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Adaptive Supply Chain Management under Severe Supply Chain Disruption: Evidence from Indonesia

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Abstract

The recent Covid-19 outbreak has caused severe disruption of the global supply chain, which tests firms' ability to survive and build resilience. The concept of adaptive supply chain management (A-SCM) has never been tested against a severe supply chain disruption, such as a pandemic. **Purpose:** The aim of this study is to examine how firms in Indonesia develop resilience through the implementation of components of adaptive supply chain management, namely risk management, resource reconfiguration and supply chain flexibility, in order to survive severe supply chain disruption. **Research design, data and methodology:** A qualitative method and PLS-SEM were used to analyze 120 data collected from Indonesian manufacturing firms in various industries. **Results:** The findings show that risk management, resource reconfiguration, and supply chain flexibility are important components that make up A-SCM. However, only risk management contributes to help build firm resilience in the presence of severe supply chain disruption. **Conclusions:** The components of A-SCM have been empirically tested. The implication is that managers should carefully use RM to prepare firms for different scenarios to develop contingency strategies. This research contributes to the supply chain management body of knowledge in the context of pandemic-level disruption and broadens the dynamic capabilities perspective.

Keywords : Severe Supply Chain Disruption, Adaptive Supply Chain Management, Firm Resilience, Risk Management, Covid-19

JEL Classification Code M30, M31, Q55

1. Introduction

Supply chain disruptions (SCD) are events from internal or external factors that disrupt the flow of goods and

services in a supply chain (SC) (Cavinato, 2004), including uncertain market rate demands during crisis (Kim, 2019), disturbances in lead time and other daily operational activities leading to demand fluctuations (Ivanov, 2020). Recently, the Covid-19 pandemic has spread worldwide (Camba & Jr, 2020; Wolor et al., 2020), testing and disrupting the global SC resilience as never been in the history. Although, several disruptions in the SC have occurred in recent decades, however, the current coronavirus pandemic (Covid-19) is unpredictable. With quarantine and lockdown policies for the human population, some firms experience a surge in demand for certain products, while others experience a dramatic demand decline (Haas, 2020; Pramana et al., 2020). Access to the supply of raw materials and labor throughout the world is severely disrupted.

Although "improvement systems and quality management have fairly fast development to answer consumer needs" (Sutrisno, 2019) and to improve

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performance (Sutrisno & Ardyana, 2020), they are not enough to overcome severe SCD. To date, this has affected more than 200 countries, endangering global communities, ecosystems, SCs and the members within (Deyshappriya, 2020; Wakolbinger & Cruz, 2011).

SCD in the food and beverage industry has resulted consumer panic buying behavior, which this is likely to have longer lasting effects (Hobbs, 2020), suggesting the rise of a new normal. The reduction in production capacity is below the optimum level, retail closures, production failures due to the scarcity of imported raw materials are proofs that firm resilience is at stake during this pandemic. Further, not all firms in developing countries are ready to face severe SCD (Agrawal et al., 2020), (Haas, 2020). For Indonesia, Covid-19 pandemic is stated as a national disaster (Mahy, 2020). Despite the improvements in infrastructure, human resources, and intensive marketing (Sumantri, 2020), the covid-19 has severely impacted the Indonesian economy, especially the tourism sector. Gradual restrictions on incoming flights, labor movement and business operations have been carried out in stages by the government. Thus, understanding how companies can manage SCDs has become an important topic for both academics and practitioners in the midst of a pandemic.

Taking the perspective of dynamic capabilities (DC) (Teece, 2007; Teece et al., 1997), in the face of turbulent environment, firms need to be agile and flexible enough to adapt to rapid change by exploiting existing internal and external resources and capabilities. In the presence of a pandemic, the level of environment turbulence has reached a higher level, while consumers have become more demanding due to health and safety concerns. The ability of firms to survive in the midst of covid-19 pandemic becomes questionable (Ivanov & Dolgui, 2020). Therefore, it is essential for firms to keep on the edge of gaining competitive advantage to survive.

However, resources and capabilities prior to the pandemic have no longer significance to keep up with the new normal. One way to survive this pandemic is to build resilience, which is the most effective way to recover from any SCDs (Ambulkar et al., 2015; Polyviou et al., 2019), through having an adaptive supply chain management (A-SCM). To the authors' knowledge, the extent of the existing knowledge on A-SCM has not touched upon the threat of a severe SCD, such as a pandemic.

Further, firm resilience should be supported by implementing risk management, reconfiguring resources, and rearranging SC flexibility to achieve business continuity and survival ability (Liu et al., 2018). Resilience allows firms to manage SCDs and continue to deliver products and services (Polyviou et al., 2019). It is important for firms to build resilience to face the unforeseen and

unpredictable risks.

This study attempts to address this gap and identify the antecedent factors affecting firm resistance to SCDs. The aim of this study is to examine how firms in Indonesia develop resilience through the implementation of components of adaptive supply chain management, namely risk management, resource reconfiguration and supply chain flexibility, in order to survive severe SCD. This study provides several theoretical, which extends the knowledge of DC in the field of supply chain management, and enriches the knowledge of adaptive supply chain management in the context of SCD. In addition, a timely review of SCD in the event of a pandemic is discussed. This research also contributes to and practical contributions to firms' decision support system by examining the mediating roles of risk management, resource reconfiguration and supply chain flexibility to build firm resilience for firms under severe disruption.

2. Literature Review

2.1. Firm Resilience

Resilience is defined as "the ability of a system to return to its original state, or move to a new, more desirable state after being disturbed" (Christopher & Peck, 2004). Based on the perspective of DC (Teece et al., 1997), adaptability, agility, flexibility and responsiveness are vital contributors in order for firms to achieve resilience in the face of a SCD (Kwak et al., 2018). For the firm's perspective, resilience "emphasizes important aspects of resilience such as adaptability, flexibility, maintenance, and recovery" (Ponomarov & Holcomb, 2009). Resilient firms are able to reduce the disruption magnitude impacts through the ability to relatively quickly recover from disturbances, thus enabling fewer disruption duration (Kwak et al., 2018). The capacity to learn from disruptions to be better prepared for future events is a vital aspect of resilience (Ponomarov & Holcomb, 2009).

2.2. Adaptive Supply Chain Management

The concept of adaptive supply chain management (A-SCM) is still broadly and freely defined. A study by Day (2013) found that a complex adaptive supply chain network (CASN) framework is important to build SC resilience in terms of natural disaster recovery. One study focused on reducing the bullwhip effect as well as to address the need for appropriate SC reconfiguration due to the advances in technology and e-commerce (Emerson et al., 2009), another study focused on adaptability, agility and alignment of SC

for competitiveness (Ishaq et al., 2012), whereas several studies focused on responsiveness, recovery, flexibility, and adaptability of SC resilience for disaster disruption (Chowdhury & Quaddus, 2016; Day, 2013; Wadhwa et al., 2008) and SC resilience to improve SC performance (Piprani et al., 2020).

Previous studies by Ivanov (2009) and Ivanov et al. (2010) have focused on developing A-SCM framework in the form of mathematical model in efforts to increase SC decision making efficiency by building a more agile, responsive, and flexible SC to ensure long-term competitiveness as well as survival in the dynamic and rapidly changing environment. The A-SCM framework consists of (1) integrative, cooperative, and coordinative SCM; (2) agile virtual enterprises supported by their web services, responsiveness, and core competencies; (3) sustainable SCM through better product life-cycle, policy, and society; which results in (4) higher profitability through better competitiveness, effectiveness, sustainability, responsiveness, cost-efficiency, stability, quality, and flexibility (Ivanov & Sokolov, 2010).

In sum, there are some different versions and focus of A-SCM. There is one similarity: adaptiveness is the ability to respond to dynamic and uncertain environment changes. However, there is a gap of building SC resilience in the presence of severe SCD, such as a pandemic, which calls for urgent investigation. Therefore, in this research A-SCM proposed is to address this gap, discussing the ability to manage risk, reconfigure resources, and develop flexible SC within the context of building SC resilience to combat severe SCD.

2.3. Supply Chain Disruption and Risk Management

The Covid-19 pandemic has revealed many system failures in various countries and resulted deadly consequences disrupting the existing business processes (Haas, 2020). These failures and firms' efforts to retaliate can be well understood in the field of risk management. Past literatures have used the terms "risk", "uncertainties", "vulnerabilities", and "source of risk" interchangeably, however, risk is defined as "the expected outcome of an uncertain event, e.g. uncertain events lead to the existence of risks" (Manuj & Mentzer, 2008). Thus, risk management (RM) describes firm's ability to manage risk and SCDs occurring at the moment and future disruptions. RM, as a part of organization, functions to increase firm resilience to overcome SCDs (Blackhurst et al., 2011) in which robustness of SC is the ultimate goal (Kwak et al., 2018). RM enables firms to reduce work ambiguity, increase task specialization, have the ability to replicate learning, and increase information exchange (Bonner et al., 2002). At the

moment, firms are experiencing a disruption that is unpredictable. Therefore, a fast and precise response is crucially needed for fast recovery (Blackhurst et al., 2011). Firms with the right resources can also use the experience of dealing with previous disturbances to manage similar disruptions efficiently in the future. When facing severe SCD, firms can respond using a risk mitigation approach to reduce the long-term impact in a structured manner (Ambulkar et al., 2015).

Firms with RM rooted as a culture are able to enhance RM performance, which influence the enhancement of firm performance (Christopher & Peck, 2004; Liu et al., 2018). The DC perspective emphasizes firm adaptability and agility in the presence of turbulent environment (Teece et al., 1997). Firms with low RM capability have difficulties to respond appropriately in times of SCD, which timely reaction to disruption and the ability to mitigate disruption's negative effects are vital (Liu et al., 2018). Despite previous researches that claim proactive measures and comprehensive RM process as preventive actions to build resilience (Scholten et al., 2014), those preventive actions cannot prepare and difficult to forecast SCDs (Peck, 2007), such as a pandemic. Therefore, firms need to develop the ability to continuously assess risks and coordinate efforts to their SC in order to be resilient (Scholten et al., 2014). Firms experiencing SCDs need to use existing RM to manage severe disruptions, therefore, we propose the following hypotheses:

H1: There is a relationship between SCD and risk management.

H2: There is a relationship between risk management and firm resilience.

2.4. Supply Chain Disruption and Resource Reconfiguration

The Covid-19 pandemic has inflicted the economic growth, which calls for firms to focus on risk response readiness and resource reconfiguration (RR). "Reconfigurability is the ability to reconfigure resources with timeliness and efficiency in order to deploy a new configuration that matches the new environment" (Wei & Wang, 2010), which is very important for the survival of any firm (Chan & Reiner, 2019). The high level of uncertainty surrounding the SCDs (Son & Orchard, 2013) creates ambiguity upon values and functions of available resources for firm recovery. In this case, a firm need to acquire, shed and reorganize its existing resource bases to develop capabilities that enable adaptation to changing environments (Sirmon et al., 2007), which contribute to firm survival and resilience. Learning from the external environment, firms are able to reconfigure and realign their

resources and processes to develop capabilities, providing them with sustainable benefits in the aftermath of a crisis (Helfat & Peteraf, 2003; Ramaswami et al., 2008) by proactively building capabilities, enabling them to respond effectively to SCDs happening at the moment (Polyviou et al., 2019).

The Covid-19 outbreak has forced many CEOs to respond to the pressure on how to protect their employees, ensure SC security, mitigate financial impacts, overcome reputation risks and navigate market uncertainties driving down product demand. This condition is experienced by more than 30 provinces in the Republic of Indonesia. Some government policies are implemented such as large-scale

social restrictions (similar to lockdown), causing a reduced in production flexibility and limited distribution access in certain areas. In this case, firms experiencing SCDs could use previous disruption experiences to be better prepared to deal with uncertainty. As such, firms need to invest in reconfiguring and mobilizing resources. Therefore, we propose the following hypotheses:

H3: There is a relationship between supply chain disruption and resource reconfiguration.

H4: There is a relationship between resource reconfiguration and firm resilience.

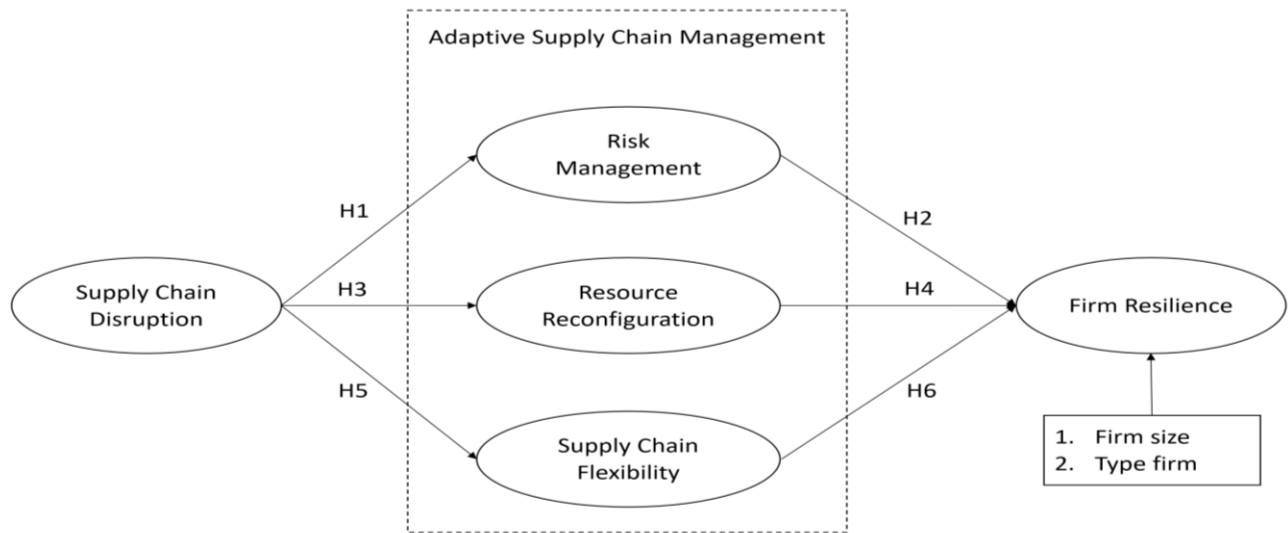


Figure 1: Conceptual framework

2.5. Supply Chain Disruption and Supply Chain Flexibility

The severe disruption has a wager on firm resilience to overcome the disruption (Blackhurst et al., 2011), for instance, the lack of information and the depletion of supplies are causing worry upon fulfilling firms' contractual obligations on time. Along with the increasing level of complexity and interdependence of the SC in general, disruption will increase the level of risk that occurs (Christopher & Lee, 2004). Several researchers suggest that firms with a higher degree of flexibility are able to respond to unexpected events, such as SCDs compared to those that are not flexible (Fredericks, 2005; Swafford et al., 2006). Supply chain flexibility (SCF) acts as a firm's strategy to reduce the disruption impacts.

The term flexibility is defined as firms' adaptability towards unexpected events and the ability to focus on the ability to encounter, resolve, and appropriately exploit an

unexpected opportunity (Skipper & Hanna, 2009). Whereas, SCF is defined as "[SC that is] able to adapt effectively to disruptions in supply and changes in demand whilst maintaining customer service levels" (Stevenson & Spring, 2007). The scope of SCF extends beyond intra-firm level to inter-firm level. In order for firms to cope with high levels of environmental and operating uncertainty, such as a pandemic, flexibility is important to provide better coordination processes (Manuj & Mentzer, 2008). Risk exposure due to SCD can be minimized through flexibility as firms are able to respond better compared to non-flexible firms (Skipper & Hanna, 2009), and possess the "ability to change itself quickly, structurally and functionally depending on the current execution state and reaching SCM goals by a change in SC structures and behavior" (Ivanov & Sokolov, 2010). Thus, this calls to move past the flexible factory towards a SCF (Stevenson & Spring, 2007).

The underlying logic of building a resilient SC would need firm's ability to possess sufficient flexibility to

maneuver and adapt to changes, which also increase competitive business performance (Hassan & Annabi, 2019; Swafford et al., 2008; Wadhwa et al., 2008). Major trend for achieving SCF is to outsource (Hassan & Annabi, 2019), which it shows firms that outsource generates higher ROA and ROE (Khudadad et al., 2018). While major SCD such as pandemic cannot be forecasted, enhancing flexibility can provide appropriate strategic planning tools through the employment of strategic initiatives that improve firms' capability to minimize the negative impacts of the disruption on the SC performance (Skipper & Hanna, 2009), as well as to build resilience. It is therefore important that organizations throughout any SC are involved in the planning process to reduce the impact of severe disruptions, thus dampen the disruption severity as well as to build firm resilience. On that note, we propose several hypotheses as follows:

H5: There is a relationship between supply chain disruption and supply chain flexibility.

H6: There is a relationship between supply chain flexibility and firm resilience.

3. Method

A quantitative research method is used in this research under a positivist paradigm in order to objectively study the object of research as well as to ensure research rigor and replicability (Sekaran & Bougie, 2016). Thus, deductive reasoning is put forward to understand the phenomena researched. The population of this research is Indonesian manufacturing firms that are affected by the covid-19 pandemic. Manufacturing firms are more heavily affected by the pandemic compared to service firms as manufacturing firms tend to have a greater number of employees, production and operational processes are heavily relying on capital intensive and the vitality of the SC networks, which SC partnerships are key to SC performance (Kim & Kim, 2019; Kim & Song, 2019).

The respondent criteria used is following the Malcolm Baldrige Assessment, which are firms that focus on strategic planning, especially examining strategic direction and decision-making of the firm. Therefore, this research focus on firms in the food and beverages; textile, leather and garment; wood, paper and printing; pharmaceutical; automotive; computer and electronics; steel and machinery; and building materials industry. This is shown in Table 1, which also shows that the research sample ranges from small-medium enterprises (SMEs) to multinational companies (MNCs).

Purposive sampling is used in this research to appropriately obtain information from samples that met the

criteria set (Sekaran & Bougie, 2016). The understanding of the relationship between variables in this study can be obtained by collecting data from firms experiencing SCDs during the Covid-19 crisis using online survey distributed to SC professionals, namely "Google Form" via email. Therefore, the unit analysis of this research is key person in charge of SC, logistics and/or operational managers, who are frontlines in their respective operational processes and within direct contact with the phenomena.

Table 1: Sample Demography and Characteristics

Position	Number of Respondent
Director	8
Manager	42
Head of section (warehouse, planner, production, finance, analyst)	52
Engineers	18
Type of Firm Industry	Number of Respondent
Food, beverage and tobacco	40
Textile, leather and garment	12
Wood, paper, and printing	18
Pharmaceutical	8
Automotive	22
Computer and other electronics	7
Steel and machinery	6
Building materials	7
Number of Employees in a Firm	Number of Respondent
< 100 (Small-sized enterprises)	4
100-500 (Medium-sized enterprises)	32
500-1000 (Medium-large-sized enterprises)	48
1000-3000 (Large-sized enterprises)	22
> 3000 (Multinational companies)	14

Source: processed data (2020)

Prior to developing the questionnaire, several focus group discussions (FGD) were conducted to obtain initial overview of the phenomena. The first FGD was done with members from the Indonesian SC and Logistics Institute (ISLI) to obtain deeper understanding on the impacts of covid-19 in Indonesia at its earliest stage, and the second FGD was done with members from Indonesian Production and Operations Management Society to obtain deeper understanding on the impacts of covid-19 in manufacturing firms. Then, a pretest with three researchers was conducted, who are experts in SC research, and two practioners.

Feedback from the pretest results is used to improve the survey questionnaire quality and then the questionnaire was distributed to a larger sample in the Indonesian context, thus, the questionnaire has been validated.

The questionnaire survey was sent to 232 potential respondents. 120 respondents completed the survey and the responds are useable, generating a 51.7% response rate. Table 1 describes the demographic characteristics of the sample. The majority of respondents were head of section (43.33%), manager (35%), engineers (15%) and directors (6.67%). The average experience held by the respondents is between five and ten years. The majority of respondents work in food and beverage manufacturing firms (33.33%) and a minority work in computer manufacturing firms (5.83%) and building material firms (5.583%). Most respondents work in companies with a number of employees between 500 and 1000 (40%) and the majority of area distribution is in the Eastern Province of Java. Out of the 120 reported disruptions, 32 were supply disruptions, 18 were logistics disruption, 48 were production disruption, and 22 were sales disruption. Table 2 shows the examples of four types of disruption reported by the respondents during the covid-19 pandemic.

Table 2: Types and Examples of Disruption

Disruption Types	Examples
Supply disruption	Disruption with the availability of core raw materials and production support due to the policy of limiting the operation of non-prioritized factories during the pandemic.
Logistics disruption	Disruption due to regional limitation and distribution priorities related to health regulation set by government
Production disruption	Lack of labor availability due to physical distancing regulations Substantial reduction of labor productivity due to physical work distance between work units related to the physical distancing regulations Product unavailability

Measurement adopted for firm resilience is from Ambulkar et al. (2015), SCD is from (Bode et al., 2011), RM is from (Blackhurst et al., 2011), RR is from Wei and Wang (2010), and SCF is from Swafford et al. (2006). All variables are measured using 5-point Likert Scale (1 = strongly disagree to, 5 = strongly agree). The complete items can be seen in Appendix 1.

Then, a model is proposed and tested. This study focuses on examining the dimensions of A-SCM and how they contribute to FR in the midst of pandemic situation, thus the three dimensions are not examined as one integration in order to further investigate which dimension put forth most optimum contribution to FR. The analysis

technique used in this research is structural equation modeling (SEM) using AMOS, which is covariance-based to confirm a theory. The next section discusses the measurement model validity and reliability, goodness of fit (GOF) criteria evaluation, and hypothesis testing.

4. Results and Discussion

4.1. Result

Measurement model validity and reliability used are convergent validity shown by average variance extracted (AVE), discriminant validity shown by factor loading, and construct reliability.

Table 3: Measurement Model Validity and Reliability

Construct	Indicator	Factor Loading	AVE	Construct Reliability
Supply chain disruption (SCD)	SD1	0.725	0.557	0.834
	SD2	0.700		
	SD3	0.779		
	SD4	0.778		
Risk Management (RM)	RM1	0.683	0.561	0.833
	RM2	0.586		
	RM3	0.848		
	RM4	0.845		
Resource reconfiguration (RR)	RR1	0.919	0.654	0.787
	RR2	0.681		
Supply Chain Flexibility (SCF)	FC1	0.833	0.673	0.860
	FC2	0.832		
	FC3	0.796		
Firm Resilience (FR)	FR1	0.740	0.569	0.841
	FR2	0.792		
	FR3	0.776		
	FR4	0.707		

Source: processed data (2020)

As shown in Table 3, the result of factor loading for all variable indicators are > 0.5 , thus, discriminant validity is supported (Hair et al., 2017). AVE for all variables are ≥ 0.5 , thus convergent validity is supported (Hair et al., 2017). The result of composite reliability for all variables are > 0.7 , therefore, reliability is supported (Hair et al., 2017).

Table 4 shows the criteria and cut-off value and acceptable criteria adopted from Arbuckle (2006), and result of structural model GFI evaluation. The X^2 -chi square value is quite large, which indicates a poor fit.

However, the chi-square model is too restrictive due to its sensitivity to sample size and assumptions of multivariate normality and severe deviation from normality, CMIN/DF is an alternative model to assess model fit that can be used (Hooper et al., 2008). Based on Table 4, the result of CMIN/DF is within a reasonable fit; and GFI, AGFI, TLI,

and CFI results are within the acceptable values, thus considered as marginal fit. Despite, the result of RMSEA that is considered a poor fit, according to Utomo et al. (2019) “if two or more of the entire GOF used have shown a fit, the model is considered good”, therefore, the model is accepted.

Table 4: Structural Model Goodness of Fit Evaluation

Goodness-of-fit-Index	Cut-off Value	Acceptable Values	Value	Description
X ² -chi square	Expected small value	N/A	391.507	Poor fit
CMIN/DF	≤ 2.00	2.00 < CMIN/DF ≤ 5.00	2.682	Reasonable fit
RMSEA	≤ 0.08	<0.05 (good fit) 0.05 < RMSEA ≤ 0.10 (mediocre fit) > 0.10 (poor fit)	0.119	Poor fit
GFI	≥ 0.90	GFI = 1 (perfect fit) GFI value ≤ 1	0.753	Marginal fit
AGFI	≥ 0.90	AGFI = 1 (perfect fit) AGFI value ≤ 1	0.679	Marginal fit
TLI	≥ 0.95	Range from 0 to 1	0.649	Marginal fit
CFI	≥ 0.95	Range from 0 to 1	0.700	Marginal fit

Source: Arbuckle (2006); processed data (2020)

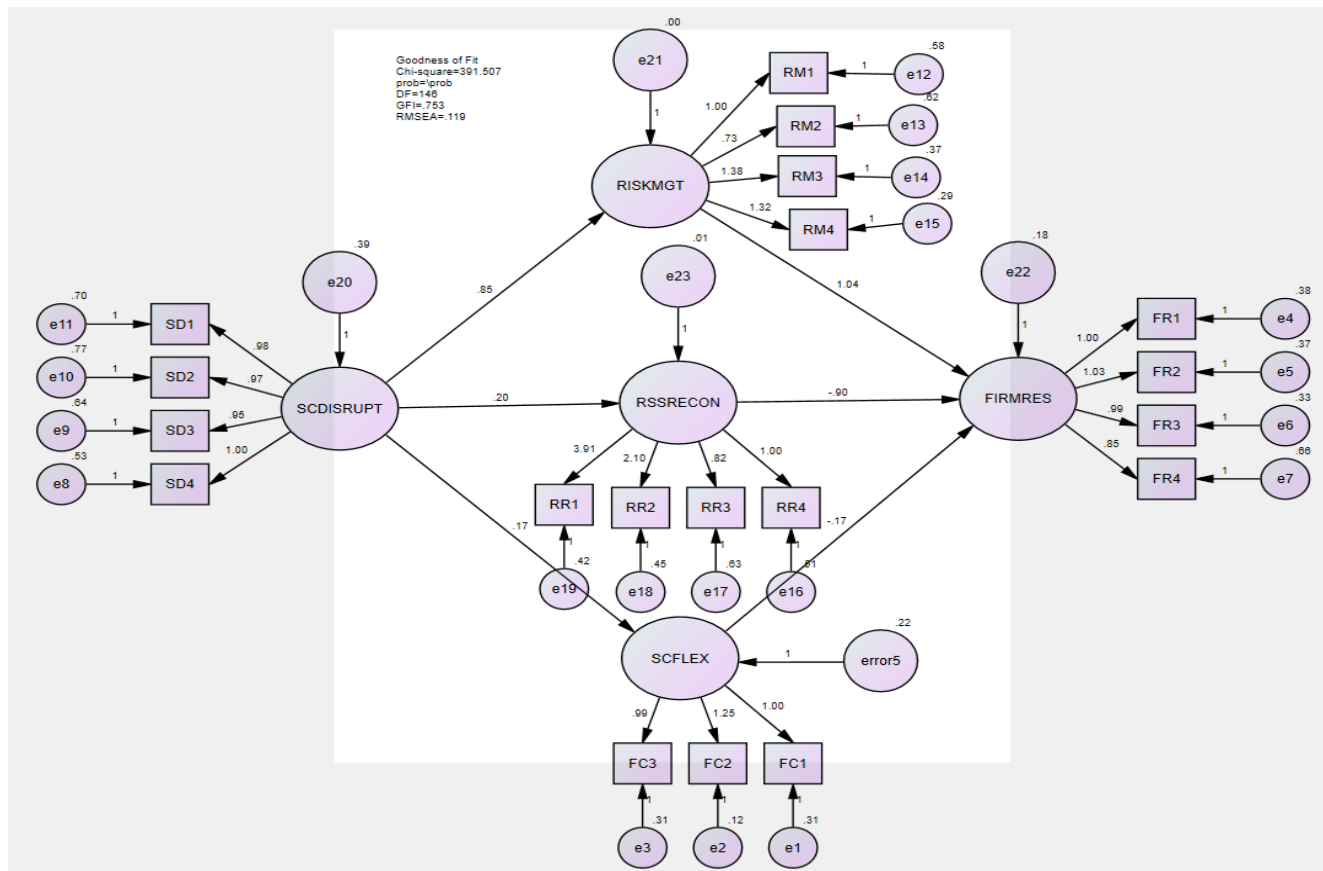


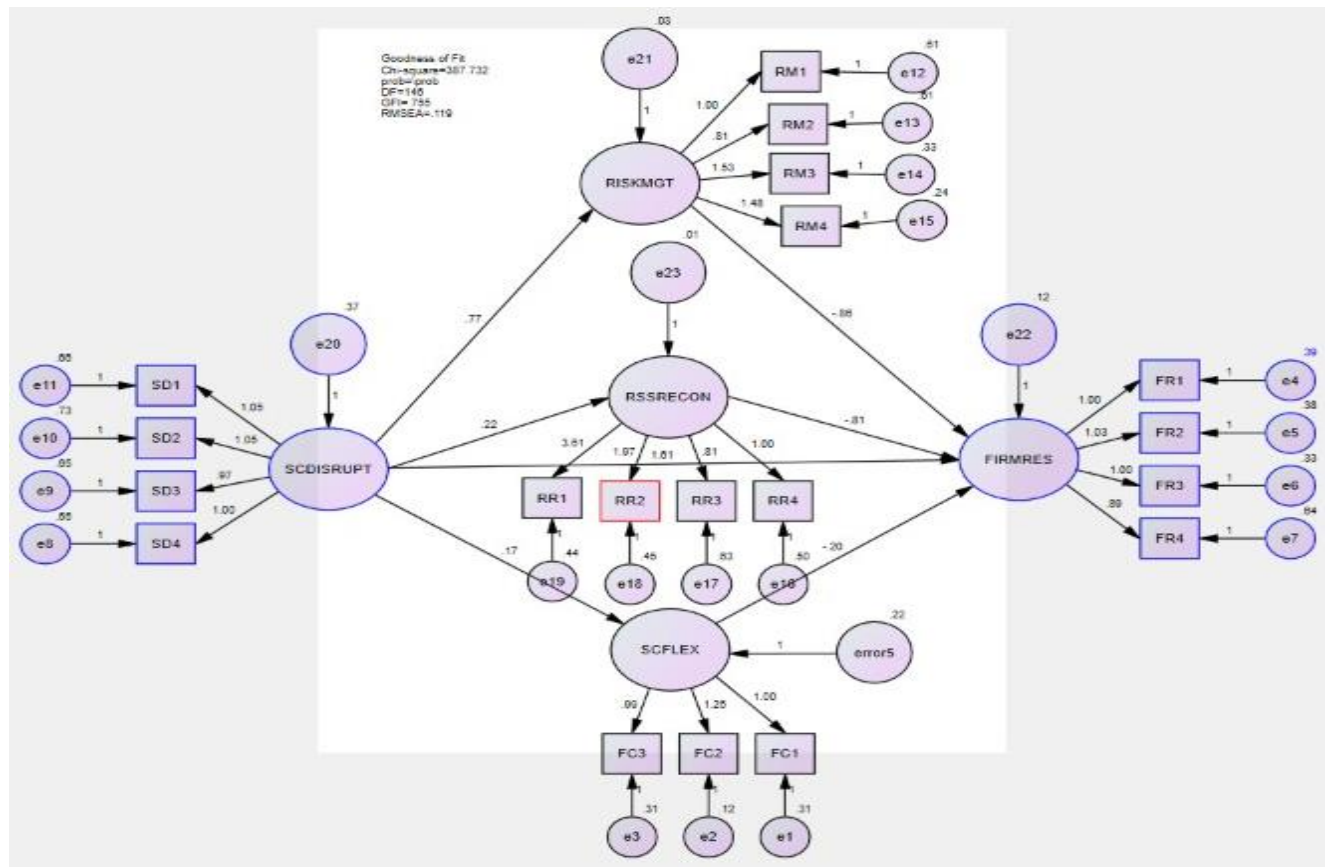
Figure 2: SEM AMOS Test Result for Direct Effects

Table 5: Hypothesis Testing

Hypothesis	Estimate (Coefficient)	Critical Ratio (CR)	P Value	Result
RM <--SCD	.850	5.285	***	Positive significance
RR <--SCD	.204	1.958	.050	Positive significance
SCF <--SCD	.166	1.902	.057	Positive significance
FR <-- RM	1.038	2.982	.003	Positive significance
FR <-- RR	-.901	-.778	.437	Not significant
FR <--SCF	-.170	-1.336	.182	Not significant

Source: Processed data (2020)

Critical ratio (CR) > 2, and $p \leq 0.05$ show that null hypothesis is rejected and alternative hypothesis is accepted (Hair et al., 2017). Based on the result shown in Table 5, the CR value of SCD to RM, SCD to RR, SCD to SCF. The indirect effect of SCD to FR is significant, with regression coefficient of 1.61. Since H5 and H6 are rejected, therefore, there is no mediation effect of RR and SCF from SCD to FR. While, H4 is accepted, therefore, there is partial mediation effect of RM from SCD to FR. In other words, SCD has direct effect and indirect effect to FR through RM, while SCD does not have indirect effect to FR through RR nor SCF. The indirect effect is shown in figure 3.

**Figure 3:** SEM AMOS Test Result for Indirect Effects

4.2. Discussion

A recent health crisis has swept many regions worldwide, namely the covid-19 pandemic leaving no single SC unaffected and unprepared. This study found that RM enhances firm's ability to continuously assess risks and coordination efforts to be able to bounce back from the

negative effects of SCD, supporting sensing and seizing stage of DC (Teece, 2007). The more a firm is aware of the disruption impacting the SC, the higher the need for RM to devise new strategies to be able to survive the worst risks. However, based on the indirect effect result, RM becomes negatively significant towards FR, implying that due to the pandemic-level uncertainty, RM become less effective and

efficient to build FR compared to firm with RM in a normal turbulent environment. Nonetheless, RM is still needed in any circumstances indicating regardless whether a firm is in a normal competitive environment, in a turbulent environment, or under a severe SCD, RM still has an important role in building FR. The abilities to manage risks, through risk identification, risk assessment, and risk mitigation (Kern et al., 2012; Kwak et al., 2018), enable firms to be agile and maneuver to overcome and adapt to the changes caused by severe disruptions. Thus, our result emphasizes that RM should be implemented as a culture in order to help firms to be able to mitigate the negative effects of SCD, consistent with previous studies (Liu et al., 2018; Scholten et al., 2014), which also help to enhance the speed to respond and recover from SCD. Therefore, this makes RM an important firm competence for A-SCM, especially in building FR.

This research highlights that regardless whether a firm is under a severe SCD or not, RR is needed to have an A-SCM. Adaptability in SCM requires a firm to be able to reconfigure its existing resources and processes in response to changes in the environment by restructuring, updating, redeploying and its resource base. This supports the findings by Wei and Wang (2010). Therefore, the more a firm is aware of the existence and negative impacts of SCD, the higher need for RR. Furthermore, this finding is aligned with the perspective of DC (Teece et al., 1997), which the exploitation of firm internal and external resources and competences address changing environment and the reconfiguring stage of DC (Teece, 2007).

Despite findings from previous studies that reconfigurability has been proven to have a positive impact on firm performance (Wei & Wang, 2010) and strong positive association with FR (Ambulkar et al., 2015; Parker & Ameen, 2018), however, this study found that RR does not improve FR. Previous studies were conducted under normal (non-pandemic) turbulent environment, unlike this research context that is under a severe SCD (pandemic). A pandemic situation cannot be forecasted. Moreover, the extent to which the negative impacts and how long the pandemic will last are unpredictable, thus, difficult for firms to determine the contingency strategies as the future becomes too blurry, making efforts to reconfigure resources ineffective. As a result, in the midst of a pandemic-level SCD, RR does not help firms to build resilience.

The more a firm is aware of the existence and the impacts of a SCD, the higher need for SCF. Flexibility in the SC allows firms to have flexibility in the logistics processes through demand-driven decisions (Stevenson & Spring, 2007) and adapt to changes, such as shipping, supplier capacity, production volume, and delivery schedules to meet changing customer needs due to the impact of a pandemic. SCF also allows better flow of

information sharing throughout the SC, reducing uncertainty and the bullwhip effect (Stevenson & Spring, 2007; Wadhwa et al., 2008). Thus, findings also highlight that regardless the severity of a SCD, SCF is still needed in order to achieve A-SCM.

Although, findings of previous studies showed the role of SCF in A-SCM can increase firm competitive advantage, which will increase firm performance (Swafford et al., 2008) and supports FR (Mandal et al., 2016), however, our study found that SCF does not help to build FR. As mentioned above, pandemic-level SCD, the stakes have dramatically changed, risks have multiplied and the level of uncertainty is as high as ever. From an Indonesian perspective, there are other factors to be taken into consideration during the covid-19 pandemic, such as uncertain demand pattern changes and government interference through the new normal policies. Quarantine and lockdown policies impose no office activities were allowed for a period of time. Malls, restaurants, and cafes were closed for almost two months. Several restaurants and cafes are allowed to serve drive thru or takeaway orders. Citizens were encouraged to stay at home and optimize online shopping for household needs. Fortunately, this is an available option as online shopping, social network services and digital payment to support online shopping have been growing over the past years (Choi & Yang, 2018; Teofilus et al., 2020; Yucha et al., 2020). Manufacturing firms were also required to close down until the lockdown policy has been lifted. These policies were made and adjusted according to the daily updates on the rise and/or fall numbers of covid-19 cases. Moreover, citizens are difficult to be controlled, as they do not adhere to the government policies in efforts to battle the pandemic. Many citizens refuse to wear masks, during the lockdown period, there are still many social gatherings, and some regions do not implement the social/physical distancing policy. Therefore, firms must carefully reconsider the right strategies to overcome the pandemic crisis despite unpredictable future, thus makes SCF nonessential to FR.

In sum, this suggests that RM is the most important competence to be optimized in facing pandemic-level SCD prior to having other competences, such as RR and SCF.

5. Conclusions

In conclusion, our study has found interesting findings. First, there is a relationship between SCD and RM, SCD and RR, as well as SCD and SCF, highlighting that RM, RR and SCF are important aspect of A-SCM. Second, this supports the DC perspective, which adaptability is very important for firms in order to be able to adjust to changes in turbulent environment through sensing, seizing, and

reconfiguring stages (Teece, 2007; Teece et al., 1997). Third, RM mediates the relationship between SCD and FR, however, due to the pandemic-level uncertainty, RM become less effective and efficient to build FR compared to firm with RM in a normal turbulent environment. Fourth, in the midst of pandemic-level SCD where the future becomes too blurry and unforeseeable, RR and SCF do not contribute to build FR. Nonetheless, they are still important to firm's A-SCM. Implications for managers should carefully use RM to prepare firms for different scenarios in which firms must develop contingency strategies. Overall, the findings of this research contribute to the SCM body of knowledge in the context of pandemic-level SCD and broaden the knowledge of DC perspective. Finally, the opportunities future studies are to explore other variables that may contribute to FR in pandemic-level SCD and explore other countries' perspectives.

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Appendix

Construct items (descriptive statistics and reliability)

Construct	Mean	Standard deviation	α
Supply chain disruption			0.74
SD1	We feel we need to be aware of the possibility of supply chain disruptions during the break-up of COVID -19.	1.037	0.64
SD2	We are aware that supply chain disruptions in the outbreak of COVID -19 can be looming	1.069	0.66
SD3	We think a lot about how supply chain disruptions can be avoided because of the outbreak of COVID-19.	1.000	0.69
SD4	After COVID -19 supply chain disruptions occur, their impact can be thoroughly analyzed	0.961	0.71
Risk Management			0.73
RM1	We have a department to manage supply chain risks and disruptions	0.929	0.74
RM2	We have KPIs and metrics to monitor supply chain risks	0.878	0.73
RM3	We have an information system to manage supply chain risks and disruptions	0.951	0.59
RM4	We have a reserve strategy that has been carefully studied when facing the worst risk	0.883	0.62
Resource Reconfiguration			0.51
RR1	We align our company's resources and processes in response to changing environments.	0.912	0.57
RR2	We reconfigure our resources and processes in response to a dynamic environment.	0.757	0.64
RR3	We restructure our resource base to react to a changing business environment.	0.809	0.48
RR4	We are updating our resource base in response to changes in the business environment	0.883	0.51
Supply chain flexibility			0.76
SF1	We have shipping flexibility and supplier capacity when COVID-19 disruption	0.737	0.72
SF2	We have the ability to change production volume capacity when needed	0.697	0.57
SF3	we are able to change delivery schedules to meet changing customer requirements due to COVID-19 disruption	0.732	0.73
Firm Resilience			0.75
FR1	We can overcome changes caused by supply chain disruptions related to COVID-19.	0.871	0.66
FR2	We can easily adapt to supply chain disruptions regarding COVID-19.	0.879	0.64
FR3	We can respond quickly to supply chain disruptions related to COVID-19.	0.835	0.64
FR4	We are able to maintain high situational awareness at all times regarding COVID-19.	0.966	0.78