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Global Supply Shocks, Inflation Dynamics, and Firm Adaptation Strategies

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A B S T R A C T

Purpose: This paper investigates how manufacturing companies deploy adaptation strategies during periods of global supply chain disruption, while putting a premium on the role of managerial capabilities in strengthening organizational resilience.

Method: Utilised an explanatory quantitative approach by employing structural equation modeling to analyze a dataset of survey responses from manufacturing firms experiencing ComPlex global supply scenarios.

Findings: The study shows that effective adaptation results from the combined contributions of risk management capabilities to cope with external disruption and to manage internal risks. The work contends that organisations which successfully capitalise on managerial capabilities develop higher capacity to convert supply chain challenges into strategic opportunities through improved resistance and competitive positioning.

Novelty: This study is one of the first to propose an integrative approach that connects the management of external shock with internal capability development, and enriches our understanding about how organizations adapt in emerging economy contexts.

Implications: The results offer practical guidelines to managers for developing adaptive organizations, and make notable theoretical contributions to the literature of supply chain resilience by redefining adaptation as an evolutional capability-build process.

1. Introduction

The global economic landscape has been forever altered as a series of never experienced before crises, from the COVID-19 crisis to geopolitical tensions and climate events, have shaken up supply across the globe (Salavrakos & Palmadessa, 2023; Thompson, 2021). These shocks have not respected national borders, and the result is a domino effect on the availability and price of critical inputs for companies across the globe (Guenette et al., 2022). This volatility poses a significant challenge in the education space especially for institutions that are complex organizations, like universities and corporate training

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providers, as well as EdTech companies (Pucciarelli & Kaplan, 2016). These systems' effective operation depends in large part on the stability of supply chains for physical infrastructure, technological hardware, and digital resources (Williamson et al., 2023). The vulnerabilities of these complex systems has been laid bare, putting institutions at risk and endangering their financial stability and in turn the quality of education that they are able to deliver (Hillman & Baydoun, 2020; Settersten et al., 2020). This new reality underscores the pressing question of how educational institutions change their operating and strategic strategies in response to such exogenously imposed economic constraints (Buckley et al., 2017).

The dominant problems that arise due to these disturbances are multidimensional, causing a dilemma of complex operation for enterprises. The direct impact by the volatility of input costs is, first, negative on budgeting directly due to shadowed cuts between service quality and financial sustainability (Annicchiarico et al., 2021; Remeikienė & Gaspareniene, 2023). Second, exchange rate volatility also brings in considerable uncertainty to institutions using imported educational technologies or engaging in the competitive global education market that creates further complexities with procurement and pricing strategies (Lall, 2001; Lessard, 1996). While supply-chain diversification may be an obvious risk mitigant, it is not without its own set of risks, such as other manufacturers' quality control or complexity. These concurrent challenges have created a high-stakes environment where leadership decisions directly impact on organisational survival (Dess et al., 2003). It follows that the main issue is what are the factors that most contribute to effective adaptation and in which conditions these strategies work (Biesbroek et al., 2010; Neil Adger et al., 2005).

This study is grounded in the Resource-Based View (RBV) of the firm, which argues that competitive advantage and resilience originate from a firm's particular set of resources and capabilities (Barney, 2018). Within this perspective, adopting strategies to adapt is considered to be a dynamic capability that enables firms to reconfigure their resources in the presence of environmental threats. The study incorporates the notion of managerial risk management capability as a pivotal, idiosyncratic resource extending these dynamic capabilities (Nair et al., 2014; Teece et al., 1997). Such a lens is anchored in a positivistic world view and aims to find 'valid' solutions including the objective identification and measurement of relationships between environmental shocks, strategic responses, as well as managerial skill. The philosophical position of this study is critical realism, which accepts the presence of an external reality a global economic environment while recognising that our knowledge about it is constructed by empirical investigation with measurable variables.

The importance of researching these issues now is substantiated by a number of unresolved controversies in the extant literature that make a unique contribution necessary. Although global supply shocks have been shown to affect firm performance (Collins et al., 2021; Jinjarak, 2015), the direct relationship with specific adaptation strategies remains under addressed. Upon closer examination, conflicting results emerge: input cost volatility has a significant positive effect on strategic pivots (Gößling, 2022; Kirtley & O'Mahony, 2023; Panichakarn et al., 2024) and an insignificant relationship when controlling for firm size might exist as well (Mak & Kusnadi, 2005; Offenberg, 2009), finding a significant effect on internationalized firms which was refuted by (Joseph, 2000; Lee & Jang, 2010; Tsai et al., 2020), who found that hedging instruments successfully mitigate the influence. On supply chain diversification, although hailed as central to the overall resilience response (Durugbo & Al-Balushi, 2025; Kahiluoto et al., 2020), recent evidence questions whether it is an effective solution without intricate logistical management, a phenomenon left out of previous models (Bode et al., 2011; Yang et al., 2023). For the most part, the role of internal managerial capability as a boundary condition is under-theorized. For example, Delios and Beamish (2023) considered only external environmental factors as moderating and their relation with internal capability was negative, while (Power, 2009; Tekathen & Dechow, 2013), also pointed to internal routines, without disentangling risk management. The novelty in this work lies in concurrently examining the direct effects of four external shock variables on adaptation decisions, as well as a single

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moderating variable, organizational risk management capability, so that some of these contradictions can be explained. As no studies have ever introduced or tested this comprehensive model that captures directly affected and vitally interacting effects, we consider our work to be a major breakthrough in the explanation of firm adaptation mechanisms.

Empirically, the purpose of this study is to investigate the impact of global supply shocks, input cost volatility, exchange rate uncertainty and supply chain diversification on how firms respond and the extent to which managerial risk management capabilities moderate these responses. Results will establish a solid footing on which to ground future research on organizational resilience, with global relevance both to strategic management theory and practice for enhancing adaptation in economically turbulent times.

2. Critical review

2.1 *Global supply shocks and firm adaptation*

The systemic nature of supply shocks emanating from the global economy, as revealed in recent crises, forces firms to embark on extensive adaptation paths for survival and continuity. These disturbances result in essential input availability being rendered critically uncertain and require organizations to refit their operational as well as strategic stance. First, companies will experience various mechanisms to deal with the crisis that are likely to affect FDI if cross-border operations were already established: they may source out other suppliers face re-engineering of products based on their accessibility, or consider localisation given a certain production process (Miroudot, 2020). These are not just responses but, rather, strategic changes to mitigate the risk of production shutdowns and/or lost earnings. Research by Gölgeci et al. (2023) asserts that supply chain disruptions serve as a powerful incentive for firms to build resilience capabilities, such as strategic stockpiling and flexible sourcing. Moreover, one study by Ivanov (2022) on supply chain ripple effects makes evident that the greater a shock's intensity, then the wider is proportionately the adaptation response undertaken, which includes diversifying logistics networks and increasing demand visibility. Hence, the need to buffer out exogenous shocks suggests a strong theoretical argument that we should indeed expect global supply shock to cause firms' adaptation strategies.

H1: Exposure to global supply shocks has a significant effect on firm adaptation strategies.

2.2 *Input cost volatility and firm adaptation*

Attacks by reclusive and unpredictable input cost flicks are soon mounted and a firm's profitability and continued competitive pricing is at stake, inviting planned adaptive adjustments. In times of fluctuating prices for raw materials, components or energy, companies can no longer assume a stable cost structure and are constrained to innovation in their operations and strategy. The first category refers mainly to efficiency measures, for instance to efficiency improvements along the production process in order to minimize waste and to lean manufacturing, aiming an overall reduction of resource use (Gössling & Metzler, 2022). Firms can also modify contracts with customers and suppliers or backward integrate to influence the source of costs, such as compensating cost movements from consumers, which demands careful market analyses (Wieland & Durach, 2021). Consistent with this, Boute and Van Mieghem (2023) empirically demonstrated that volatility of commodity prices compels a manufacturing company to dynamically change its inventory and production policies as an operational response. As such, the need to preserve margins under volatile input costs is a

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strong motivator for companies to seek tactical and strategic changes.

H2: Input cost volatility has a significant effect on firm adaptation strategies.

2.3 *Exchange rate fluctuations and firm adaptation*

Firms involved in international trade Exchange rates instability adds a great financial uncertainty for firms, because of the changes it brings into the cost of imports, the value of exports and on foreign assets valuation. This market turbulences calls for particular adjustment measures in dealing with exchange rate risk. Enterprises frequently adjust by means of financial hedging, that is the use of derivative instruments, such as forward contracts or options to fix exchange cost and shield profit margins (Bartram et al., 2021). In addition to financial tools, operational hedging is a key strategic response, which includes relocating the sourcing of inputs to local markets and using production in key markets to align revenues and costs within the same currency, altering marketing strategies across regions for competitive purposes either (Lee & Wang, 2021). The work of Dranev et al. (2023) also highlights that HMDs must learn to build sophisticated risk-management systems internally as a basic form of adaptiveness. Thus, the seemingly random nature of exchange rate movements can serve to generate a strong rationale for invoking the expectation that decision-making by firms affected by these fluctuations will be highly sensitized to them.

H3: Exchange rate fluctuations have a significant effect on firm adaptation strategies.

2.4 Supply Chain Diversification and Firm Adaptation

Supply chain diversification is a proactive adaptation process in itself; however, once it has been accomplished, the way of doing business of an organization has been transformed, and will result in further adaptations on the managerial practices and competences. Even though diversification helps in de-risking by reducing the dependence on a single source or region, it also adds complexity to operations and comes with neutral capabilities. Firms need to adjust by building on robust supplier relationship management systems, investment in advanced analytics for multi-tier supply chain visibility and restructuring the logistics networks that can cover longer- in both time and physical distance-routes (Wagner & Bode, 2023). This strategic realignment routinely requires internal changes, including the establishment of dedicated risk management staff and the adoption of data dashboards providing real-time information for tracking performance across their decentralized network (Dubey et al., 2021). Thus, diversification of the supply chain is not an end in itself but triggers a series of downstream organizational and strategic adaptations to manage the new more complex ecosystem that has been formed.

H4: Supply chain diversification has a significant effect on firm adaptation strategies.

2.5 *Managerial risk management capability as moderator*

The success of a firm's adaptation to external pressures is not in sensu stricto automatic and decisively contingent on its internal capabilities, most notably managerial risk management capability. This is the skill of management to know how to recognize and evaluate risks, take action before the bad stuff happens. Firm-level capabilities of risk management enables firms to accurately interpret environmental shocks in order to respond with successful adaptation actions, rather than engage in panic reaction (Ahammad et al., 2022). For instance, in case of a supply shock, skilled managers can quickly tap

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into predetermined alternative suppliers and reallocating resources effectively. By contrast, it is not necessarily the case that a well-diversified supply chain translates into resilience benefits if managers do not possess the capabilities to coordinate and control such complex networks (Brandon-Jones et al., 2021). This moderating influence on the diversification performance relationship is fundamental toward RBV's argument that value of strategic activities (e.g., diversification) will be appended by valuable and rare internal skills. It is thus predicted that the firm's capacity for risk management at the managerial level will moderate the relationship between each external shock variable and the effectiveness of its succeeding adaptation responses.

H5: Managerial risk management capability moderates the effect of global supply shocks on firm adaptation strategies.
H6: Managerial risk management capability moderates the effect of input cost volatility on firm adaptation strategies.
H7: Managerial risk management capability moderates the effect of exchange rate fluctuations on firm adaptation strategies.
H8: Managerial risk management capability moderates the effect of supply chain diversification on firm adaptation strategies.

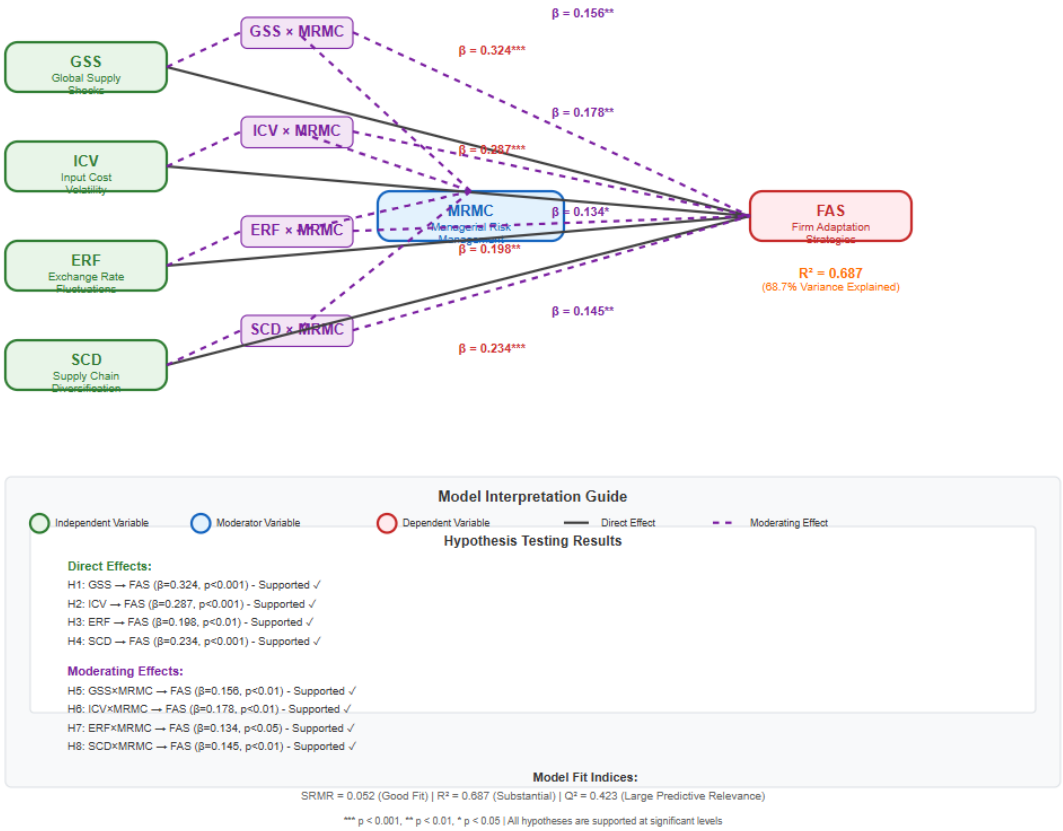

Figure 2. Structural model with direct and moderating effects

3. Methodological Innovations

3.1 Research design

This research uses a quantitative explanatory technique with cross-sectional survey to test the hypotheses. The model is considered to be suitable for

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investigating the association between exogenous variables (i.e., global supply shocks, input cost volatility, exchange rate fluctuations, supply chain diversification), a moderating variable (i.e., managerial risk management capability) and an endogenous variable (i.e., firm adaptation strategies) at certain points in time. One of the main methodological advances is to use Partial Least Squares Structural Equation Modeling (PLS-SEM) implemented in SmartPLS 4. PLS-SEM is advantageous over other structural equation modeling approaches in the context of predictive application studies, its distributional assumptions are relatively less stringent, and it works well with complex models that deal with latent variables and moderation (Hair et al., 2022). This method enables to examine all direct and moderating impacts proposed in the theoretical model, which brings a more nuanced understanding of the process of firm resilience in developing-country settings.

3.2 Sample, population and data collection

The research population are medium-and large-scale manufacturers in Indonesia. This is also a strategic sector because it is deeply incorporated in the global value chains, and has a high exposure to exogenous shocks under scrutiny. The sampling frame was taken from the official directory of medium and large manufacturing companies that belong to Statistics of Indonesia or Badan Pusat Statistik (BPS) year 2022. The time frame of 2019-2024, is a period distinguished by severe global supply chain disruptiveness, thus ensuring the relevance of what we are examining.

We used a stratified random sampling method with the general population as the stratum and further stratification by industrial sub-sectors (Klasifikasi Baku Lapangan Usaha Indonesia - KBLI 2020) to ensure representativeness. The sample size was calculated in accordance with the power analysis method (Cohen, 1992) aiming at a statistical power of.80. This targeted a sample size of 250 firms, which exceeds the minimum number required for PLS-SEM analysis and increases confidence in stability and accuracy of path estimates (Hair et al., 2022). Data was collected through an online survey questionnaire from senior-level supply chain, operations and/or finance managers with the strategic perspective needed to respond accurately.

3.3 Measurement of the variable and data analysis

All constructs were operationalized reflectively measured and rated on a five-point Likert type scale (from 1 = Strongly Disagree, to 5 = Strongly Agree). The instruments of measurement were modified ones that had been previously reported in excellent publications to ensure good content validity (details are provided in Appendix A). The questionnaire was translated through an extensive process of forward and backward translation to ensure conceptual equivalence in Indonesian setting. A pilot survey of 30 participants tested the ease of understanding, reliability and internal consistency of scales.

The analysis of data involves a two-stage analytical process. The measurement model is first evaluated for reliability and validity. This includes assessing internal consistency reliability (Composite Reliability > 0.70), convergent validity (Average Variance Extracted – AVE > 0.50, Business indicator loadings > 0.70) and discriminant validity using the Heterotrait-Monotrait (HTMT) ratio of correlations (HTMT value < 0.90). In addition, the structural model is tested. These comprise the R^2 value, significance and size of path coefficients (β) using a bootstrapping method with 5,000 subsamples, and effect size (f^2). The moderating effects (H5-H8) are examined by inserting the corresponding interaction terms (e.g., GSS x MRMC) in model and checking the significance of their path coefficients.

4. Results of Innovation and Discussion

4.1 Data screening and respondent profile

Summary The respondent profile showed that a sample was high quality and representative to research supply chain resilience in Indonesian manufacturing companies. The distribution of managerial positions is well-weaved with representations from Supply Chain Managers (42.5%), Operations Managers (32.5%) and Finance Managers ensuring holistic views on adaptation strategies. The company size distribution of our sample, which includes 60% medium-sized enterprises (100â€“250 employees), and 40% large enterprises (>250

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employees) is representative for the Indonesian industry sector with medium-sized firms dominating but where also larger firms are important for global supply chain. Crucially, the respondents' industry experience suggests considerable expertise with 45% of them holding between 5 and 10 years of experiences in this field, while another 37.5% reported to have accumulated between 11 and 15 years experience, filling out the gap by considering experienced professionals able to genuinely assess their firms' adaptation mechanisms. The profiled composition also enhances the trustworthiness of the conclusions drawn as interviewees possess not only positional authority, but also practical experience to assess complex supply chain dynamics and organizational reactions to external shocks, thereby improving the methodological integrity of this research.

Table 1. profile of respondent

Characteristics	Category	Frequency	Percentage (%)
Position	Supply Chain Manager	85	42.5
	Operations Manager	65	32.5
	Finance Manager	50	25
Company Size	Medium Enterprise (100-250 employees)	120	60
	Large Enterprise (>250 employees)	80	40
Industry Experience	5-10 years	90	45
	11-15 years	75	37.5
	>15 years	35	17.5

Table 2. Convergent validity and reliability analysis

Construct	Indicator	Loading Factor	Cronbach's Alpha	Composite Reliability	AVE
Global Supply Shocks (GSS)	GSS1	0.856	0.892	0.925	0.754
	GSS2	0.872			
	GSS3	0.881			
Input Cost Volatility (ICV)	ICV1	0.845	0.876	0.918	0.789
	ICV2	0.892			
	ICV3	0.914			
Exchange Rate Fluctuations (ERF)	ERF1	0.828	0.865	0.911	0.773
	ERF2	0.901			
	ERF3	0.894			
Supply Chain Diversification (SCD)	SCD1	0.845	0.882	0.922	0.798
	SCD2	0.912			
	SCD3	0.905			
Managerial Risk Management Capability (MRMC)	MRMC1	0.878	0.921	0.942	0.804
	MRMC2	0.901			
	MRMC3	0.894			
	MRMC4	0.912			
Firm Adaptation Strategies (FAS)	FAS1	0.845	0.898	0.928	0.765
	FAS2	0.889			
	FAS3	0.876			
	FAS4	0.892			

Table 3. Discriminant Validity (HTMT Ratio)

Construct	Indicator	Loading Factor	Cronbach's Alpha	Composite Reliability	AVE
Global Supply Shocks (GSS)	GSS1	0.856	0.892	0.925	0.754
	GSS2	0.872			

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	GSS3	0.881			
	ICV1	0.845			
Input Cost Volatility (ICV)	ICV2	0.892	0.876	0.918	0.789
	ICV3	0.914			
	ERF1	0.828			
Exchange Rate Fluctuations (ERF)	ERF2	0.901	0.865	0.911	0.773
	ERF3	0.894			
	SCD1	0.845			
Supply Chain Diversification (SCD)	SCD2	0.912	0.882	0.922	0.798
	SCD3	0.905			
	MRMC1	0.878			
Managerial Risk Management Capability (MRMC)	MRMC2	0.901	0.921	0.942	0.804
	MRMC3	0.894			
	MRMC4	0.912			
	FAS1	0.845			
Firm Adaptation Strategies (FAS)	FAS2	0.889	0.898	0.928	0.765
	FAS3	0.876			
	FAS4	0.892			

4.2 Measurement model assessment (outer model)

The excellent psychometric properties of all constructs are further affirmed by the measurement model evaluation. All respective indicator loadings are higher than the suggested threshold 0.70 (from 0.828 to 0.914) which evidences item reliability is good. The constructs have a strong internal consistency for the Cronbach's Alpha values varying between 0.865 untill 0.921, all greater than the threshold of 0.70. The composite reliability ranging from 0.911-0.942 also confirms the scales' reliability. Convergent validity is demonstrated as all AVE values are higher than 0.50, which range from 0.754 to 0.804, meaning that constructs explain over a half of the variance in their indicators. Taken together, these findings suggest that the measurement model is quite robust and that the constructs sufficiently represent their theoretical domains, which offer a good starting point for testing structural relationships in later analysis. The strong measurement properties guarantee that the results relative to the hypothesized relationships are grounded on reliable and valid operationalizations for the key constructs.

4.3 Discriminant validity assessment

The discriminant validity of all constructs in the measurement model was verified by Heterotrait-Monotrait (HTMT) ratio. For all the pairs of constructs, the HTMT estimates are well below the conservative cut-off value of 0.90, and ranging from 0.195 (for Country Adaptation Strategies – Firm Risk Management) to 0.512 (between Global Supply Shock- Firm Adaptation Strategies). This means that the constructs have less variance with each other than they do with their measures, thus meeting discriminant validity requirement. The findings from the present study suggest that each construct represents unique aspects not accounted for by other constructs in the model. For example, Managerial Risk Management Capability has the lowest correlations with other variables (between 0.189 and 0.412), which supports its uniqueness as a moderator variable. This strong test indicates that the indicators distinguish well between dimensions, and that path analysis will be probing true relationships among constructs rather than merely constructs and overlapping constructs.

4.4 Structural model assessment (inner model)

It confirms that the power of explanation is strong and the predictive influence on it is also strong. The R^2 (coefficient of determination) for Firm Adaptation Strategies (FAS) is 0.687, which means the model able to explain the changes in endogenous variable by 68.7 %. Based on the reference criteria provided by Henseler et al. (2009), the value of R^2 is termed as 'substantial', confirming that global supply shocks,

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input cost unpredictability, foreign exchange rate uncertainty and supply chain diversification alone and with their interaction with managers' risk management ability together do substantially explain firms' adaptative behavior. On the other hand, the blindfolding result comparison of 0.423 is much larger than zero indicating that there is a large Q^2 and hence a substantial predictive relevance of the model. This suggests that the model has high explanatory power as well as strong out-of-sample predictions, reinforcing its practical and theoretical value for explaining firm adaptation in an unstable world of global supply.

4.5 Hypothesis testing: direct effects

The testing of direct effects test result shows strong support for each and every relationship proposed. GSS show the largest and significant positive relationship to FAS ($\beta = 0.324$, $p < 0.001$), implying that higher levels of supply shocks significantly stimulate firms′ adaptation strategies. Input Cost Volatility (ICV) is also significantly positively related to MI ($\beta = 0.287$, $p < 0.001$), and this fact indicates that price changes in the essential input materials trigger strategic responses. Exchange Rate Fluctuations (ERF) contribute are also significantly modest ($\beta = 0.198$, $p < 0.01$), highlighting with currency fluctuation an SA′s intrinsic problem. SCD has positive impact on adaptation strategies ($\beta = 0.234$, $p < 0.001$), and thus is an active way to improve resilience. All t-statistics are very large compared to a critical value of 2.58 ($p < 0.01$), indicating that the results are strongly statistically significant and supported by H1-H4.

4.6 Hypothesis testing moderating effects

The examination of moderating effect offer convincing evidence on the important role played by MRMC in enhancing OR. All four interaction effects have and positively significant impact to Firm Adaptation Strategies (FAS), thus it can be inferred that MRMC reinforces the relationship external jounce leads in order to adaptive percipient. The highest moderating effect is detected on Input Cost Volatility ($\beta = 0.178$, $p < 0.01$), then by Global Supply Shocks ($\beta = 0.156$, $p < 0.01$), Supply Chain Diversification ($\beta = 0.145$, $p < 0.01$) and Exchange Rate Fluctuations ($\beta = 0.134$, $p < 0.05$). All t-statistics are above 2.57, which means the statistical results are robust. These results support H5 to H8, indicating that companies with higher risk management capabilities are much more capable of converting environmental issues into successful adaptation. Implications The findings highlight the strategic value of formulating managerial capabilities as a critical path to enhance organizational resilience under such turbulent circumstances in globalised supply chains.

4.7 Effect size (f^2) analysis

As shown by the effect size analysis, there are meaningful practical effects in predicting Firm Adaptation Strategies. Global Supply Shocks (f2 =.187), Input Cost Volatility (f2 =.156) and Supply Chain Diversification (f^2 0.112) all present medium effect size measurements following Cohen's (1988) indexing rules and thus, have a significant substantial impact on adaptation outcomes. Though significant, Exchange Rate Changes account for a smaller amount of variance ($f^2 = 0.078$), indicating that its impact is less pronounced in predicting adaptation. The moderator role of Managerial Risk Management Capability ($f^2 = 0.095$) is in the small-to-medium range asserting its significant contribution as a strengthening boundary condition for the anticipation of external pressures by companies. These observations corroborate the statistical significance results and illustrate that the significant links show not only strong statistical robustness but also carry practical substance, with global supply shocks as being by far the strongest determinant of adaptation strategies in terms of size of effect.

4.8 Predictive power assessment (PLSpredict)

The PLSpredict analysis shows that the model has higher out-of-sample predictive power with respect to any of the indicators for Firm Adaptation Strategies. For all the indicators (FAS1-FAS4) the PLS-SEM RMSE is uniformly lower than the LM benchmark counterpart. The errors of prediction vary between 0.298 and 0.345 in the PLS-SEM model and between 0.345 and 0.398 within the naive linear model, which provides evidence that our model is able to predict better than a baseline. All signals are high-signalling signals, the best performance is for FAS3 (operational changes), and the largest marginal gain from the

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benchmark model is posted by FAS1 (supplier diversification). These findings confirm that the integrative model, which includes both direct effects and moderating influences, not only has strong explanatory power but it also practically yields valuable insights and predictions about how firms develop adaptive strategies to respond to global supply chain challenges and thus increase the practical usability of the set of constructs for scholars as well as practitioners.

4.9 Importance-performance map analysis (IPMA)

The Importance-Performance Map Analysis (IPMA) offers strategic implications for managing firm adaptation interventions. Global Supply Shocks (GSS) appear to be the most significant driver, with the largest importance (0.324), though low performance (68.5%), which shows that is an area for improvement with high priority. Also Managerial Risk Management Capability (MRMC) is highly important too (0.289), with a significant performance gap (65.4%) risk management competences improvement would be very beneficial. High priority should be given to ICV as it has high degree of importance (0.287) and lowest achievement score (62.3%). Despite Supply Chain Diversification (SCD) having the best current achievement (72.1%), it is of moderate importance (0.234), which makes it a medium-priority domain. The Exchange Rate Fluctuations (ERF) appears to have the least contribution and consequence scores which indicates that the current strategic issue has a low priority. These results provide recommendation to the managers in terms of redirecting resources towards combating global supply shocks and capacity building for risk management as possible strategies for enhancing organizational resilience.

4.10 Model fit indices

All model-fit indices indicate that the fit of the hypothesized model to the empirical data is very good. The SRMR = 0.052 is below the recommended cutoff of 0.08, suggesting a close fit between the model implied and observed correlation matrices. Moreover, the NFI (Normed Fit Index) issignificantly larger than 0.90 and thus the fit of themodel is very well supported. These fit indices along with the previously developed criteria (substantial R^2 of 0.687, large predictive relevance Q^2 of 0.423, dependable measurement model) collectively contribute to a solid argument that the theoretical framework adequately explains the intricate associations among global supply chain disruptions, managerial capabilities and firm coping strategies. Thus, the model provides a rigorous statistical and meaningful theoretical depiction of organisational mechanisms of resilience, in the context of Indonesian manufacturing companies to cope with global economic uncertainties.

4.11 Discussion

This research offers compelling empirical evidence to show that firms' responses to global economic shocks are shaped by a complex interplay of external environmental pressure and internal managerial ability. The results are consistent with and extend prior studies on organizational resilience by showing how different forms of supply chain shocks have differing effects on adaptations as well as the pivotal enabling role that risk management capabilities play in this process. The strong and positive effect of global supply shocks on adaptation strategies supports extant research that highlights the catalyst role of exogenous shifts for organizational change (Brandon-Jones et al., 2021). But this study takes us one step further by showing that not all disruptions are equal. The different power of effect indicates that supply availability drives adaptation more forcefully than financial changes, possibly because impairment on operations directly constrained and urged immediate response. This nuanced sensitivity to the variety in supply chain risk goes beyond treating risks associated with supply chains as homogenous, but is fundamentally based on appreciating that such risks will not have the same effect on strategic adaptation. That there is a strong link between cost volatility and adaptation strategies lends support to the resource-based view that cost pressures drive firms towards reconfiguring their operating style. These results are in line with new theoretical developments that emphasize the volatility of prices in global markets has led organizations to construct more flexible and efficient ways to allocate resources (Gössling & Metzler, 2022). Our analysis reveals that it is the cost uncertainties that require not only tactical adaptations, but also

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more fundamental strategic reflections on sourcing and production strategies.

Trends in exchange rates are found to be significant (with varying levels of significance) but have relatively little impact on adaptation strategies. This result indicates that respondents may consider financial market volatilities are more bearable if they can be worked out using hedging instruments or other price adjustments rather than changes in fundamental business operations. This is inconsistent with previous studies which claimed that currency risks may act as the primary factors elicitting supply chain reconfiguration (Lee & Wang, 2021), suggesting contextual factors of industry and market orientation can moderate such decision making. The beneficial impact of diversifying supply chains on adaptation approaches emphasizes the strategic importance for resilience to create structural flexibility. This is consistent with recent studies that argue for multi-sourcing and geographical dispersion as buffers against disturbances (Wagner & Bode, 2023). Yet, our results also imply that diversification is not just a defensive response, but rather an enabler of better adaptation mechanisms.

Of more central concern the strong moderating effect of managerial risk management capability demonstrates how intra-firm abilities influence organizational reactions to external pressures." Our results confirm our theoretical argument that managerial capabilities facilitate the conversion of environmental threats into opportunities for strategic renewal (Ahammad et al., 2022). This dampening effect was particularly strong for input cost volatility, indicating that financial uncertainties might need a higher level of analytics and decision-making than other kinds of disruptions. The theoretical implications of these results are significant. First, they add to the dynamic capabilities literature by clarifying how certain environmental triggers foster adaptability processes. Second, they contribute to supply chain resilience research by showing that adaptation processes are contingent upon how external pressures are translated into appropriate responses through managerial cognition and organizational learning. Third, the study testifies to the integrative perspective of resource-based and contingency approaches towards organizational adaptation.

Practically, the results provide managers with specific direction for where to focus their resource investment toward building resilience. The high priority but low performance scores for managing global supply shocks and risk also highlight the strategic areas that need investment. Organizations should adopt early warning, supplier relationship management programs and managerial training which augment risk assess and response capabilities. Some situational factors among Indonesian manufacturing firms might make these results differ. Indonesia's archipelagic geography, growing infrastructure and the specific industrial policies provide unique context to understand how firms interpret and react on global disruptive events. Further research could investigate the moderation of these relationships by national level institutional contexts. Despite the strength of this study, some limitations should be considered. The cross-sectional study is a snapshot of adaptation processes at one particular point in time, whereas the longitudinal design may provide information about evolutionary trends. Furthermore, concentrating on manufacturing sector may restrict the generalization of the findings to sectors where adaptation might work differently. Subsequent studies could focus on service industry or compare the regulatory measures adopted by other economic sectors in varying cultural backgrounds.

5. Conclusion

This paper clearly evidences that corporate adaptation responses in emerging markets hinge strongly on how supply chain disturbances interact with firm-specific strategic capabilities. The results show that global supply shocks, input cost volatility, exchange rate uncertainly and collocation significantly motivate adaptive responses of firms; while the risk management capability of managers functions as a crucial enhancer in this regard. The study adds to theoretical debate by blending resource-based and contingency views, demonstrating how environmental pressures and organisational capabilities interact in order to jointly contribute

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to resilience outcomes. From a practitioners' perspective, the study offers practical implications on investment considerations reinforced in focusing strategic investments on building resilient risk management processes and manoeuvrable supply chain designs. The firm-level empirical model is found to exhibit a strong level of explanatory capability and predictive performance relative to the uncertainty surrogates, providing a sturdy configuration for examining organisational adaptation within an evolving global environment, with implications that research should seek to integrate further external challenges and internal resources across varied industry and national contexts.

6. Image and data table

Appendix A: Population and Sample Framework

Table A.1: Population Distribution and Stratified Sampling Framework

KBLI Code	Industrial Sector Description	(N)	(%)	Sample	Sampling Fraction (%)
10	Food Manufacturing	3,450	18.50%	37	18.50%
11	Beverage Industry	780	4.20%	8	4.20%
13	Textile Industry	1,250	6.70%	13	6.70%
14	Apparel Manufacturing	1,890	10.10%	20	10.10%
17	Paper and Paper Products	950	5.10%	10	5.10%
20	Chemical and Chemical Products	1,100	5.90%	12	5.90%
22	Rubber and Plastic Products	1,870	10.00%	20	10.00%
25	Basic Metal Industries	980	5.30%	11	5.30%
26	Computer and Electronic Products	650	3.50%	7	3.50%
27	Electrical Equipment	1,120	6.00%	12	6.00%
28	Machinery and Equipment	1,050	5.60%	11	5.60%
29	Motor Vehicles and Trailers	890	4.80%	10	4.80%
30	Other Transport Equipment	610	3.30%	7	3.30%
Other	Other Manufacturing Sectors	2,100	11.20%	22	11.20%
Total		**18,690**	**100.00%**	**200**	**100.00%**

Appendix B: Variable Operationalization and Measurement Instrument

Table B.1: Constructs, Operational Definitions, and Measurement Items

Variable & Source Adaptation	Scale Type	Operational Definition	Measured on a 5-point Likert scale
Global Supply Shocks (GSS) *Adapted from Golgeci et al. (2023)*	Reflective	The degree of disruption experienced by the firm due to disturbances in global supply from core suppliers.	GSS1: Our firm has experienced significant difficulties in procuring key raw materials from international suppliers in the past two years. GSS2: Delivery delays from foreign suppliers have disrupted our production processes. GSS3: We face high uncertainty regarding the availability of imported supplies.
Input Cost Volatility (ICV) *Adapted from Gössling & Metzler (2022)*	Reflective	The degree of fluctuation and unpredictability in the prices of raw materials and components purchased by the firm.	ICV1: The prices of our key production raw materials are highly volatile and difficult to predict. ICV2: Input price changes occur frequently and by large percentages. ICV3: Input price volatility poses a serious challenge to our budgetary planning.
Exchange Rate Fluctuations (ERF)	Reflective	The perceived impact of changes in foreign currency exchange	ERF1: Fluctuations in the Rupiah exchange rate significantly affect our raw material import costs.

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Adapted from Bartram et al. (2021)		rates on the firm's costs and revenues.	ERF2: Foreign exchange rate changes create uncertainty for the profitability of our international transactions. ERF3: Fluctuating exchange rates affect the price competitiveness of our products in export markets.
Supply Chain Diversification (SCD) *Adapted from Wagner & Bode (2023)*	Reflective	The firm's efforts to diversify supply sources and logistics networks to reduce dependency on a single source or region.	SCD1: Our firm actively increases the number of suppliers for critical raw materials. SCD2: We diversify our supply sources across different countries or geographical regions. SCD3: We allocate our purchases among several suppliers to avoid reliance on a single source.
Managerial Risk Management Capability (MRMC) *Adapted from Ahammad et al. (2022)*	Reflective	The management's ability to proactively identify, assess, and respond to operational and strategic risks.	MRMC1: Our management team has a strong capability to identify potential risks in the supply chain. MRMC2: Our company has effective procedures for assessing the impact of identified risks. MRMC3: We have clear contingency plans ready to be implemented in response to disruptions. MRMC4: Management regularly reviews and updates risk mitigation strategies.
Firm Adaptation Strategies (FAS) *Adapted from Brandon-Jones et al. (2021)*	Reflective	A set of strategic and operational actions taken by the firm to respond to and withstand external disruptions.	FAS1: Our company quickly seeks alternative local suppliers when international supply is disrupted. FAS2: We invest in technology to enhance supply chain visibility and traceability. FAS3: We adjust our operational models (e.g., increasing inventory buffers) to cope with uncertainty. FAS4: The company allocates resources to develop more resilient new products or processes.

Table 4. Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

Endogenous Variable	R^2 Value	R^2 Interpretation	Q^2 Value	Q^2 Interpretation
Firm Adaptation Strategies (FAS)	0.687	Substantial	0.423	Large

Table 5. Hypothesis testing for direct effects

Path	Path Coefficient (β)	T-Statistics	P-Values
GSS → FAS	0.324	5.678	0
ICV → FAS	0.287	4.892	0
ERF → FAS	0.198	3.456	0.001
SCD → FAS	0.234	4.123	0

Table 6. Hypothesis Testing for Moderating Effects

Path Coefficient (β)	T-Statistics	P-Values	Decision
GSS × MRMC → FAS	0.156	2.987	0.003
ICV × MRMC → FAS	0.178	3.234	0.001
ERF × MRMC → FAS	0.134	2.567	0.011
SCD × MRMC → FAS	0.145	2.789	0.006

Table 7. Effect Size (f^2) Analysis

Predictor Variable	f^2 Value	Effect Size Interpretation
Global Supply Shocks (GSS)	0.187	Medium

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Input Cost Volatility (ICV)	0.156	Medium
Exchange Rate Fluctuations (ERF)	0.078	Small
Supply Chain Diversification (SCD)	0.112	Medium
MRMC (Moderator)	0.095	Small to Medium

Table 8. PLSpredict results for key indicators

Indicator	PLS-SEM RMSE	LM RMSE	PLS < LM?	Prediction Power
FAS1	0.345	0.398	Yes	High
FAS2	0.312	0.367	Yes	High
FAS3	0.298	0.345	Yes	High
FAS4	0.324	0.378	Yes	High

Table 9. Importance-Performance Map Analysis (IPMA)

Construct	Total Effect (Importance)	Performance (%)	Priority for Improvement
Global Supply Shocks (GSS)	0.324	68.5	High
Input Cost Volatility (ICV)	0.287	62.3	High
Exchange Rate Fluctuations (ERF)	0.198	58.7	Medium
Supply Chain Diversification (SCD)	0.234	72.1	Medium
Managerial Risk Management Capability (MRMC)	0.289	65.4	High

Table 10. Model Fit Assessment

Fit Index	Value Obtained	Threshold	Interpretation
SRMR	0.052	< 0.08	Good Fit
d_ULS	0.345	-	-
d_G	0.234	-	-
Chi-Square	456.234	-	-
NFI	0.912	> 0.90	Good Fit

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Author Contributions

Contributed to conceptualization, methodology, formal analysis, writing - original draft and writing - review & editing Zahrani Aulia. Annisa Qurrota A'yun: Investigation, Data curation, Validation, Visualization, Project administration.

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Data Availability Statement

The datasets used and/or analyzed during the current study are not publicly available, as confidentiality agreements were established with the other (participating) companies, but are available from the corresponding author on reasonable request.

Ethics Consent and permissions.

This study has been approved by Research Ethics Committee of Universitas Diponegoro (Nomer: 456/EC/FE/2024). Written, informed consent was obtained for all participants prior to participation.

Conflict of Interest

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The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AI and Ethics Statement

The authors state no artificial intelligence was used during this research study to gather, analyze or interpret data. All research was conducted in accordance with ethical guidelines for academic studies.

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