO and UNICEF[48] criteria, which include (1) all children aged 5-11 engaged in work, as children within this age range are generally prohibited from working, and (2) children aged 12-14 involved in hazardous work or non-hazardous work exceeding 14 hours per week.

Digital tools used in this study refer to all digital devices intended for work-related purposes. The categories of digital tools included in Sakernas data collection are: (i) computers, including personal computers, netbooks, notebooks, laptops, tablets, and personal digital assistants (PDAs); (ii) smartphones/mobile phones (HP); and (iii) other digital technologies. The use of digital tools covered in Sakernas includes those connected to the internet and those that are not. Digital tools connected to the internet can include all online work activities, such as content creators, e-commerce, and others. Meanwhile, the use of digital tools not connected to the internet may include any type of work conducted using computers or other devices.

To examine the impact of the use of digital tools on the increase in children's working hours, a multiple linear regression model is employed. The ordinary least squares (OLS) approach is used for estimation, and the model is represented by the following equation:

$$Y_i = Digital_i\delta + x_i'\beta + u_i \quad (1)$$
$$Y_{digital-j} = x_j'\theta + \tau_j$$
$$u \sim N(0,\sigma)$$
$$\tau \sim N(0,\sigma)$$

Where:

- Y_i is the length of working hours of child workers aged 5-14 years old.
- $Y_{digital\text{-}j}$ is the length of working hours of child workers aged 5-14 years old who use digital tools.
- $Digital_i$ is a binary variable indicating the use of digital tools in their work, whether connected to the internet or not.
- x_i' or x_j' represents a set of explanatory variables (Table 2)).
- u_i *and* τ_j are errors from the regression of working hours, following a normal distribution with a mean of 0 and a constant standard deviation of σ.

[48] International Labour Office and United Nations Children's Fund, "Child Labour: Global Estimates 2020, Trends and the Road Forward." International Labour Organization, Accessed January 1, 2024, https://www.ilo.org/publications/major-publications/child-labour-global-estimates-2020-trends-and-road-forward

Table 2.
Definition of Dependent, Explanatory, and Selection Variables

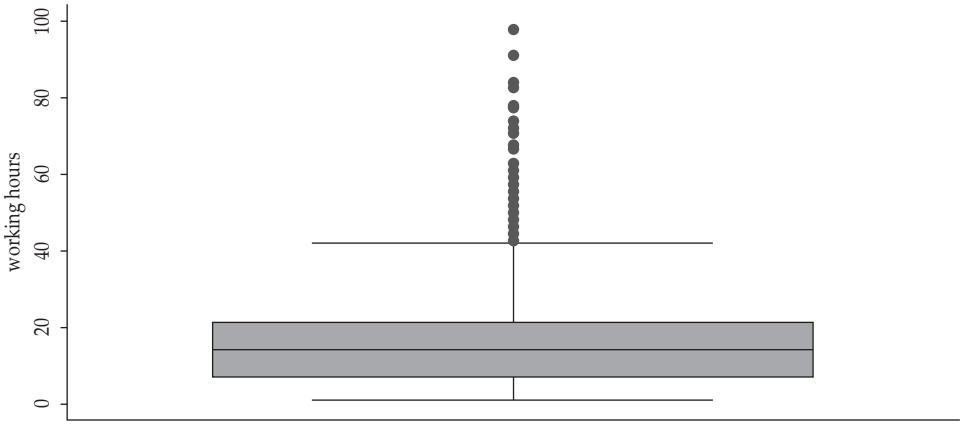
Variable	Description
Working hours	The variable denotes the number of working hours typically undertaken in a week, whether by individuals engaged in employment or those not employed. This variable is characterized as a numeric variable.
Digital	Defined as the utilization of digital tools (computers/handphones/others) to support one's work, whether connected to the internet or not. This variable is categorized as a binary variable, where "0" indicates the absence of digital tool usage (reference category), and "1" signifies the use of digital tools.
Children status	Defined as the relationship of the unit of analysis to the HH within a household. This variable is binary, with "0" representing other relationships (reference category), and "1" denoting HH's children.
Sex	A binary variable with "0" for girls (reference category) and "1" for boys.
Age	Numerical variable (in years; discrete).
School Participation	A categorical variable where "0" represents still in school (reference category), "1" represents not yet in school, and "2" represents no longer attending school.
Rural	A binary variable with "0" for urban (reference category) and "1" for rural.
Job tenure	Numerical variable (in months).
Number of Household members	Numerical variable (discrete). It is defined as the number of people in the household.
Employment status	A categorical variable where "0" represents regular employment (reference category), "1" represents self-employment, "2" represents casual work, and "3" represents family work.
Workplace	A categorical variable where "0" represents others (reference category), "1" represents business or corporation, "2" represents sole proprietor or household business, and "3" represents household worker.
Sector	A categorical variable where "0" represents agriculture (reference category), "1" represents manufacturing, and "2" represents services.
Sex of HH	A binary variable with "0" for male (reference category) and "1" for female.
Age of HH	Numerical variable (in years; discrete).
Activity of HH	A binary variable with "0" for working (reference category) and "1" for not working.
Education of HH	A binary variable with "0" for middle school or below (reference category) and "1" for high school or above.

HH = Head of Household

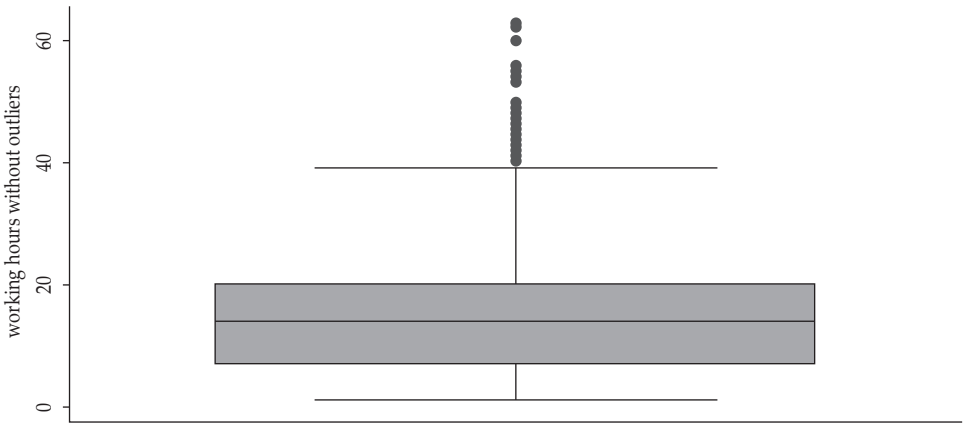
All statistical analyses were conducted using Stata version 14. The model assumptions were checked using this computer program. Linearity was assessed using the significance of the Ramsey RESET test (See Appendix A3). Assumptions of normality and homoscedasticity were controlled by applying robust standard errors to the regression model. Additionally, the assumption of no multicollinearity was verified by examining the variance inflation factor (VIF), with a value less than 5[49] (see Appendix A4).

[49] Marko Sarstedt and Erik Mooi, *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*, 3rd ed. (Springer Nature, 2019), http://www.springer.com/series/10099.

Figure 5.
Distribution of working hours for child labour



(a) Preliminary data



(b) Data addressing outliers

Before proceeding with further analysis of child labour using Sakernas data, particularly focusing on the unit of analysis of working hours, an initial check was performed to identify outliers occurring in the dependent variables. While the information on working hours is derived from actual observations, the distribution of the existing data revealed the presence of outliers (refer to Figure 5(a)). To address potential bias in the resulting model, adjustments were made to address these outliers. According to Dhakal,[50] outliers can be addressed using three methods: studentized residual, leverage value, and

[50] Chuda Prasad Dhakal, "Dealing with Outliers and Influential Points while Fitting Regression," *Journal of Institute of Science and Technology* 22, no. 1 (2017): 61–65.

Cook's distance. In this study, we applied the studentized residual method[51] to handle the identified outliers (refer to Equation [2]).

$$u_{ij} \sim t(n-2p) \tag{2}$$
$$u_{ij} \equiv \begin{cases} \text{Non-outlier, if } e_{ij} \leq 2 \\ \text{Outlier, otherwise} \end{cases}$$

Furthermore, the residuals from the regression of working hours, following a t-distribution with *n* as the number of observations and *p* as the number of parameters for all observations from the Sakernas August 2023 data, were examined. With a 5% significance level, the cutoff point for outliers is set at 2.[52] Any studentized residual values exceeding 2 were excluded from the analysis. Consequently, the final analysis unit for this study comprises 4,565 children aged 5-14 years old, with working hours distributed as referenced in Figure 5(b). The data without outliers then were analysed using the model in Equation [1].

III. RESULTS AND DISCUSSION

Based on the summary statistics in Appendix A1, it can be determined that, on average, children in the sample aged 5-14 years old work for approximately 14.97 hours per week. Specifically, children aged 5-11 years old work an average of 11.14 hours per week, while children aged 12-14 years old work an average of 17.85 hours per week. Notably, for children aged 5-11 years old, if they work every day, they exceed 1.5 hours per day of working hours, and if they work for five days a week, their daily working hours surpass two hours. Approximately 15.73% of these child workers use digital technology in their work.

Most of the child workers analysed in this study come from households with young heads of household (HH) (most of them are parents) who on average are 44.89 years old. Most of the HH in which child workers live are engaged in work, which is around 97.39%. However, around 66.40% of them have attained a low level of education.

Regarding the nature of the work performed by the child labourers, they are employed in agriculture, household enterprises, and as family workers. Their involvement as child labourers can be considered relatively long, with

[51] Edmore Ranganai, "On Studentized Residuals in the Quantile Regression Framework," *SpringerPlus* 5, no. 1 (2016), https://doi.org/10.1186/s40064-016-2898-6.

[52] Dhakal, "Outliers."

an average working duration of 26.12 months. Nevertheless, the participation of children in educational activities remains substantial, with 91.35% of them attending school. Meanwhile, only 8.65% of child workers have either never attended school or dropped out.

The estimation results from the OLS model examining the impact of digital tool usage on working hours are presented in models 1 and 2 in Table 3. The estimations were conducted under two scenarios: (1) using only the digital variable as the explanatory variable, and (2) incorporating the digital variable along with other control variables. The F-test for both models indicates that at least one variable significantly influences the working hours of child labour. Model 2, which includes additional control variables, achieves an R-squared value of 39%, suggesting that these variables sufficiently explain the variation in the dependent variable in the model in our cross-sectional dataset collected from Sakernas.[53] Meanwhile, Model 3 is dedicated to explaining the determinants of working hours for children utilising digital tools in their work, with an R-squared value reaching 42%.

Table 3.
Linear Regression Results

Variables	Model 1		Model 2		Model 3	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Digital	3,601***	0.414	1,123***	0.340		
HH's Children			1,153***	0.444	1,722	1,463
Boys			-0.263	0.223	-0.884	0.608
Age			1,041***	0.058	1,216***	0.188
Not yet in school			10,646***	1,205		
No longer going to school			12,809***	0.668	12,424***	1,610
Rural			1,212***	0.266	0.767	0.628
Job tenure			0.045***	0.006	0.059***	0.014
Number of Household members			0.011	0.080	0.133	0.228
Self-employment			-4,825***	1,359	-3,585	2,734
Casual workers			-8,571***	1,363	-8,809***	2,837
Family workers			-12,803***	1,093	-12,602***	2,136
Business/ Corporation			4,347**	1,830	10,899***	3,272
Individual Business/ household Business			2,393**	1,027	7,262***	2,296
Household workers			-6,235***	1,917	2,233	5,415
Manufacturing			-0.283	0.407	-0.557	1,237

[53] Sarstedt and Mooi, *Concise Guide.*

Table 3.
Linear Regression Results (Continued)

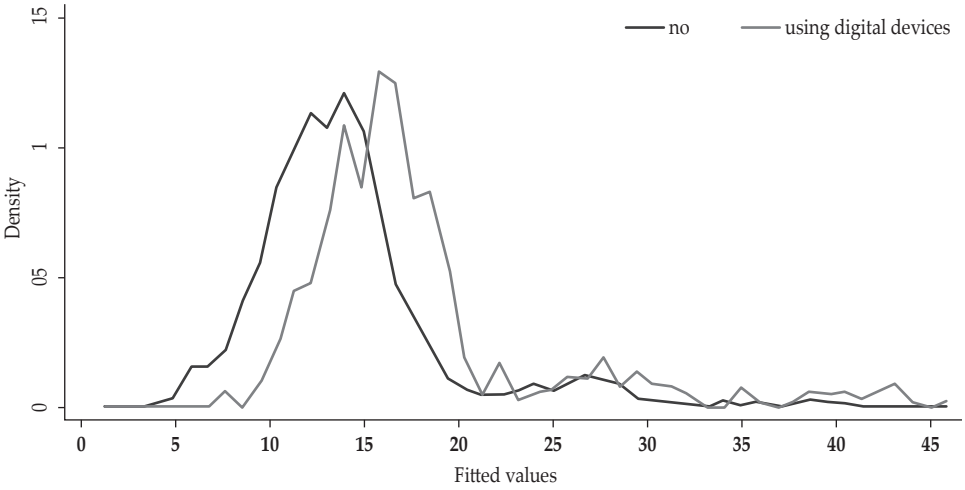
Variables	Model 1		Model 2		Model 3	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Services			2,823***	0.271	3,854***	0.869
HH's characteristics						
Female			0.642*	0.353	-0.017	1,012
Age			-0.026*	0.014	0.011	0.043
Not working			0.959	0.786	2,027	1,976
High school and above			-0.498**	0.236	-1,403**	0.622
Intercept	14,406***	0.148	8,351***	1,865	-0.566	4,840
Number of Observations	4565		4565		718	
F-stat	75.55***		87.91***		18.47***	
R^2	0.019		0.390		0.416	

* significant at p-value=10 %, ** significant at p-value =5%, *** significant at p-value =1%.

HH = Head of Household

The OLS estimation results pointed out that the utilisation of digital tools has an impact on the increase in working hours for child labour. The impact is statistically significant at a 1% significance level, as observed in both models 1 and 2. In model 1, the use of digital tools is associated with an increased workload of almost four hours per week. However, when controlled for other explanatory variables in Model 2, the additional working hours for child labour are 1.12 hours per week fewer. It is also confirmed by the distribution of child labour working hours by digital device usage (Figure 6). The working hour distribution for digital device users is slightly to the left of the users' distribution. In addition to digital tool usage, other variables also have statistically significant impacts on the higher working hours for children, which include their status as a child, age, school participation, tenure, employment status, workplace, sector, and demographic characteristics of the HH.

Figure 6.
Distribution of child labour working hours by digital device usage



Source: Author's calculation from estimation results

In more detail, Figure 6 confirms that the increased working hours due to the use of digital tools are more pronounced among child labourers with workloads exceeding 15 hours per week. This suggests that the impact of using digital tools on child labour may lead to extended working hours for children. Consequently, when the working hours for child labourers are higher, there is less time available for other activities, including school attendance and learning.[54] Also, Kim and Olsen[55] argue that prolonged working hours can be detrimental to the health and well-being of children, disrupting their focus on learning, even for those attending school. Besides, they suggest that the recorded working hours for child labourers in research may not be entirely accurate, as unrecorded working hours could potentially hide actual longer working hours, especially when combined with domestic chores. Likewise, the Sakernas results indicate the possibility of bias in recording working hours. The use of digital tools in work using online-based platforms is an example of a seemingly non-hazardous job that can end up getting children involved in long working hours and even lead to potential exploitation beyond working hours.[56] However, as pointed out in Table 4, only a very small portion of child labourers aged 5-14 years old who use the internet in their jobs during

[54] James A. Levine et al., "Looking at Child Labor," *Science* 296, no. 5570 (2002): 1025–26, https://doi.org/10.1126/science.296.5570.1025c.

[55] Kim and Olsen, "Harmful Forms."

[56] Morris, "Kidfluencers and Conundrums;" Kojok, "Reinventing Child Labour."

the 12-month period experienced unhealthy conditions due to work. Likewise, the proportion of those working in an unsafe and unhealthy environment, as well as experiencing workplace violence (both verbal and physical), is also very small.

Table 4.
Distribution of child labour aged 5-14 years old using the Internet for jobs according to work conditions

Category	Experiencing health-threatening conditions due to work during the last 12 months	Working in an unsafe and unhealthy environment	Have experienced workplace violence (both verbal and physical)
Yes	0.43	3.00	0.21
No	99.57	97.00	99.79

Source: Authors' calculation from 2023 Sakernas August Data

As a secondary impact, the increase in working hours also affects the educational outcomes of children. There is a vicious cycle in that many child labourers eventually drop out of school due to extended working hours,[57] and according to Pandey and Nayak,[58] lack of participation in education increases the likelihood of children becoming child labourers. The estimation results in Table 3 confirmed the negative relationship between children's school participation and the length of working hours. It can be seen that children who are no longer enrolled in school have longer weekly working hours, 12.8 hours per week, compared to those still enrolled. Meanwhile, those who have never enrolled in school have more than 10.6 hours of weekly working time compared to those who are going to school.

In model 3, which focuses on using digital tools in child labour, working hours are longer for older children. This is because older children commonly have a better ability to use digital tools. Moreover, since most child labourers come from impoverished backgrounds, access to digital tools is more challenging,[59], preventing children from early exposure. The distribution

[57] Arun N.R. Kishore and K. S. Shaji, "School Dropouts: Examining the Space of Reasons," *Indian Journal of Psychological Medicine* 34, no. 4 (2012): 318–23, https://doi.org/10.4103/0253-7176.108201.

[58] Pandey and Nayak, "Child Labour Among School Dropouts."

[59] Krish Chetty et al., "Bridging the Digital Divide in the G20: Skills for the New Age," *Economics: The Open-Access, Open-Assessment E-Journal* 12, no. 24 (2018): 1–20, https://doi.org/10.5018/economics-ejournal.ja.2018-24; Peterson K Ozili, "Contesting Digital Finance for the Poor," *Munich Personal RePEc Archive (MPRA) Paper*, no. 101812 (2020); Teresa Correa et al., "Digital Inclusion through Mobile Phones?: A Comparison between Mobile-Only and Computer Users in Internet Access, Skills and Use," *Information Communication and Society* 23, no. 7 (2020): 1074–91, https://doi.org/10.1080/1369118X.2018.1555270.

of working hours of child labourers using digital devices by age groups in Figure 7 also confirms that working hours increase as the child's age increases, especially for those aged 12-14 years old.

The estimation results of model 3 also point out that the negative relationship between school enrolment and working hours also exists among child labourers using digital devices. This could be explained by the fact that the use of digital tools at work is not feasible during school hours, leading to shorter working hours for children still enrolled in school. According to the Programme for International Student Assessment (PISA) 2022 results, using digital tools and the internet during school hours can disrupt the learning process, suggesting the possibility of regulations prohibiting such activities. In this study sample, 7.19% of children are no longer attending school (Appendix A1). Therefore, greater efforts are needed to ensure that child labourers who are still in school are not further impacted.

Figure 7.
Distribution of child labour working hours using digital devices by age of children

Source: Author's calculation from estimation results

Our estimation results also confirm the significant impact of the working environment on working hours among both child labourers in general and child labourers using digital devices in their work. Those who work as family workers tend to have much shorter weekly working hours compared to non-family workers. A substantial difference exists between the family worker and the reference category, which is 12.8 hours shorter. Children employed in various businesses, whether small or large, tend to have higher weekly working hours, ranging from 7 to 11 hours per week, compared to other workplaces.

The majority of child labour is found in the agriculture and service sectors. The working hours of child labour using digital devices in the services sector are longer by almost four hours per week compared to those in the agricultural sector. The services sector is often associated with longer working hours, especially in areas related to tourism.[60] According to Lulu and Luethje,[61] online merchant activities in China still involve child labour, even with long working hours by their subcontractors.

In general, we found that education negatively affects the length of working hours for child labourers using digital devices. The estimation in model 3 illustrates that the presence of digital tools in child labour within households with HH educated up to high school tends to have fewer working hours, up to 1.5 hours per week. According to Oluwagbohunmi and Popoola,[62] the incidence of child labour in households with highly educated parents tends to be more moderate, resulting in lower working hours for children forced into child labour. Furthermore, based on the findings of this study, highly educated parents have a greater influence on children working with digital tools. In other words, the use of digital tools can enhance work efficiency.[63] Unfortunately, the majority of child labourers live in households with heads of household having low levels of education. The low education levels of both parents and child labourers are also a strong indication of poverty within those households.[64] Figure 8 illustrates that the majority of child labour, either with low or high working hours, is in households with an average adult income of around IDR 1 million. The average income of adult workers is significantly lower than the lowest provincial minimum wage (*upah minimum provinsi* or UMP) in Central Java, which is IDR 1.96 million per month.[65] It indicates that child labour is the

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[60] Vikrant Kaushal and Sidharth Srivastava, "Hospitality and Tourism Industry amid COVID-19 Pandemic: Perspectives on Challenges and Learnings from India," *International Journal of Hospitality Management* 92 (2021), https://doi.org/10.1016/j.ijhm.2020.102707.

[61] Lulu and Luethje, "Taobao Villages."

[62] Margaret F. Oluwagbohunmi and Esther O. Popoola, "Educated Parents' Practice of Child Labour in Ekiti State, Nigeria," *European Scientific Journal* 19, no. 13 (2023): 79, https://doi.org/10.19044/esj.2023.v19n13p79.

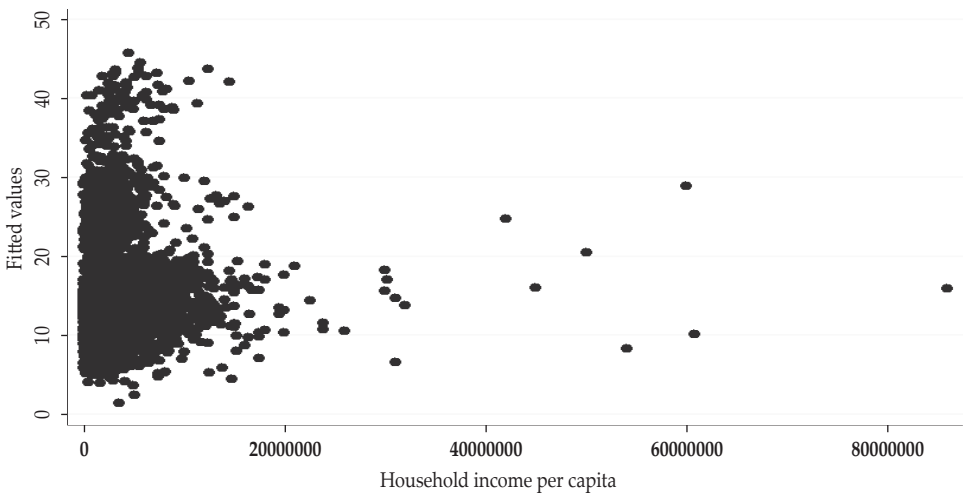
[63] Noelle Chesley, "Technology Use and Employee Assessments of Work Effectiveness, Workload, and Pace of Life," *Information, Communication & Society* 13, no. 4 (2010): 485–514, https://doi.org/10.1080/13691180903473806.

[64] Ade Marsinta Arsani et al., "Impact of Education on Poverty and Health: Evidence from Indonesia," *Economics Development Analysis Journal* 9, no. 1 (2020): 87-96, http://journal.unnes.ac.id/sju/index.php/edaj; Chris Chambers Goodman, "Class in the Classroom: Poverty, Policies, and Practices Impeding Education," *American University Journal of Gender, Social Policy & the Law* 27, no. 5 (2019): 95-136, https://digitalcommons.wcl.american.edu/jgspl/vol27/iss5/6.

[65] Kompas.com, "Rincian UMP 2023 Yang Mulai Berlaku Hari Ini," accessed January 1, 2023, https://www.kompas.com/tren/read/2023/01/01/083100965/rincian-ump-2023-yang-mulai-berlaku-hari-ini?page=all.

phenomenon of low-income households seeking additional income earned by adult workers in the households. In other words, with such low household income, the involvement of children in household activities can be interpreted as an additional income to the household.[66]

Figure 8.
Predicted value of child labour working hours and Household income per capita



Source: Authors' calculation from the 2023 Sakernas August Data

This study is subject to limitations due to the utilisation of Sakernas data, which is a cross-sectional survey, and is unable to capture children who stopped working before the data collection period. Additionally, 7.97% of information regarding the parents of the children could not be obtained (refer to Appendix A1 regarding children's status). Nevertheless, the study provides accurate insights into child labour aged 5-14 years with a sample distributed across Indonesia in August 2023 (see Appendix A2). Furthermore, the study contributes to the broader research on child labour and the challenges posed by the digital era.

IV. CONCLUDING REMARKS

Our study examines whether the use of digital devices for work affects the increase in weekly working hours among child labourers in Indonesia. The empirical analysis in this study confirms a higher number of working hours

[66] Kaushik Basu and Pham Hoang Van, "The Economics of Child Labor," *The American Economic Review* 88, no. 3 (1998): 412–27, https://doi.org/10.1257/aer.89.5.1386.

for child labourers using digital tools, particularly for children aged 12-14 who work more than hours per week. The study results suggest a strong possibility of exploitation of child labour through digital tools.

Jobs utilising digital tools may not appear hazardous, but the extended working hours can lead to long-term issues for the children. To address this, a clear regulatory framework regarding child labour in digital activities is essential. The existing regulations primarily focus on the formal sector, while the majority of child labour occurs in the informal sector, and the existing legal framework does not specifically regulate the potential economic exploitation of children in a digital environment. Additionally, regulations regarding children's involvement in broadcasting activities through online platforms are needed, along with time restrictions to prevent prolonged working hours. A regulation that could be implemented in this context, similar to the one issued by the UN Committee on the Rights of the Child (UNCRC), adopted General Comment No. 25 (2021) on children's rights in relation to the digital environment. This document encompasses the right to protection and safety in the digital sphere, including safeguarding against commercial exploitation and exposure to age-inappropriate advertising and marketing. This further recognises that the use of digital tools and the internet can conceal the nature of the work, but also develops children's skills in digital learning and the digital economy. Related to UNCRC General Comment, Indonesia has initiated policies addressing child protection in digital environments, with the regulation currently in the drafting phase of a Presidential Regulation (Perpres). This draft outlines the Roadmap for Child Protection in the Online Realm, spearheaded by the Ministry of Women's Empowerment and Child Protection. It is anticipated that once finalised, the regulation will be implemented promptly. Moreover, there is a pressing need to enhance protections for child labourers who operate outside the digital realm and beyond formal employer-employee relationships, as specified in Article 75, Paragraph 1, Section 2, Chapter X.

Another notable finding is that prolonged work can contribute to school dropout rates. The study reveals a significant gap in working hours between children using digital tools who are not attending school and those who are still in school. Furthermore, the percentage of child labourers has increased for those who have chosen to or have been forced to drop out of school. However, it has decreased among those still attending school. Prolonged working hours may contribute to school dropout rates, and efforts should be made to reintegrate out-of-school children into, or back into, the education system. However, in Indonesia, not all elementary and middle schools are accessible for free, even for public schools. Continuing education poses a challenge for children, given that there is only one middle school for every four elementary schools. The government needs to promote the construction of

school facilities to enhance mandatory nine-year education and increase school participation. Although the government provides various subsidies for children from poor families, many programs miss their targets and encounter obstacles in processing documents for poor families. Therefore, the government needs to ensure that subsidies and programs are directed specifically towards children from low-income families.

The government should also ensure safe living conditions for children's households, such as household welfare. The majority of households with child labour are engaged in informal sector activities. Assistance to informal businesses can be provided to increase income. Improving the competitiveness of these businesses and providing business mentoring to contribute to free trade are also crucial. Sustaining businesses requires capacity building for adult workers in these households, as the majority have education levels at the middle school level or below. This process can be implemented gradually. At the very least, efforts should be made to prevent children from working as labourers in outside family businesses. The study results suggest that child labour working hours would be lower if the children worked within their family businesses.

REFERENCES

Ab-Rahim, Rossazana, and Bilal Tariq. "The Impact of Trade on Child Labour: Evidence from Selected SAARC And ASEAN Countries." *Journal of Indonesian Economy and Business* 32, no. 1 (2017): 1–18.

Arsani, Ade Marsinta, Bugi Ario, and Al Fitra Ramadhan. "Impact of Education on Poverty and Health : Evidence from Indonesia." *Economics Development Analysis Journal* 9, no. 1 (2020): 87–96. http://journal.unnes.ac.id/sju/index.php/edaj.

Basu, Kaushik, and Pham Hoang Van. "The Economics of Child Labour." *The American Economic Review* 88, no. 3 (1998): 412–27. https://doi.org/10.1257/aer.89.5.1386.

Badan Pusat Statistik Indonesia. "Berita Resmi Statistik," Accessed July 17, 2023. https://www.bps.go.id/id/pressrelease/2023/07/17/2016/profil-kemiskinan-di-indonesia-maret-2023.html.

Badan Pusat Statistik Indonesia. *Booklet Pekerja Anak di Indonesia 2022: Sebelum Dan Semasa Pandemi COVID-19*. BPS RI, 2022.

Badan Pusat Statistik Indonesia. *Indeks Pembangunan Informasi san Komunikasi 2022*. BPS RI, 2022.

Badan Pusat Statistik Indonesia. *Indikator Pekerjaan Layak di Indonesia 2022*. Badan Pusat Statistik, 2023.

———. "Pertumbuhan Ekonomi Indonesia Triwulan I-2023," May 5, 2023. https://www.bps.go.id/id/pressrelease/2023/05/05/1998/ekonomi-indonesia-triwulan-i-2023-tumbuh-5-03-persen--y-on-y-.html.

———. "Statistik ECommerce 2022/2023." Jakarta, September 9, 2023.

———. "Telecommunication Statistics in Indonesia 2022." August 2023.

Chesley, Noelle. "Technology Use and Employee Assessments of Work Effectiveness, Workload, and Pace of Life." *Information, Communication & Society* 13, no. 4 (2010): 485–514. https://doi.org/10.1080/13691180903473806.

Chetty, Krish, Urvashi Aneja, Vidisha Mishra, Nozibele Gcora, and Jaya Josie. "Bridging the Digital Divide in the G20: Skills for the New Age." *Economics: The Open-Access, Open-Assessment E-Journal* 12, no. 24 (2018): 1–20. https://doi.org/10.5018/economics-ejournal.ja.2018-24.

Correa, Teresa, Isabel Pavez, and Javier Contreras. "Digital Inclusion through Mobile Phones? A Comparison between Mobile-Only and Computer Users in Internet Access, Skills and Use." *Information Communication and Society* 23, no. 7 (2020): 1074–91. https://doi.org/10.1080/1369118X.2018.1555270.

Dağdemir, Özcan, and Hakan Acaroğlu. "The Effects of Globalization on Child Labor in Developing Countries." Business and Economic Horizons 2, no. 2 (2010): 1-12. www.pieb.cz.

Das, Kaushik, Toshan Tamhane, Ben Vatterott, Phillia Wibowo, and Simon Wintels. "The Digital Archipelago: How Online Commerce Is Driving Indonesia's Economic Development." *Mckinsey & Comp*any 2018.

Dhakal, Chuda Prasad. "Dealing with Outliers and Influential Points while Fitting Regression." *Journal of Institute of Science and Technology* 22, no. 1 (July 2017): 61–65.

Gayatri, Gati, I. Gede Nyoman Mindra Jaya, and Vience Mutiara Rumata. "The Indonesian Digital Workforce Gaps in 2021–2025." *Sustainability* 15, no. 754 (2023). https://doi.org/10.3390/su15010754.

Goodman, Chris Chambers. "Class in the Classroom: Poverty, Policies, and Practices Impeding Education." *American University Journal of Gender, Social Policy & the Law* 27, no. 5 (2019): 95–136. https://digitalcommons.wcl.american.edu/jgspl/vol27/iss5/6.

Guarcello, L., S. Lyon, and F. Rosati. "Impact of Working Time on Children's Health," O-IPEC International Programme on the Elimination of Child Labour, September 2004.

Gunawan, Ricky Adrian, Arta Sundjaja, and Andika Pratama. "The Business Digitalization Model to Enhance Family Business Performance." *Journal of Applied Engineering and Technological Science (JAETS)* 5, no. 1 (2023): 197–212. https://doi.org/10.37385/jaets.v5i1.2049.

Gunawardhana, H.M.K.T., B.T.G.S Kumara, R.M.K.T. Rathnayaka, and P.M Jayaweera. "Use of Random Forest Classifier to Identify Counterfeited

E-Commerce Listings." In *12th Annual Research Sessions of the Sabaragamuwa University of Sri Lanka*, 2022.

Hof, Simone Van Der, E. Lievens, I. Milkaite, V. Verdoodt, T. Hannema, and T. Liefaard. "The Child's Right to Protection against Economic Exploitation in the Digital World." *International Journal of Children's Rights* 28, no. 4 (2020): 833–59. https://doi.org/10.1163/15718182-28040003.

Indonesia. Law No.13 of 2003 on Manpower, Pub. L. No. 13 (2003).

International Labour Office and United Nations Children's Fund. *Child Labour: Global Estimates 2020, Trends and the Road Forward.* New York: License: CC BY 4.0, 2021.

International Trade Administration. "Indonesia - ECommerce." Indonesia-Country Commercial Guide, January 9, 2024. https://www.trade.gov/country-commercial-guides/indonesia-ecommerce1/8.

Kasiyanto, Safari, and Mustafa R. Kilinc. "Legal Conundrums of the Metaverse." *Journal of Central Banking Law and Institutions* 1, no. 2 (2022). https://doi.org/10.21098/jcli.v1i2.25.

Kaur, Navpreet, and Roger W. Byard. "Prevalence and Potential Consequences of Child Labour in India and the Possible Impact of COVID-19 – a Contemporary Overview." *Medicine, Science and the Law* 61, no. 3 (2021). https://doi.org/10.1177/0025802421993364.

Kaushal, Vikrant, and Sidharth Srivastava. "Hospitality and Tourism Industry amid COVID-19 Pandemic: Perspectives on Challenges and Learnings from India." *International Journal of Hospitality Management* 92 (2021). https://doi.org/10.1016/j.ijhm.2020.102707.

Kemenkop UKM. "Gambaran UMKM Indonesia." KUMKM Dalam Angka. Accessed February 7, 2024. https://www.kemenkopukm.go.id/kumkm-dalam-angka/?type=indikator-umkm&sub=0.

Kemp, Simon. "DIGITAL 2023: INDONESIA." DataReportal – Global Digital Insights, Accessed February 9, 2023. https://datareportal.com/reports/digital-2023-indonesia.

Kim, Jihye, and Wendy Olsen. "Harmful Forms of Child Labour in India from a Time-Use Perspective." *Development in Practice* 33, no. 2 (2023): 190–204. https://doi.org/10.1080/09614524.2022.2155620.

Kishore, Arun N.R., and K. S. Shaji. "School Dropouts: Examining the Space of Reasons." *Indian Journal of Psychological Medicine* 34, no. 4 (2012): 318–23. https://doi.org/10.4103/0253-7176.108201.

Kojok, Bayan. "Reinventing Child Labour: A Contemporary Analysis of Children's Participation in the Digital Labour Economy." *Major Papers* 226 (Oct 2022). https://scholar.uwindsor.ca/major-papers/226.

"Rincian UMP 2023 Yang Mulai Berlaku Hari Ini." Kompas.com. Accessed January 1, 2023. https://www.kompas.com/tren/read/2023/01/01/083100965/rincian-ump-2023-yang-mulai-berlaku-hari-ini?page=all.

Levine, James A., Robert Weisell, Simon Chevassus, Claudio D. Martinez, and Barbara Burlingame. "Looking at Child Labor." *Science* 296, no. 5570 (2002): 1025–26. https://doi.org/10.1126/science.296.5570.1025c.

Lulu, Fan, and Boy Luethje. "Taobao Villages: Rural E-Commerce and Low-End Manufacturing in China," *East West Wire*. July 31, 2019.

Maiti, Dibyendu, and Akshara Awasthi. "ICT Exposure and the Level of Wellbeing and Progress: A Cross Country Analysis." *Social Indicators Research* 147, no. 1 (2020): 311–43. https://doi.org/10.1007/s11205-019-02153-5.

Marcela, Claudia, and Umaña Aponte. "Child Labour and the Economic Recession of 1999 in Colombia." *Revista de Economia Del Rosario* 6, no. 2 (2003): 139–78.

Ministry of Manpower. "Peta Jalan (Roadmap) Menuju Indonesia Bebas Pekerja Anak Tahun 2022." Jakarta, December 2022.

Morris, Melissa. "Kidfluencers and Conundrums: The Rising Need for Internet Policy That Addresses Child Labour and Safety." *The Motley Undergraduate Journal* 1, no. 1 (2023): 116–26.

Negara, Siwage Dharma, and Astrid Meilasari-Sugiana. "The State of Indonesia's Digital Economy in 2022." *ISEAS Yusof Ishak Institute Perspective* 2022, no. 109 (2022).

Novianto, Arif, Anindya Dessi Wulansari, and Yeremias T. Keban. "Searching for a Better Job : Indonesian Gig Workers and the Limits of Decent Work Agendas." *Work Organisation, Labour and Globalisation* 17, no. 2 (2023): 71–90. https://doi.org/10.13169/workorgalaboglob.17.2.0071.

Oluwagbohunmi, Margaret F., and Esther O. Popoola. "Educated Parents' Practice of Child Labour in Ekiti State, Nigeria." *European Scientific Journal, ESJ* 19, no. 13 (2023): 79. https://doi.org/10.19044/esj.2023.v19n13p79.

Ozili, Peterson K. "Contesting Digital Finance for the Poor." *Munich Personal RePEc Archive (MPRA) Paper*, no. 101812 (July 15, 2020).

Pandey, Vartika, and Prof B D Nayak. "Child Labour Among School Dropouts and Its Social Impact on The Working Child." *Journal of Emerging Technologies and Innovative Research* 6, no. 6 (2019): 147–51. www.jetir.org.

Ranganai, Edmore. "On Studentized Residuals in the Quantile Regression Framework." *SpringerPlus* 5, no. 1 (December 1, 2016). https://doi.org/10.1186/s40064-016-2898-6.

Ruan, Mengqian. "Play-Working: Study on Phenomenon of Children Digital Work as Chair Grabbing Games on Micro-Video Platforms." *Journal of Education, Humanities and Social Sciences* 7 (2023): 92–96.

Sarstedt, Marko, and Erik Mooi. *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*. 3rd ed. Springer Nature, 2019. http://www.springer.com/series/10099.

"Number of Internet Users in Indonesia from 2017 to 2022 with Forecast until 2028." Statista. Demographics & Use, 2024. https://www.statista.com/statistics/254456/number-of-internet-users-in-indonesia/.

The World Bank. "Beyond Unicorns Harnessing Digital Technologies for Inclusion in Indonesia." WASHINGTON DC, 2021.

Thévenon, Olivier, and Eric Edmonds. "Child Labour: Causes, Consequences and Policies to Tackle It." OECD Social, Employment and Migration Working Papers, 2019. https://doi.org/10.1787/f6883e26-en.

Ul-Haq, Jabbar, Sana Khanum, and Ahmed Raza Cheema. "The Impact of Trade Liberalization on Child Labor in Pakistan." *International Review of Applied Economics* 34, no. 6 (2020): 769–84. https://doi.org/10.1080/02692171.2020.1782853.

UN. "Child Labour: Global Estimate &Trends." *Infographics*, 2023.

UNSTAT. "Indicator 8.7.1: Proportion and Number of Children Aged 5-17 Years Engaged in Child Labour, by Sex and Age." SDG Indicators: Metadata repository, July 29, 2024. https://unstats.un.org/sdgs/metadata/.

Wihardja, Maria Monica, Abror Tegar Pradana, Sanjiwacika Wibisana, Arya Swarnata, and Aufa Doarest. "Digital Transformation in Indonesia's Labour Market: Gainers and Losers." *ISEAS Perspective*, no. 6 (2024).

Zhouzheng, Huang. "Digital Child Labor-Kid-Influencer and Legal Countermeasure in China." In *Online Conference on Combating Child Labour in ASEAN/Southeast Asia*, 2021.

APPENDICES

A1. Summary statistics

Numeric Variables		Means (SD)
Working hours	children aged 5-11 years	11.14 (0.17)
	children aged 12-14 years	17.85 (0.19)
	children aged 5-14 years	14.97 (0.14)
Age (years)		11.64 (9.49)
Number of household members		4.79 (1.52)
Job tenure (months)		26.12 (22.03)
Age of HH (years)		44.89 (9.37)

Categorical Variables		Percentage
Digital	No	84.27
	Digital	15.73
Children status	Other	7.97
	HH's Children	92.03
Sex	Girls	48.32
	Boys	51.68
School participation	Not yet in school	1.47
	Still in school	91.35
	No longer go to school	7.19
Urban	Urban	29.31
	Rural	70.69
Employment status	Employees	2.67
	Self-employment	3.11
	Casual workers	2.58
	Family workers	91.63
Workplace	Others	1.03
	Business / Corporation	0.72
	Individual business / household business	97.79
	Household workers	0.46
Sectors	Agriculture	46.59
	Manufacturing	9.46
	Services	43.94
Sex of HH	Male	86.59
	Female	13.41
Activity of HH	Working	97.39
	Not working	2.61
Education of HH	Middle school or below	66.40
	High school and above	33.60

HH = Head of Household

A2. Distribution of units of analysis of child labour ages 5-14 years according to province

Province	Percentage	Province	Percentage
Aceh	0.85	West Nusa Tenggara	3.44
North Sumatra	17.68	East Nusa Tenggara	13.32
West Sumatra	3.04	West Kalimantan	1.31
Riau	1.23	Central Kalimantan	0.96
Jambi	0.61	South Kalimantan	1.18
South Sumatra	2.52	East Kalimantan	1.07
Bengkulu	1.01	North Kalimantan	0.90
Lampung	2.28	North Sulawesi	0.88
Bangka Belitung Islands	0.59	Central Sulawesi	2.67
Riau islands	1.07	South Sulawesi	7.89
Jakarta	0.37	Southeast Sulawesi	5.87
West Java	2.89	Gorontalo	1.53
Central Java	4.49	West Sulawesi	1.97
Yogyakarta	0.37	Maluku	2.06
East Java	2.72	North Maluku	1.23
Banten	1.12	West Papua	3.31
Bali	2.69	Papua	4.86

Source : Authors' calculation

A3. Ramsey RESET test using powers of the fitted values of Working Hours

Ho: model has no omitted variables
F(3, 4540) = 21.65
Prob > F = 0.0000

A4. VIF results

Variables	VIF	1/VIF
Digital	1.12	0.89
HH's Children	1.23	0.81
Boys	1.05	0.95
Age	1.21	0.83
Not yet in school	1.02	0.98
No longer going to school	1.24	0.81
Rural	1.21	0.82
Job tenure	1.09	0.92
Number of household members	1.11	0.90
Self-employment	2.23	0.45
Casual workers	1.96	0.51
Family workers	3.46	0.29
Business / Corporation	1.70	0.59
Individual business / household business	2.14	0.47
Household workers	1.50	0.67
Manufacturing	1.16	0.86
Services	1.48	0.67
HH: Female	1.11	0.90
HH: Age	1.27	0.79
HH: Not working	1.04	0.96
HH: High school and above	1.10	0.91
Mean VIF	1.88	

HH = Head of Household

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