Did digitalisation help manufacturers cope with the Covid-19 pandemic?

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Presentation outline

- Introduction
- Motivation of this study
- Theoretical background
- Data
- Empirical findings
- Conclusion and policy recommendations

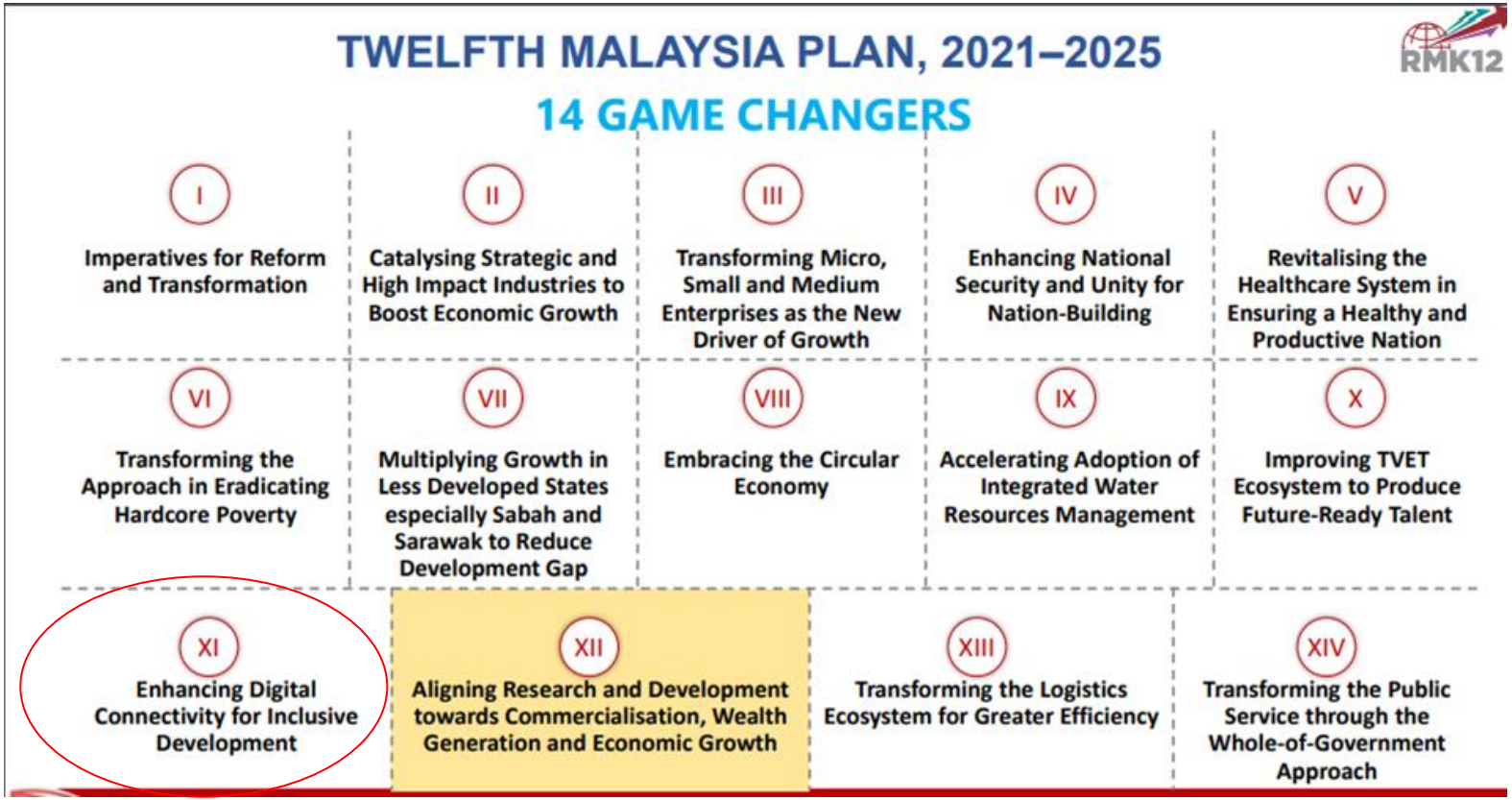
Introduction: The importance of digitalisation

- Malaysia has been actively promoting the digitalisation of the economy for several reasons
  - Long period of deindustrialisation (Rasiah, 2011)
  - Wages have not been growing commensurate with the growth of the economy
  - Heavy dependence on foreign labour
  - Improve value chain through Fourth Industrial Revolution (IR 4.0).
  - Escape middle-income trap and emerge as a digital leader in ASEAN.

Introduction: The 12th Malaysia Plan

- The economic importance of digitalisation is introduced in the 12th Malaysia Plan (12MP)
    - Drivers of growth for the next five years are sustainability and digitalisation.
    - Post-Covid recovery
    - Transform Malaysia into a technology-based economy

Introduction: The 12th Malaysia Plan



Introduction: The 12th Malaysia Plan

Chapter 11: Boosting Digitalisation and Advanced Technology

Advancing Digital Economy

- Providing an Enabling Environment for the Growth of the Digital Economy
- Strengthening Provision of Digital Infrastructure and Services
- Developing Future-ready Digital Talent
- Positioning Malaysia as the ASEAN Digital Centre

Mainstreaming Digitalisation for Inclusive Development

- Expanding Digitalisation
- Improving Digital Governance for Inclusive Digitalisation

Accelerating Research, Development, Commercialisation and Innovation

- Strengthening Capacity and Capability in Research, Development, Commercialisation and Innovation
- Nurturing Quality Science, Technology and Innovation Talenti

Capitalising on Advanced Technology Potential

- Gearing up for the Fourth Industrial Revolution

Introduction: The 12th Malaysia Plan

- Digital economy is expected to contribute 25.5% to the GDP by 2025.
- Digital content export is expected to achieve annual growth rate of 8% from 2021 to 2025 (Malaysia Digital Economy Blueprint)

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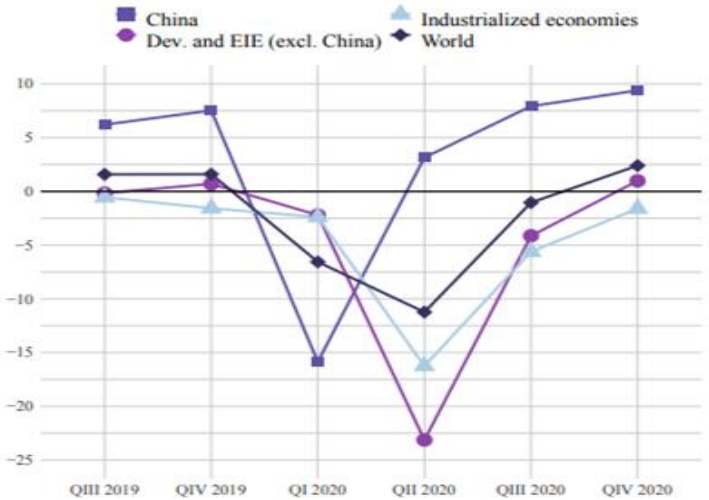
Introduction: Covid-19 pandemic (Global perspective)

- The pandemic brought conventional economic activities, such as manufacturing, to a standstill.
- Global manufacturing production growth has been on decreasing trend since 2019:
    - Even before Covid-19, we had the trade dispute between the United States and China
- The slowdown is exacerbated with the outbreak of the Covid-19 pandemic in the year 2020.
- Implementing a national lockdown policy to curb the Covid-19 transmission has halted manufacturing activities

Introduction: Covid-19 pandemic (Global perspective)

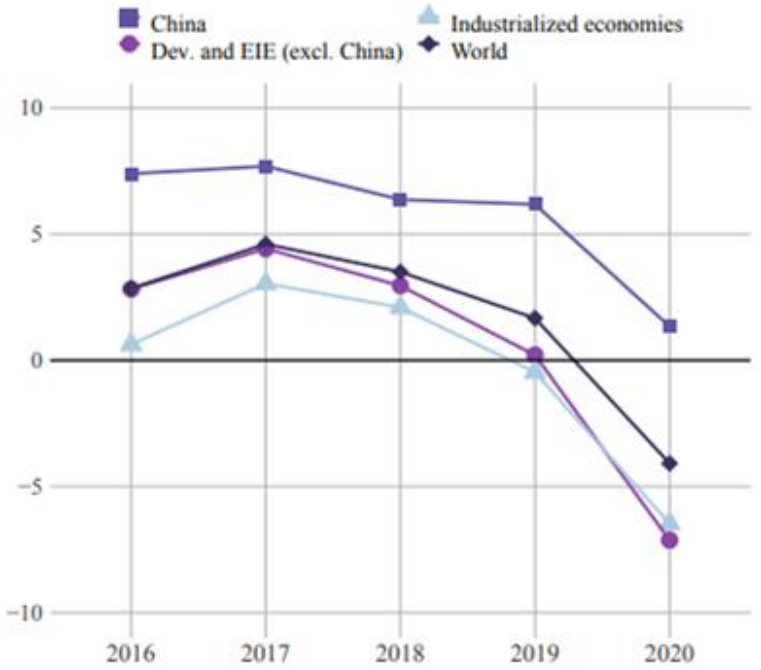
- In Q2 2020
  - Global manufacturing output dropped by 11.2%
  - Manufacturing production in Industrialized economies dropped by 16.2%
  - Largest drop observed in developing and emerging industrial economies = 23.1%



Growth of world manufacturing output (year-on-year growth). Source: UNIDO

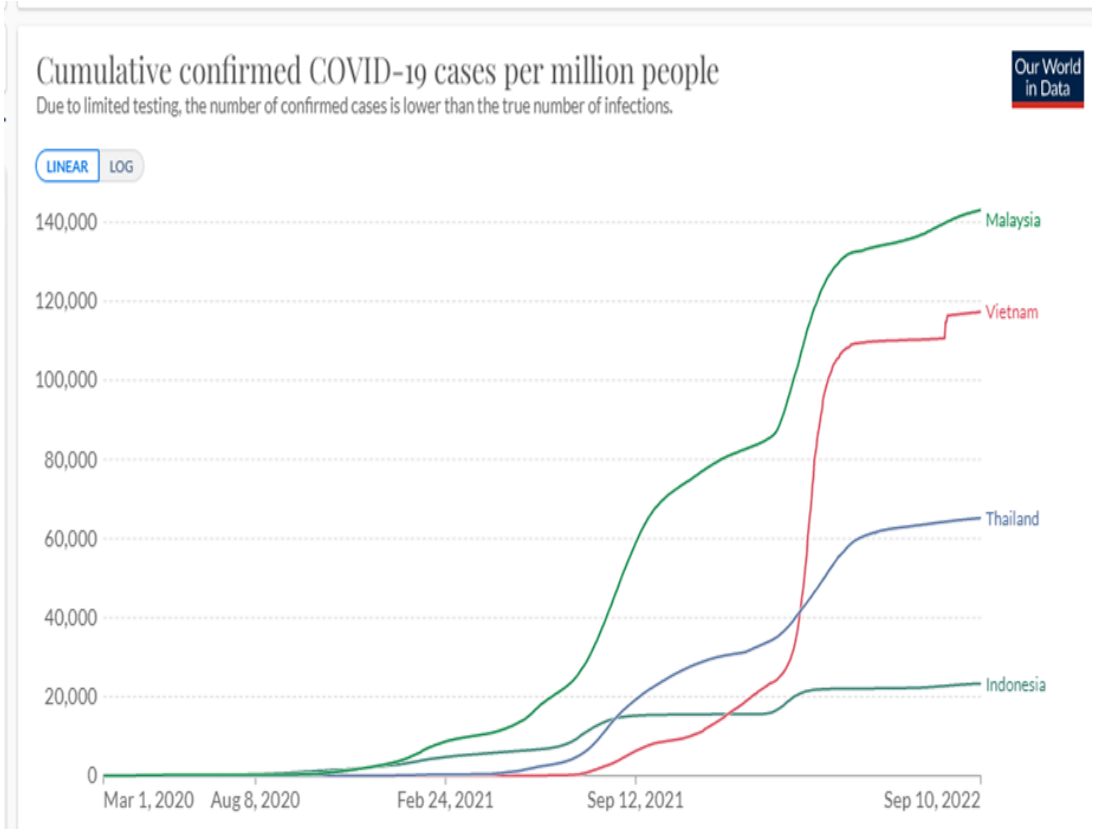
Introduction: Covid-19 pandemic (Global perspective)

- Global manufacturing production dropped by 4.1% in 2020.
- Industrialized economies experienced a 6.5% contraction in the annual manufacturing production.
  - Europe (-7.6%)
  - North America (-6.7%)
  - East Asia (-4.7%)
- China recorded a positive manufacturing production growth of 1.3%,
- The manufacturing output in developing and emerging industrial economies dropped by 7.1% in 2020



Growth of world manufacturing output (year-on-year growth). Source: UNIDO

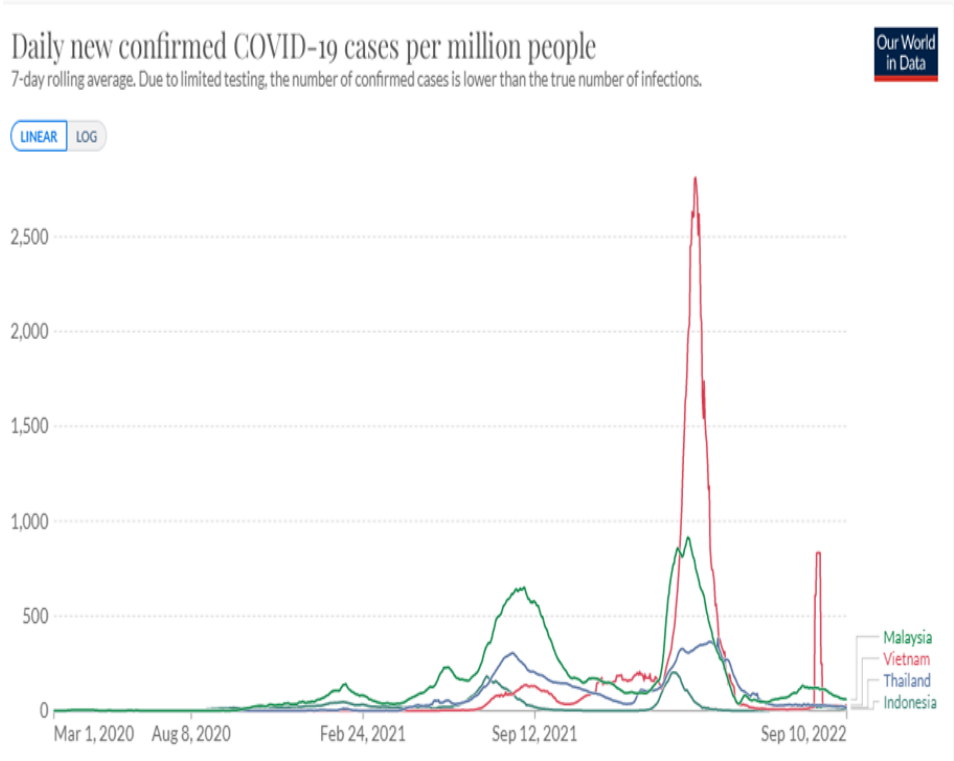
Introduction: Covid-19 pandemic (Malaysia context)



- The cumulative confirmed Covid-19 cases per million people in Malaysia far surpassed neighbouring countries.

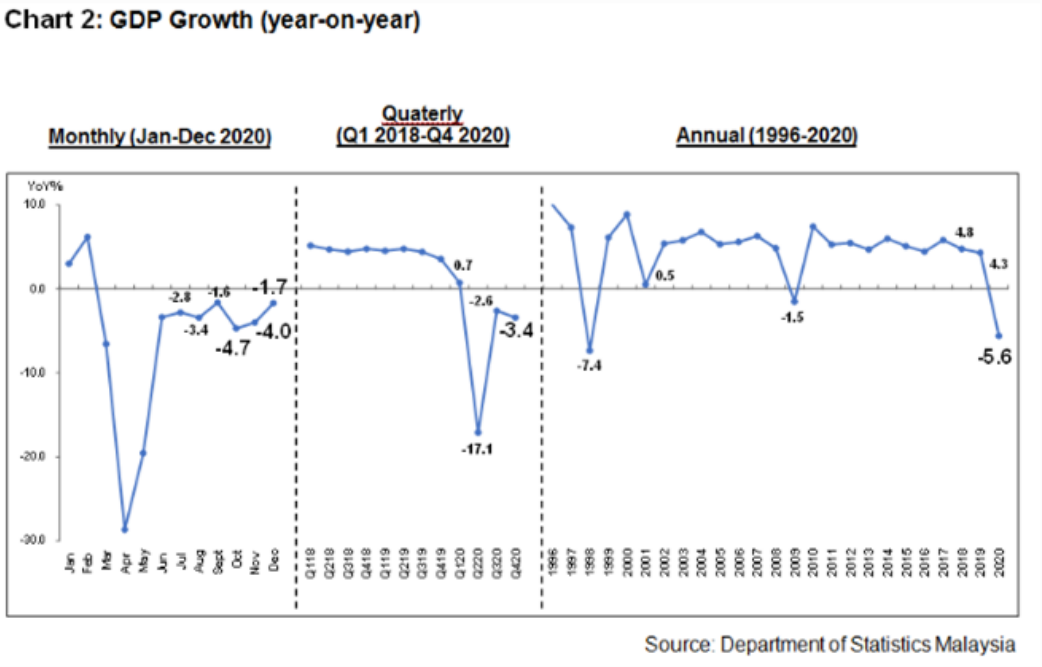
- As of 31 December 2020, the cumulative confirmed cases per million population in:
  - Malaysia (3366 cases)
  - Indonesia (2714 cases)
  - Vietnam (96 cases)
  - Thailand (15 cases)

Introduction: Covid-19 pandemic (Malaysia context)



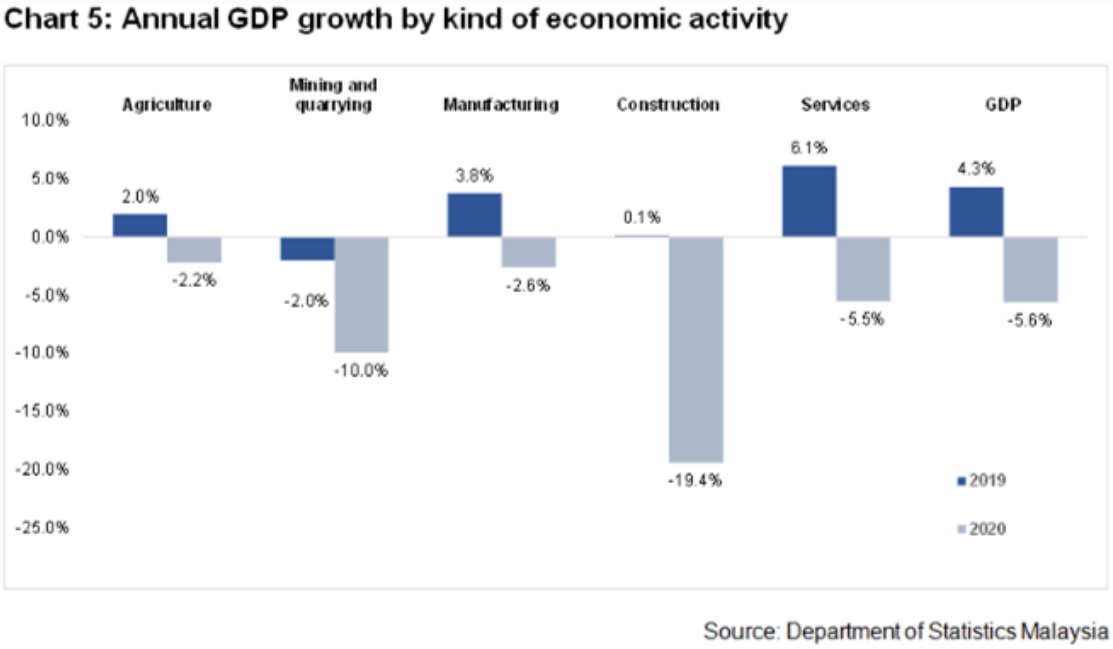
- Similar pattern is observed for the daily new cases per million population
- As of 31 December 2020, the daily new cases per million population in:
  - Malaysia (54.01 cases)
  - Indonesia (26.28 cases)
  - Thailand (2.10 cases)
  - Vietnam (0.05 cases)
- Daily new cases per million population in Vietnam surpassed Malaysia in early 2022.

Introduction: Covid-19 pandemic (Malaysia context)



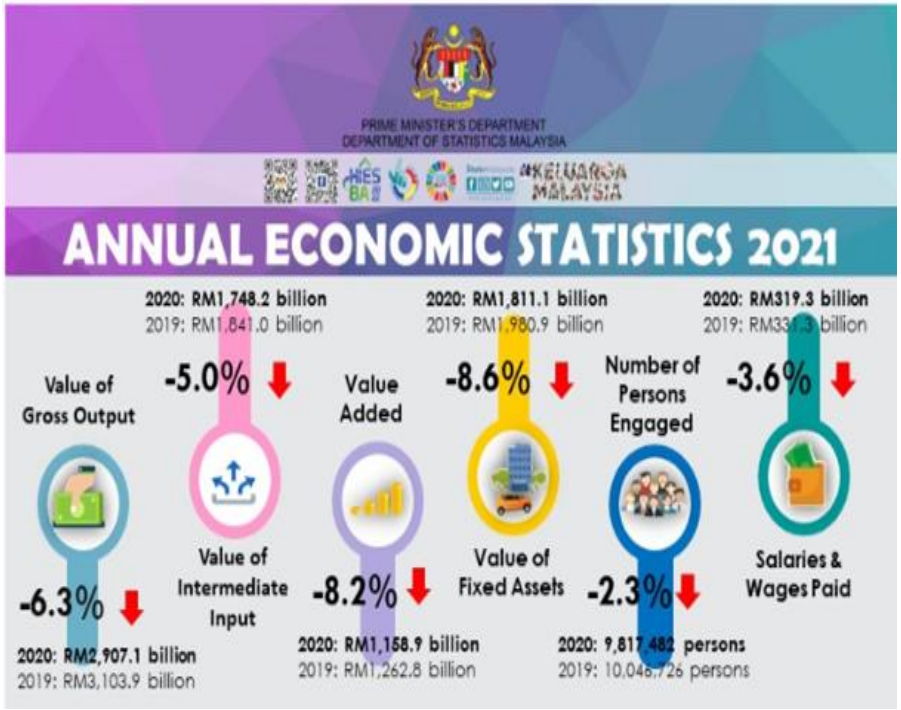
- Malaysia's GDP contracted by 5.6% in 2020.
- Malaysia's full-year growth rate is weakest since a 7.4% contraction in the 1997/98 Asian Financial Crisis

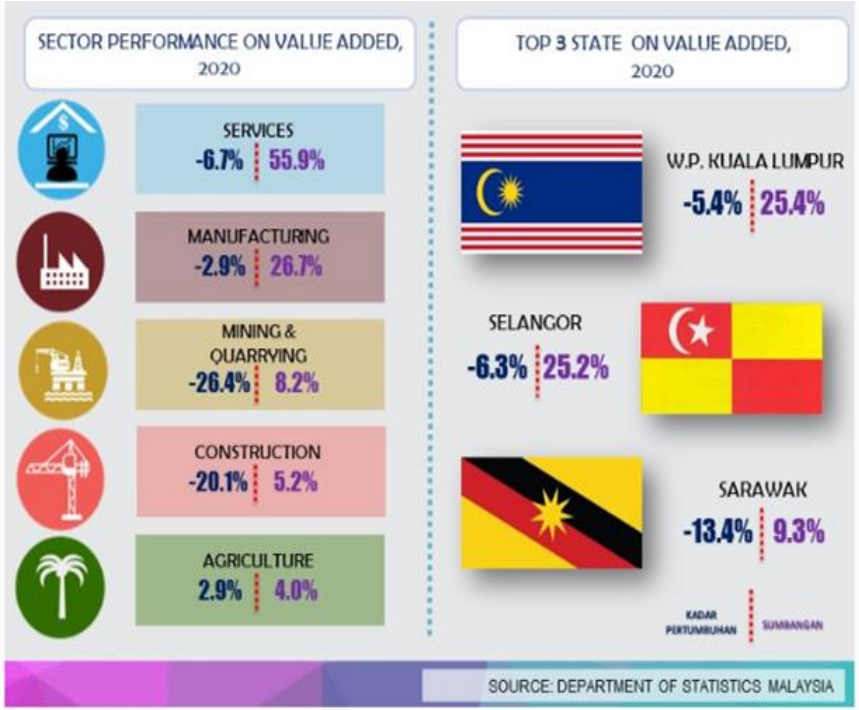
Introduction: Covid-19 pandemic (Malaysia context)



- The manufacturing sector has recorded a negative 2.6% annual growth in 2020
    - Manufacturing Sales contracted by 2.2% in 2020.
    - The largest decline in sales was observed in April 2020, with a negative 33% growth rate as compared to the preceding month

Introduction: Covid-19 pandemic (Malaysia context)





Motivations of this study

- International organisations, such as the World Bank, UNCTAD, and IMF have suggested that digitalisation helps firms to mitigate the negative impact of the Covid-19 pandemic on companies' performance.
- Digitalisation is one of the drivers of growth in the 12th Malaysia plan (12MP).
- Earlier presentations have showed the potentials of digitalisation in the era of Covid-19 pandemic.
- Thus far, the analysis on the mitigating effect of digitalisation is rather limited.

Theoretical background: Dynamic capabilities (Guo et al. 2020)

- Dynamic capabilities refer to the firm's' capability to build, integrate and reconfigure resources when coping with a rapidly changing environment.
  - Key to formulate effective crisis response strategies
  - Firms with dynamic capabilities are more likely to adapt to the changing environment and sustain company operations during crisis period.

- Involve three dimensions
  - Capability of sensing the crisis
  - Capability of seizing new opportunities in the crisis
  - Capability of reconfiguring resources to cope with the crisis

Theoretical background: Dynamic capabilities (Guo et al. 2020)

- First dimension: Capability of sensing the crisis
  - Firms with poor dynamic capabilities are unlikely to predict the arrival of an unprecedented events / unlikely to anticipate the economic implications of unprecedented events
  - Firms possesses dynamic capabilities able to gauge the possible implication of the pandemic on the company's operation.
  - Firms with dynamic capabilities would be better able perceive a crisis and develop comprehensive strategies to overcome the challenges imposed by the pandemic

- The role of digitalisation
  - Enhance manufacturers capability in sensing the crisis.
  - Early preparation can be conducted to cope with the pandemic
  - Big data analysis would help to predict environmental changes to some extent and allows them to have a better perception on the pandemic

Theoretical background: Dynamic capabilities (Guo et al. 2020)

- Second dimension: Capability of seizing new business opportunities during crisis
  - Firms with poor dynamic capabilities are unlikely to come up with a new business model to sustain company operations during crisis period
  - Firms posses dynamic capabilities would leverage on various platforms to market their products and services.

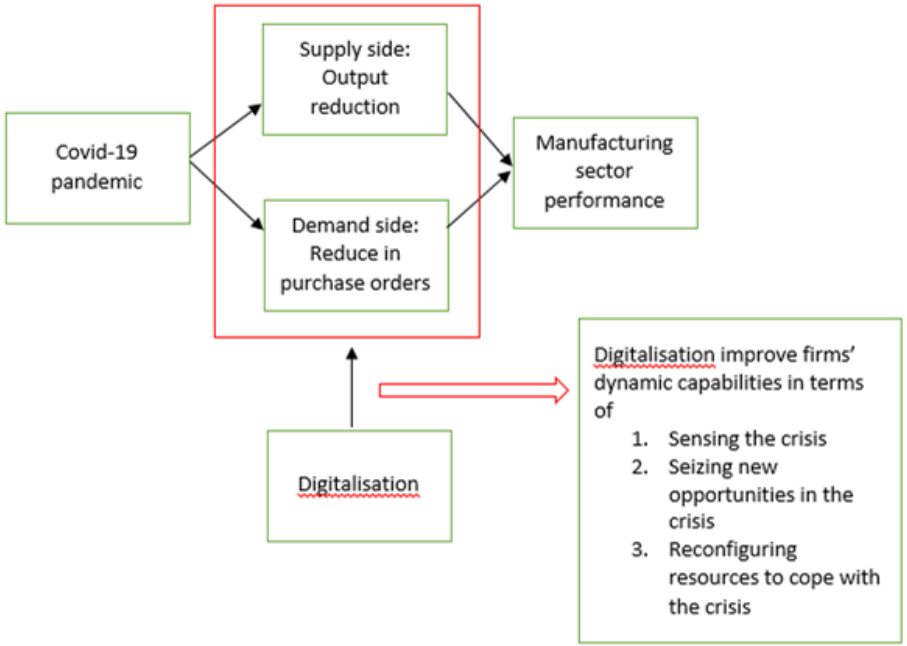
- The role of digitalisation
  - Enable firms to venture into digital business model by providing an online platform to market their products and services.
  - Expand consumer markets and provide constant revenue stream during pandemic period.

Theoretical background: Dynamic capabilities (Guo et al. 2020)

- Third dimension: Capability of reconfiguring resources
    - Firms with poor dynamic capabilities are unlikely to utilise external resources to cope with the Covid-19 pandemic.
    - Firms posses dynamic capabilities would employ external resources to ensure the continuation of business operation= Equip employee with digital technologies, such as remote robots in conducting the production activities

- The role of digitalisation
    - Allows the adoption of remote robots to perform daily routine in the factories.
    - Ensure continuation of manufacturing activity despite the closure of physical plants

Theoretical background: Dynamic capabilities (Guo et al. 2020)



- Covid-19 pandemic is conjectured to depress manufacturing performance through the reduction in output produced and purchase orders.

- Digitalisation mitigates these adverse effect by providing effective crisis response strategies

Data

- Secondary data
  - 130 manufacturing industries (based on the five-digits code of MSIC classification)
  - Monthly data: January 2020 to December 2020

List of variables

Variables	Description	Unit of measurement	Source
Dependent variable			
IPIYoY	Manufacturing industrial production index	Year-on-year %	DOSM
Covid-19 variables			
COVID	Total Covid-19 cases	Per million population	Our World in Data
COVIDNEW	New Covid-19 cases	Per million population	Our World in Data
Digitalisation variables			
DIGITAL	Telekom Malaysia's fixed broadband subscriber	Thousands	Telekom Malaysia
IB	Internet banking penetration rate	% of total population	BNM
MOBILE	Mobile banking penetration rate	% of total population	BNM
Control variables			
EXPORT	Malaysia Gross export	Million MYR	BNM
MYRUSD	Dollar to Ringgit exchange rate	Exchange rate	BNM
IPI	Malaysia Industrial production index	Index	BNM

Note:

1. DOSM denotes Department of Statistics Malaysia
2. BNM denotes Bank Negara Malaysia.

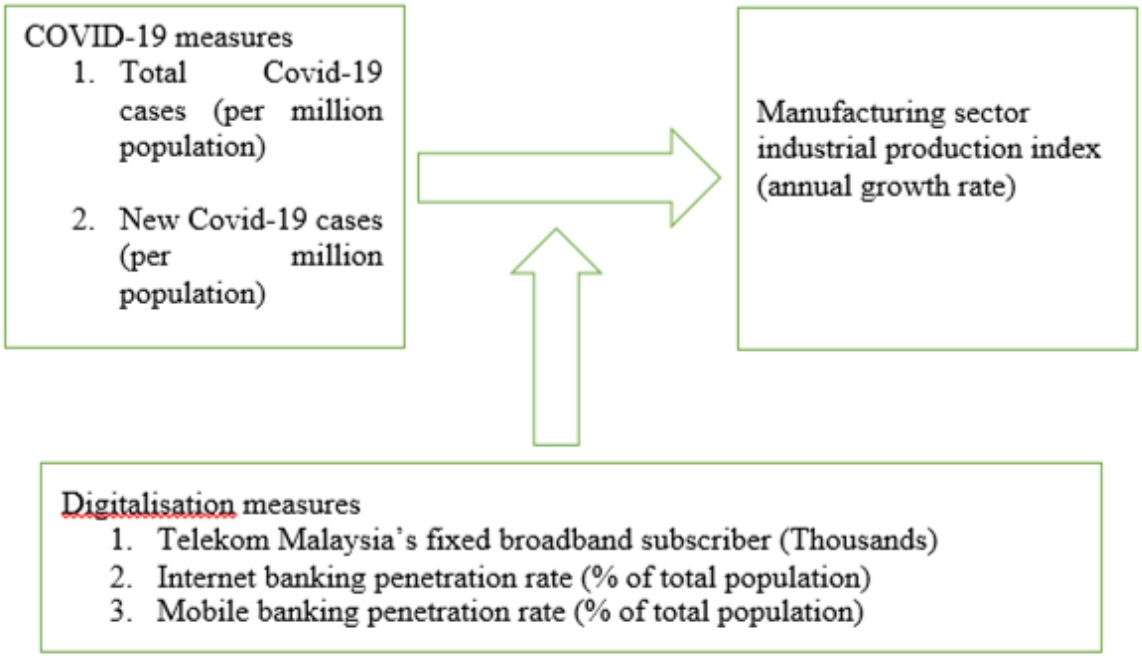
Data

Assumptions on the Covid-19 and digitalisation measures

1. Covid-19 cases is not available for each manufacturing industry. Therefore, country-level data is used.
    a. Higher Covid-19 cases induces Government to implement the lockdown policy to curb the virus transmission. This negatively affects manufacturing activities as factories are not allowed to operate during lockdown period
2. Digitalisation measures denoted by country-level, industry-level data is not available. The use of country-level measure captures the overall degree of digitalisation
    a. Consumers: The use of internet enables online purchase
    b. Manufacturers: The use of internet enables to venture into digital business. High Speed internet, such as 5G network, allows firm to deploy remote robots in factory, thereby ensuring the continuation of manufacturing activities during lockdown period

Empirical model

IPIYoY=f(COVID-19, DIGITAL, COVID19*DIGITAL, CONTROLS)



Econometric analysis: Panel data approach

Empirical findings

- Key finding 1:
  - Covid-19 pandemic is found to depress Malaysian manufacturing production.
  - Result is consistent with the empirical finding in other countries, such as South Africa (Telukdaries et al., 2020), China (Wen et al., 2021), the United Kingdom (OECD, 2020), Japan (Zhang, 2021), and the United States (Bauer et al., 2020).
  - Finding is in line with the survey results published by the Federation of Malaysian Manufacturers (FMM).
    - Federation of Malaysian Manufacturers (FMM)-Malaysian Institute of Economic Research (MIER) Business Conditions Index recorded a slump in manufacturing activity, local and exports sales in the first of 2020.
    - Almost all businesses saw revenue drop
    - 82% of the respondents surveyed reported a decrease in income
    - 80% said their profitability plunged.

Empirical findings

- Key finding 2:
  - Digitalisation increases the manufacturing production
  - Finding is in line with the empirical literatures which argued that digital adoption is the key for improving manufacturing sector performance (Falentina et al., 2020; Martina-Pena et al., 2020; Chauhan et al., 2021).
  - Support policy measures undertaken by the Malaysian government under the Malaysia Digital Economy Blueprint in accelerating the digital adoption in the country

Empirical findings

- Key finding 3:
  - Digitalisation is found to mitigate the adverse impact of Covid-19 on the manufacturing production.
  - Covid-19 negatively affects manufacturing production when the overall degree of digital adoption is at a lower level (about 2 million of Telekom Malaysia fixed broadband subscriber=This is the minimum value of the number of subscriber in the sample period covered).
  - The adverse impact of Covid-19 diminishes with the rising level of digital adoption
  - The effect of Covid-19 on manufacturing production is negligible when the overall degree of digital adoption is at a higher level (about 2.4 million of Telekom Malaysia fixed broadband subscriber=This is the maximum value of the number of subscriber in the sample period covered).
  - Results remain consistent for (1) New-Covid19 cases (per million population), (2) Internet banking penetration rate, and (3) Mobile banking penetration rate

Conclusion and policy recommendations

- Results show that digitalisation mitigates the adverse impact of Covid-19 pandemic on the manufacturing industry performance ⇒ Lend support to the 12th Malaysia Plan in promoting digital economy in Malaysia.
- Two problems need to be addressed:
  - Uptake of digitalisation ⇒ Small firms may not have the capability to adopt advanced technology
  - Availability of migrant labour ⇒ Low wage rate, resulting in little incentive for firms to find substitutes to it
- Policies to increase uptake of digitalisation
  - Tax incentives
  - Public capital, such as public grant programme
  - Speed up the deployment of 5G network

Main references

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Appendix for empirical findings

Table 1

Specifications	1	2
Estimation methods	FE	LSDVC
Covid-19 measures	Total Covid-19 cases per million population	
Digitalisation measures	Telekom Malaysia's fixed broadband subscriber	
Effect of Covid-19 on manufacturing IPI growth rate when digitalisation is at the:		
Minimum	-0.09459**	-0.01386**
Mean	-0.00628**	-0.00911**
Maximum	-0.00119	-0.00153

*, ** and *** denotes statistically significant at 10%, 5% and 1% level, respectively

Table 2

Specifications	1	2
Estimation methods	FE	LSDVC
Covid-19 measures	New Covid-19 cases per million population	
Digitalisation measures	Telekom Malaysia's fixed broadband subscriber	
Effect of Covid-19 on manufacturing IPI growth rate when digitalisation is at the:		
Minimum	-0.60539***	-0.85441***
Mean	-0.38338***	-0.53144***
Maximum	-0.02916	-0.01613

*, ** and *** denotes statistically significant at 10%, 5% and 1% level, respectively

Appendix for empirical findings

Table 3

Specifications	1	2
Estimation methods	FE	LSDVC
Covid-19 measures	Total Covid-19 cases per million population	
Digitalisation measures	Internet banking penetration rate	
Effect of Covid-19 on manufacturing IPI growth rate when digitalisation is at the:		
Minimum	-0.03459***	-0.04381***
Mean	-0.01622***	-0.02000***
Maximum	0.00019	0.00124

*, ** and *** denotes statistically significant at 10%, 5% and 1% level, respectively

Table 4

Specifications	1	2
Estimation methods	FE	LSDVC
Covid-19 measures	Total Covid-19 cases per million population	
Digitalisation measures	Mobile banking penetration rate	
Effect of Covid-19 on manufacturing IPI growth rate when digitalisation is at the:		
Minimum	-0.04026***	-0.04523***
Mean	-0.02197***	-0.02428***
Maximum	0.00049	0.00143*

*, ** and *** denotes statistically significant at 10%, 5% and 1% level, respectively