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Original Article

Employee engagement as an antecedent of organizational commitment – A study on Indian seafaring officers

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ABSTRACT

Employee engagement has been the most widely researched area of human resource in recent times because of its practical importance in business organizations today. Engagement plays a major role as an antecedent in many organizational outputs like employee performance, commitment, and competitive advantage, etc. This research paper is aimed at identifying the factors contributing to employee engagement and its association with the affective, continuance and normative modules of organizational commitment among Indian ship officers. This research work attempts to explore the correlation existing if any, between work and organizational engagement variables with three aspects of organizational commitment. The whole study is mainly focused on seafarer's perspective and so few alterations in questionnaires of engagement and commitments were made in discussion with experts from the shipping industry. This study confirms that employee engagement is positively associated with affective and normative components whereas, engagement is not significantly associated with continuance component of organizational commitment which is a contradicting result from existing studies where continuance commitment has reported a significant negative relationship with engagement. This study also discloses the fact that the engagement and commitment levels of officers working with deck and engine department did not contrast significantly, nor did they significantly differ between officers working in different types of ships, different designations and between officers with a different experience.

1. Introduction

1.1. Manpower shortage in shipping industry

The shipping industry is presently fronting shortage of manpower and it is expected to increase shortly to a double fold. There has been a lot discussed over managing this manpower shortage shortly since 2005 when the first shortage report of BIMCO was released. The report of 2015 has forecasted the shortage of officers' to increase form 2.1% in 2015 to 11.7% in 2020 and to 18.3% in 2025 (BIMCO and ISF, 2005, 2015). Efforts have been taken by BIMCO, ICS and other associated bodies to manage the shortage by creating awareness, improving training quality of training institutes, improving quality of life at sea and so on. Unlike other jobs, life at sea is unique. Seafarers' International Research Centre at Cardiff University, USA global seafarers' database says over 60–65% of seafarers work in a diversified environment where more than one nationality seamen are employed. Diversity issue coupled with the shortage of manpower complicates the manpower management activities onboard the ship. Employee engagement holds strong significance in the context of manpower management. Engaged employees are emotionally attached, fond of their work and committed to their organization. Engaged employees put in discretionary effort to meet organizational goals, can become a catalyst for organizational development (Khan, 1992).

Ever since the pre-trade era, India has been one of the major contributors to the world merchant navy, but the last four years has seen an unprecedented growth of 42.3% shipboard jobs for Indian seafarers. Indian seafarers' contribution toward international shipping industry population is about 9.35% of the total seafarers' community. Future estimation of shortage in manpower and the increasing occupancy of Indian's onboard the ships highlights the importance of understanding the engagement level of Indian officers onboard. This paper aims to study the relationship

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of 'engagement' with the organizational commitment of seafarers and also identify the drivers of engagement.

1.2. Employee engagement

A multi-dimensional construct for engagement initiated by Khan has pioneered the employee engagement movement. Employee engagement is theorized as the individual's investment of himself/herself completely into a work role (Khan, 1992). It is an optimistic assertiveness where an individual goes beyond his assigned responsibilities, to display an improved level of ownership, and to promote the commercial interest of the organization in an all-inclusive manner (Robinson, Perryman, & Hayday, 2004). Engagement is a form of off role or on-role work or performance from an individual that nurtures change for the betterment of organization (Macey & Schneider, 2008). Work and organizational engagement virtually affect morale, commitment, loyalty, employee absenteeism and productivity in the organization (Buchingham & Coffman, 1999; Cohen, 1991). Many studies have exposed the presence of a progressive association between engagement and commitment with productivity, profitability, employee retention and safety (Buckingham, 2006; Murlis, Schubert, & Hay Group, 2001).

An organization with engaged and committed employees will make a workplace of employee's choice resulting in improved performance of an organization. Engagement is an essential aspiration to work in best awareness of the workplace whereas, the desire of a worker to remain as a fellow of concern happens through commitment (Gbadamosi, 2003).

In last two decades, employee engagement has been researched by practitioners and educational community and is viewed as the indicator which governs the relationship of the employee with the place of work performance and commitment (Sundaray, 2011). Many research works in developed and developing economies validate that there is a favorable association between engagement and affective commitment of an employee, but very few have viewed at engagement's impact on the continuance and normative commitment. In-spite of availability a lot of studies on employee engagement and its influence on organization there is an academic knowledge gap in the literature, which constantly stimulates the need for extra firsthand exploration in this area within varied situations and diverse demographic sections.

1.3. Engagement in the shipping industry

Merchant navy is a major contributor to the world economy, where the application and consequence of employee engagement are still under-researched. Moreover some of the unique features of shipping jobs like isolation, difficulty in socializing, communication problems and cultural disputes, etc., also create an inclination for the study. Though workers on-board are less in numbers and face a unique set of problems, businesses have no option but to produce more output with less employee input. In trying to do so, shipping companies in addition to physical engagement of employees they also need to engage the mental mind and the intrinsic soul of every individual worker on-board. This study explicitly attempts to expand the awareness of the impact of employee engagement on organizational commitment among Indian ship officers and also to add to the existing literature especially in the Indian Ship officer's framework, where there is a despairing need for such an investigation to be conducted. To do so, it explored components of employee engagement as criterions and organizational commitment as a tested outcome of employee engagement. For this Saks' model of employee engagement was considered and few changes made fitting the requirement of the study (Saks, 2006).

2. Literature review

2.1. Employee engagement

Numerous studies in recent times have identified engagement as a pivotal tool for success. Employee engagement contribution toward organizational effectiveness, innovation, and competitive advantage was also proven to be significant. Considering the above fact, leaders and managers of organizations are much concerned about engaging employees at their best. The engagement was treated only as a practical consultancy work until the 1990s, ever since the academicians sensed research importance on early 20th century it has got greater attractions to form scholars from disciplines of psychology, business and management and organizational behavior (Xu & Cooper Thomas, 2011). Though there are a lot of researches steered by academicians and specialists there is a shortage of critical academic literature on the subject (Kular, Gatenby, Rees, Soane, & Truss, 2008). Studies conducted on employee engagement explored its scope in a different context. As a result, there is no unified definition and drivers of engagement evolved so far. The association of engagement with other most researched paradigms like satisfaction, commitment, citizenship behavior, involvement is so strong thus, to understand engagement better, we have to depend on several other studies with different context and influence of engagement on it.

Late in 1960s employee engagement was so much associated with role theory and it is defined as impulsive role involvement by Goffman (Goffman, 1961) and as "visible investment of attention and muscular effort" by Wildermuth and Pauken (Wildermuth & Pauken, 2008). Csikszentmihalyi expressed employee engagement, as a holistic employees experience as sensation when they are wholly involved in their effort (Csikszentmihalyi, 1982). W.A. Kahn, who is a pioneer of employee engagement movement in academics called it as personal engagement. He defines engagement as a binding of oneself to their organization's work roles where they bodily, cognitively and sensitively involve themselves in their work role. He defines engagement as a multifaceted aspect (Khan, 1992). Work of Schaufeli et al. and Robinson et al. stressed the feature of employee engagement. They define engagement as an optimistic mindset toward their organization described by robustness (vigor), perseverance and absorption, wherein they are aware of work improvements and organizational effectiveness (Salanova, Shaufeli, Gonzalez, & Bakker, 2002). Hewitt Associates defines engagement as "the state in which employees are passionately and knowledgeably dedicated to the organization or group which can be measured by three behavioral exhibitions of employees namely Say, Stay and Strive (Hewitt Associates LLC, 2004). Saks in his conceptualization of employee engagement claims defines engagement as a degree to which an individual is conscientious and immersed in his/her job role. He classifies employee engagement into two types explicitly as job and organizational engagement. Job engagement is the degree to which the employee is captivated in the performance of their role. Meanwhile, organizational engagement is the degree to which an employee is psychologically attentive as an associate of an organization (Saks, 2006).

Fleming and Asplundh of Gallup define employee engagement as "the expertise to capture the heads, hearts, and souls of your employees to implant a fundamental aspiration and appetite for quality." They additionally indicate that engaged employees need their organization to prosper because they sense they are coupled passionately, socially, and spiritually to its mission, vision, and purpose of the organization (Flemming & Asplund, 2007). Newman and Harrison defined engagement from the context of the behavior of an employee focusing on performance, involvement and citizenship behavior at the same time (Newman & Harrison, 2008). Cook in 2012 defined engagement as positive thinking of an employee

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about the organization and the proactiveness of an employee in achieving goals of the organization, colleagues and other stakeholders (Cook, 2012).

2.2. Organizational commitment

Organizational commitment is the conviction and reception of the statements and policies of the organization they belong with the desirability by the employee to be associated with that organization. The commitment of an employee in an organization is grouped into three levels which include affective, normative and continuance commitments. Meyer and Allen in their work they argue that the three dimensions of commitments are shown by employees at different levels of an organization and they are independent of each other (Allen & Meyer, 1996; Karrasch, 2003; Porter, Steers, Mowday, & Boulian, 1974; Turner & Chelladurai, 2005).

Allen and Meyer conceptualized organizational commitment as a multidimensional paradigm that comprises of three types of commitments namely affective continuance and normative commitments. Affective commitment is concerned with employees' emotional attachment; continuance commitment is concerned with costs associated with separation from the organization; and normative commitment is the moral commitment to continue with the organization (Allen & Meyer, 1990). Commitment is the comparative strength of an individual's identification and involvement in an organization supported by a strong trust and acceptance of the organization's goals and values. A committed employee will incline to employ extensive exertion on behalf of the organization and a strong aspiration to maintain membership of the organization (Mowday, Porter, & Steers, 1982).

2.3. Employee engagement and organizational commitment

Organizational commitment and employee engagement have developed as a vibrant construct in business research on account of their constructive relationships with employees' behaviors, which endorse organizational performance and profit-making (Chalofsky & Krishna, 2009). It was found that affective commitment directly influence employee performance compared to the other two types of commitments (Robinson et al., 2004). Several studies on organizational commitment at different time periods have indicated that there exists a positive relationship between employee engagement and affective commitment, but very few researches in recent times has concentrated on engagement's influence on the other two components of commitment namely continuance and normative commitment (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Maslach, Schaufeli, & Leiter, 2001).

Study on the impact of engagement on an organizational commitment by Schaufeli and Salanova revealed that there exists an optimistic relationship between engagement and organizational commitment, the same study has also identified the fact that increase engagement level also enhances performance, satisfaction, improves attendance and exposes a greater execution of innovation and motivation. Learning and motivation were also influenced by enhanced engagement level of employees (Gilliland, Steiner, & Skarlicki, 2007; Schaufeli & Salanova, 2007).

It was proven by Brown and Leigh that, environment psychologically perceived as safe and expressive usually leads to the improved magnitude of involvement into the work and also improves the commitment of time and energy into organization's work. They have also revealed a fact the psychological environment has positive linkage with affective and cognitive forms of commitment, satisfaction, and motivation (Brown & Leigh, 1996).

In an investigation to determine the effect of being exhausted to mediate the relationship between job stress and sick health, and also to observe the mediating effect of engagement on the association between job resources and organizational commitment, it was established that engagement and being exhausted played a predominant mediating role in their respective proposed model (Hakanen, Bakker, & Schaufeli, 2006). In an attempt to evaluate the proposed model Job Demands-Resources (JDR), and to observe the extent resources and demands may influence motivation and health impairment over a certain period it was observed that, job demand predict job burnout within a short period that leads to a forecast of upcoming discomfort. Whereas, job resources affect future work engagement which influences organizational commitment (Hakanen, Schaufeli, & Ahola, 2008).

Since continuance commitment is defined as the cost-consciousness linked to exiting organization by Meyer and Allen. They argue that an improved engagement level leads to a lesser awareness of the cost of leaving the company, which creates a negative relationship between continuance commitment and employee engagement. In contrast, the employee who has a positive state of mindset is likely to reflect positive attitudes towards the job, and exhibit greater affective and normative commitment. Hence, it is estimated that employee engagement has a positive association with affective and normative commitment and negative association with continuance commitment (Allen & Meyer, 1990).

3. Research design

3.1. Questionnaire

A combined questionnaire in three parts was drafted to measure engagement, commitment, personal and work-related information. Employee engagement was scale developed using Saks's, instrument (Saks, 2006) as the basis and the questionnaire items relating to organizational commitment was developed using the reference from Allen and Meyer (Allen & Meyer, 1996) instrument and few changes were made as per the requirements of the marine industry after discussion with selected panel of experts from the shipping industry. Based on their suggestions, the final questionnaire had 20 variables for the measure of commitment which is 2 questions in addition to the usual model. 6 items were used for the measurement of organizational engagement and 5 items were involved to measure job/work engagement along with these ten items were used to collect demographic data. The Cronbach alpha for organizational engagement items was 0.878 and 0.896 for work engagement. Above score of Cronbach's test indicating a respectable reliability and internal consistency.

The study is based on a survey carried out at maritime training colleges/institutes in Chennai and Coimbatore regions of Tamilnadu where officers attend post-sea training courses. The Questionnaire had three parts containing personal details, engagement questions, and organizational commitment questions was personally taken to respondents for 3 months during classroom sessions and their leisure time in-between classes. Responses collected during the period counted to 440. Sufficient caution was taken not to have the repetition of participants and to get an unbiased response from them. 27 responses had to be rejected based on incomplete data, 413 responses were found usable. Size of the sample was considered acceptable for the usage of factor analysis in engagement and commitment model as the models should have 5–10 respondents per variable as referred by Munro in his contribution to health care research (Munro, 2005).

This study had used Indian officers working in foreign-flagged vessel keeping in mind the exploration of diversity aspect in future studies. India is one of the key providers of manpower to the maritime manning needs stands the third position in the contribution of the number of mariners. Population for this study consisted of all registered Indian merchant navy officers, who are currently sailing

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on seagoing merchant ships. Sample of 413 were all male officers and consisted of 200 deck officers (48.4%), 213 engine officers (51.6%). Out of these 213 were officers from engine section ranking from 5th engineer to chief engineer, 113 were chief officers and 329 were second officers. 111 officers (26.9%) were working in bulk carriers, 103 (24.9) were with container vessels, 80 (19.4%) were with car carriers, 66 (16%) of them were working in tanker/oil carriers and 53 (12.8) of them were working in LPG. Most of the Indian officers were below 30 years of age, with an average sea service of 6–9 years. Participants were also asked to indicate about their immediate reporting officers' nationality and the response was 66.3% report to Indian officer and 33.70 reports to foreign nationality chief.

3.2. Scoring methodology

Engagement and commitment scale was developed using 11 items and 20 items respectively which was measured using the five-point Likert scale. Each question was weighed from 5 (Strongly Agree) to 1 (Strongly Disagree) towards the respective items. Respondents scoring '5' on all statements would have a total of 55 on work and organizational engagement. Similarly, if the score on all items is '1', the final scores would be 11. Respondents are categorized into High, Medium and low based on the scores. High category would have a score ranging from 44 to 55. Medium segment scores range between 44 and 33 and the low category consists of respondents whose score is less than 33 overall. The same scoring methodology was used for the classification of commitment as well.

3.3. Data analysis

SPSS 21 was used for all analysis related to the study. Varimax orthogonal rotation with Kaiser normalization was applied for factor analysis extraction. Though eigenvalue of 1 was widely used as a default cutoff, 0.9 was taken as the eigenvalue cutoff for extraction as a study from Jolliffe considers Kaiser's criterion too strict, suggesting retaining all factors with an eigenvalue greater than 0.7 (Jolliffe, 1972). Hair et al. from his work claims that Eigenvalue criterion less than 0.7 is not reliable in case the count of variables used in the study was less than 20 where only a few factors could be extracted; the study also suggests considering solutions that explain 60% variance in social sciences. This study has considered an Eigenvalue of 0.9 for retaining suitable factors for explaining 60% of the variance considering reliability in mind. Coefficients smaller than 0.5 were excluded to ensure high loadings to confirm isolation of a reasonable number of factors explaining larger share of variance. Regression analysis was deployed to access the magnitude of the relationship between organizational and work engagement on organizational commitments' components.

4. Analysis and results

The respondents comprised of 413 Indian male merchant navy officers working in foreign-flagged vessels. Of this 51.6% belong to 31–40 years age group, 27.3% belong to >40 years and 21.1% belong to 21–30 years age group. Out of all respondents, 39.9% of respondents had 6–9 years of experience, 37.8% of respondents had >10 years of experience and 22.3% of respondents had 2–5 years of experience. Among the chosen respondents 26.9% of respondents were working in bulk carrier, 24.9% work in a container, 19.3% in the car carrier, 15.9% in oil carriers and 12.8 in LPG carriers. 52.3% of the respondents were from the engine department and the rest 47.7% of them are from the deck department. In remuneration profiling 30.8% of the respondents were drawing >5000 USD, 30.1% of them getting 4001–5000 USD, 22.3% draws 2001–3000 USD and the remaining 17% were getting 3001–4000 USD. The summary of the respondents' profile is displayed in Table 1.

Table 1
Showing profile of the respondents.

Respondent's profile	Categories	Frequency	Percentage
Age	21 years–30 years	87	21.1
	31 years–40 years	213	51.6
	Above 40 years	113	27.3
Experience	2–5 years	92	22.3
	6–9 years	165	39.9
	10 and above	156	37.8
Salary	2001–3000 USD	92	22.3
	3001–4000 USD	70	17.0
	4001–5000 USD	124	30.1
	5001 USD and above	127	30.8
Types of ships	Bulk carrier	111	26.9
	Container	103	24.9
	Car carrier	80	19.3
	Oil carrier/tanker	66	15.9
	LPG carrier	53	12.8
Department	Deck	197	47.7
	Engine	216	52.3

Table 2
Showing scores of engagement and commitment.

	Organizational commitment	Employee engagement
N		
Valid	413	413
Missing	0	0
Mean	50.7918	30.8547
Std. deviation	15.75357	11.55709
Minimum	25.00	14.00
Maximum	92.00	52.00

4.1. Scores of employee engagement and organizational commitment

Employee engagement scores measure using summarizing the responses of every individual response for every single question stretched from a low of 14 to a high of 52 out of 55. The mean score was 30.86 with SD of 11.56. Distribution of the sample was found to be normally distributed using histogram representation. From the calculation made using 413 responses, it was found that 20.1% ($n = 83$) officers were considered to be engaged, 21.6% ($n = 87$) were found to be partially engaged and the rest of the respondents 58.8% ($n = 243$) were found to be disengaged. This result was in contrast with the results of Bhattacharya's research study (Bhattacharya, 2015), where partially engaged officers were found to be more in number. Similarly, for the organizational commitment, the scores stretched from 25 to 92 out of 100 with a mean score of 50.8 and SD of 15.753. 3% ($n = 14$) were found to have high commitment, 31% ($n = 128$) of respondents had medium and 65.6% of respondents had low commitment. The summary of the scores, mean, SD, regression tests is shown in Tables 2 and 3.

4.2. Descriptive statistics for employee engagement and organizational commitment

Engagement score of officers working with deck department ($n = 197$) had a mean of 30.588 and 31.0972 for officers working with engine department ($n = 216$), while the scores of commitment for deck officers had a mean value of 50.1015 and 51.4213 for engine officers. Above mean values indicate that the officers from the engine department had a higher level of engagement and commitment. To test the significance of the difference between deck and

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Table 3
Showing distribution of scores of engagement and commitment.

Organizational commitment			Employee engagement		
Scores (level)	*N*	%	Scores (level)	*N*	%
<60 (low)	271	65.6	<33 (dis-engaged)	243	58.8
60–79 (medium)	128	30.9	33–44 (partially engaged)	87	21.06
80–100 (high)	14	3.0	45–55 (engaged)	83	20.09
Total	413		Total	413	

Source: Primary data collected.

Table 4
Distribution of scores of engagement and commitment.

		Employee engagement			Organizational commitment		
		Mean	SD	*t*-Value	Mean	SD	*t*-Value
Department	Deck	30.5888	11.50149	−.446	50.1015	15.01699	−.850
	Engine	31.0972	11.62895		51.4213	16.40599	

Table 5
One-way ANOVA on employee engagement and organizational commitment scores by experience, age, designation, and salary & ship type.

		Employee engagement			Organizational commitment		
		Mean	SD	*F* value	Mean	SD	*F* value
Experience	2–5 years	32.1957	12.5332	2.475	53.0109	18.0283	2.090
	6–9 years	29.3273	10.4462		49.0061	14.2428	
	10 and above	31.6795	11.9628		51.3718	15.7337	
Age	20–30 years	29.1839	11.3050	1.343	48.6207	14.5044	1.049
	31–40 years	31.0141	11.5935		51.3333	16.4439	
	>40 years	31.8407	11.6439		51.4425	15.3267	
Designation	2nd officers	32.1957	12.5332	1.204	53.0109	18.0283	1.180
	Chief officers	30.0000	10.8207		50.0876	14.5590	
	Engine officers	31.1890	11.8908		50.2598	15.7299	
Salary	2001–3000 USD	32.1957	12.5332	.851	53.0109	18.0283	.982
	3001–4000 USD	30.4286	11.0434		51.2429	14.7259	
	4001–5000 USD	29.7581	10.7305		49.4355	14.4830	
	>5001 USD	31.1890	11.8908		50.2598	15.7299	
Ship type	Bulk carrier	32.7928	11.9955	1.954	53.1351	17.4801	1.205
	Container	29.5728	11.4477		49.6408	14.6995	
	Car carrier	28.8125	10.8652		49.1500	14.9962	
	Tanker	32.1667	11.7113		51.9545	15.8302	
	LPG carrier	30.7358	11.2303		49.1509	14.7731	

engine officers in a score of engagement and commitment, independent sample *t*-test was applied. Test results values $t = .446$ for engagement and $t = -0.850$ for commitment indicates there is no significant difference in the mean scores of engagement and commitment between engine and deck officers. Analysis of variance was also conducted to conclude if there were differences in engagement and commitment levels of officers working in different types of ships, officers with different experience, officers working in different designation, officers of different age group and officers from different salary range. *F* values of the analysis revealed that there is no significant difference in mean values of scores between any of the groups considered. The summary of the analysis of variance is listed in Tables 4 and 5.

4.3. Factors of employee engagement and organizational commitment

Employee engagement score was calculated using 11 variables and organizational commitment score was measured using 20 variables. Adequacy of sample size is measured using KMO and Bartlett's test which revealed a test score of .933 and .926 for engagement and commitment respectively. Communalities for variables taken for consideration were all higher than 0.5, the average engagement variable being 0.73 and commitment was 0.69. Further analysis using dimension reduction technique identified two latent variable/factor for engagement and three latent variable/factors for organizational commitment accounting for about 73% and 70% of the variability in engagement and commitment respectively. Factor identified under engagement and commitment is described below:

i. Employee engagement factors:
   Factor 1: Work engagement – leadership, value congruence, job characteristics, supervisor's support, and reward and recognition.
   Factor 2: Organizational engagement – organizational support, procedural justice, distributive justice, shared vision, shared mood and opportunity to grow and learn.
ii. Organizational commitment factors:
   With organizational commitment like other studies, it has resulted in 3 factors namely, affective, normative and continuance commitments.

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Table 6
Reliability analysis.

Variable	Scales	Items retained	Cronbach's alpha
Organizational engagement	OE	06	0.878
Job engagement	WE	05	0.896
Affective commitment	AC	08	0.891
Normative commitment	NC	06	0.903
Continuance commitment	CC	06	0.863

Table 7
Correlation analysis.

Descriptive statistics			Correlations				
	Mean	Std. deviation	OE	WE	AC	CC	NC
OE	2.7825	.890400	1				
WE	2.8600	.71259	.662**	1			
AC	2.7579	.82963	.566**	.592**	1		
CC	2.0416	.83444	.019	.063	.054	1	
NC	2.6945	.93736	.695**	.656**	.701**	.015	1

** Correlation is significant at the 0.01 level (2-tailed).

4.4. Reliability and correlation analysis

Factors of engagement and commitment were found to be reliable form their Cronbach alpha scores of 0.878, 0.896 for organizational and job engagement respectively. Scores of 0.891, 0.903 and 0.863 for affective, continuance and normative commitment indicates a strong reliable score for factors to be considered for further analysis. Correlation analysis revealed a positive relationship between engagement factor and affective, normative factors of commitment. Continuance commitment was not found to be having a significant relationship with engagement factors, which is contrary to previous researches where continuance commitment had a negative association with engagement. The summary of Cronbach alpha score and correlation coefficients are shown in Tables 6 and 7.

4.5. Multiple regressions

Correlation analysis value $r = 0.848$, $N = 413$, $p = 0.00$ specifies a significant positive relationship with engagement and organizational commitment. Regression analysis, the R^2 value of .720 indicates that employee engagement is responsible for 72% of the variation in organizational commitment. Summary of the analysis is shown in Table 8.

Hierarchical regression analysis results revealed a fact that control variables namely experience, salary, ship type, and department were not significantly related to factors of organizational commitment. Organizational engagement and work/job engagement factors were found to be positively related to the affective and normative commitment of Indian ship officers. Employee engagement factor had neither a positive nor a negative effect on continuance commitment. Beta values .645 and .278 from Table 9 for organizational and job engagement from step 2 regression result indicates that organizational engagement has got the majority of impact on affective commitment. Beta values of regression result .513 and .268 from Table 11 for organizational and job engagement respectively indicate that organizational engagement has got the majority of impact on normative commitment as well. Though organizational engagement was found to have a negative impact on continuance commitment (−.086), the impact was not significant, whereas work engagement has a non-significant positive impact. (.125) which is displayed in Table 10.

5. Results discussion

Factor analysis resulted in the identification of two factors for employee engagement contributing to 73% of total variance scores. Organizational engagement (OE) was found to be the strongest predictor. Since the ship is both home and workplace for a seafarers OE plays a vital role in the engagement of employees. OE includes organizational support, procedural justice, distributive justice, shared vision, shared mood and opportunity to grow and learn. It has been told that the ship is an isolated workplace where there is only a little space to socialize. Shipping job also comes with a risk for life on the water which carries a lot of uncertainties.

Table 8
Regression analyses between scores of engagement and commitment.

Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate	Change statistics				
					R square change	*F* change	df1	df2	Sig. *F* change
1	.848[a]	.720	.719	8.35334	.720	1054.327	1	411	.000

[a] Predictors: (constant), engagement.

Table 9
Relationship between factors of employee engagement and affective commitment.

Variable	Step 1				Step 2			
	Beta	*t*-Test	Sig	VIF	Beta	*t*-Test	Sig	VIF
Step 1: control variables								
Experience	0.321	2.597	0.01	6.37	0.111	1.863	.063	6.469
Salary	−0.29	−2.45	0.02	5.84	−0.094	−1.643	.101	5.948
Ship type	−0.08	−1.45	0.15	1.18	−0.03	−1.176	.240	1.185
Department	0.043	0.828	0.41	1.11	0.021	0.837	.403	1.110
Step 2: employee engagement								
OE					.645**	17.68	**0.000**	2.423
WE					.278**	7.657	**0.000**	2.399
R^2	0.019				0.777			
Adjusted R^2	0.01				0.774			
F value	2.002				690.06			
Sig. *F*	0.093				.000			

OE: organizational engagement; WE: work engagement.
** $p < 0.01$.

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Table 10
Relationship between employee engagement and continuance commitment.

Variable	Step 1				Step 2			
	Beta	*t*-Test	Sig	VIF	Beta	*t*-Test	Sig	VIF
Step 1: Control variables								
Experience	0.109	0.881	0.38	6.37	0.118	0.943	.346	6.469
Salary	−0.15	−1.25	0.21	5.84	−0.16	−1.34	.181	5.948
Ship type	−0.07	−1.22	0.23	1.18	−0.06	−1.19	.236	1.185
Department	0.049	0.943	0.35	1.11	0.047	0.916	.360	1.110
Step 2: Employee engagement								
OE					−0.086	−1.12	.264	2.423
WE					0.125	1.636	.103	2.399
R^2	0.013				0.019			
Adjusted R^2	0.003				0.005			
F value	1.307				1.359			
Sig. *F*	0.267				0.258			

Table 11
Relationship between employee engagement and normative commitment.

Variable	Step 1				Step 2			
	Beta	*t*-Test	Sig	VIF	Beta	*t*-Test	Sig	VIF
Step 1: Control variables								
Experience	0.212	1.703	0.09	6.37	0.039	0.457	.648	6.469
Salary	−0.25	−2.13	0.03	5.84	−0.093	−1.15	.251	5.948
Ship type	0.005	0.097	0.92	1.18	0.045	1.244	.214	1.185
Department	−0.01	−0.13	0.89	1.11	−0.026	−0.73	.464	1.110
Step 2: Employee engagement								
OE					.513**	9.882	.000	2.421
WE					.268**	5.185	.000	2.399
R^2	0.012				0.549			
Adjusted R^2	0.002				0.543			
F value	1.197				242.16			
Sig. *F*	0.312				0			

OE: organizational engagement; WE: work engagement.
** $p < 0.01$.

Multinational crews, extended contract periods, reduced shore leaves, monotonous work procedures and isolation from land, etc., have worsened the workplace and reduced the bonding of seafarers with workplace and organization. A survey conducted by ITF revealed that nearly 50% of seafaring officers do not have access to the email facility. Denial of shore leaves is considered to be one of the vital drivers to stop people in choosing a career at sea.

Very minimal contact exists between the shipping company and seafarers from the time he/she signs a contract and join a ship. Almost all contacts are lost until he completes his contract period and rejoins. This gap minimizes the perception of the seafarer to feel he/she is a part of the company. Grievances addressed immediately and timely relief for a problem can make a seafarer feel that he is more than a casual employee like other organization (Corrigan, Kerr, & Knudsen, 2005). Since seafaring occupation is contractual, the sense of insecurity is common amongst seafarers. Job security plays an important role in driving employee engagement.

6. Practical implications and conclusions

The shipping industry has not witnessed many contributions of employee engagement studies to its literature in recent times. The output of this study may throw light on engagement and commitment aspects of Indian officers working on-board the ship. This study could be an additional insight for shipping companies to understand their employees and to evaluate their existing policies and procedures.

This study has revealed a fact that engagement and commitment levels of officers are very low and needs improvement in all aspects. Non-conducive work environment which makes life at sea a challenge. This challenge is considered to be the major reason for this cause. Since the association between engagement and commitment was found to be positive and engagement being an antecedent for most of the work and organizational outcomes this study throws light on the importance of improving working conditions and organization's participation. Non-significant association of engagement with continuance commitment could be understood as a cause of increasing demand for seafarers and increasing awareness among seafarers about industry requirements. Since the nature of work carried out being almost same within companies of shipping industry, the job shift of officers between companies is very high. Officers experiencing less engagement will therefore are more liable to switch companies at the minor dissatisfaction which makes better treatment and valuing them vital importance.

Increasing demand and improved awareness in seafaring occupation would result in high retention in the future. There are numerous capacities where ship shipping companies can progress which can increase seafarer engagement as well as their commitment levels. Making every seafarer valued at the workplace by proper recognition, introduction of fair wage system to make them feel equality, additional recreational facilities, extended shore leaves, additional assistance for distant anchorage and berths to shore, etc., could all be an option to look into. Continued interaction with seafarer while on off-contract, instant recognition of work, meetings with owners/owner's representatives before and after every contract period to understand organization's requirement and to share seafarers' requirement, proper treatment at shore offices on visits, facilities to communicate to friends and family frequently can be carried out by shipping companies to promote attachment of employees with work and company. Keeping in mind

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the increasing demand for qualified seafaring officers and the threat of losing qualified and experienced seafarers from industry, shipping companies should think about looking back to their HR policies and procedures and bring changes which could positively reflect on culture and climate of the workplace.

7. Limitations

- This study is limited only to Indian ship officers. Whereas future study can be done on different nationality seafarers on engagement and commitment levels. Comparisons between nationalities could also be considered a subject of discussion.
- Engagement effect on commitment alone is analyzed whereas, employee performance, organizational effectiveness, competitive advantage, organizational climate, etc., could have been also analyzed.
- Moderating and mediating effect of different variable namely emotional quotient, employee satisfaction, job involvement, etc., were not considered for analysis considering the scope of next research work.

Conflict of interest

None declared.

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Interpreting Competitive Advantage : Evidence from Existing Literature

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Abstract

The importance of competitive advantage cannot be overemphasized. Every firm strives to gain some advantage in the market that they operate. A vast amount of research has gone into the different aspects of competitive advantage, and yet, a universally accepted definition has not emerged to date. Definitions that have appeared are few and far between. Only one paper focused on its measurement, though the author did not find any instance of it having been used in the industry or academia. Therefore, the objective of this paper was to collate different perspectives of competitive advantage existing in the extant literature and present the current understanding of the term. The papers published in the last two decades have been taken into consideration. This article has been written carefully by selecting leading literature on competitive advantage from databases such as Google Scholar, Proquest, JSTOR, and miscellaneous sources. Also, a workable definition of competitive advantage was included in the discussion section, fulfilling the gap. This study is unique in the sense that it tries to fulfil the lonazag-felt need for a formal, simple, and easy to interpret definition of competitive advantage.

Keywords

Competitive Advantage, Definition, Measurement, Perspective, Understanding

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Attribute Preference Hierarchy Based Segments in the Indian Car Tyre Replacement Market – An Exploratory Study

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Abstract

Purpose: This study was undertaken during February-June 2019 to understand the attributes car owners considered while making a tyre purchase decision, and to understand if any meaningful customer segments emerged on the basis of their attribute preference hierarchy. Review of literature did not find much of note on this topic. This paper filled this void in research. This paper provided usable insights for the $ 8.5 billion Indian tyre industry.

Approach: Exploratory personal interviews of car owners were conducted in the city of Bangalore to arrive at a consideration set of seven unique attributes. These attributes were then tested for their relative importance by conducting a mix of personal and online surveys on a pan India level. A total of 112 responses were analyzed to arrive at the top five attributes. As a next step, the κ-means clustering technique was applied to the 112 responses to arrive at meaningful customer segments.

Findings: The top five attributes which emerged as critical to the tyre purchase decision were – quality, price, brand, safety, and reliability. Four unique segments emerged with unique attribute preferences. The first segment considered quality and price as the top attributes and no significant importance was attached to the other attributes. The second segment only looked at brand and quality while deciding on the purchase. The third segment looked at safety along with brand and price as the top decision attributes. The fourth segment was very peculiar as it assigned equal importance to all five attributes.

Keywords

Consumer Behavior, Tyre Purchase Attributes, Cluster Analysis, Indian Tyre Market.

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Impact of OTT media on the society: insights from path analysis

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Abstract

Purpose

The proliferation of the internet has enabled over-the-top (OTT) media to spread rapidly. It is now at the threshold of creating a huge social impact. However, there have been no studies so far that have examined the impact of OTT media on society, family and individuals. This study proposes to investigate the same and discover its impact on the family, society and whether it has any effect on individuals' career or education and one's health.

Design/methodology/approach

Path analysis was used to investigate the patterns of the effect of OTT on the family and society. This method was chosen since it allows to examine the influences within a system of variables and gain insights into the OTT media's impact. The responses were collected through an online questionnaire.

Findings

The paper provides empirical insights into the impact of OTT media. It reveals some interesting and crucial insights on its influence.

Research limitations/implications

Social implications

With watching OTT emerging very rapidly as a powerful channel of entertainment, what people see is very important. Hence, the purpose of this empirical study to investigate the influence of OTT media on individual, family and society is crucial and topical.

Originality/value

This paper fulfils an identified need to understand OTT media's influence.

Keywords

OTT media | Path analysis | Social impact | Family and individuals | Society | Influence

Citation

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The necessity of machine learning in clinical emergency medicine; a narrative review of the current literature

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Abstract

Clinical databases may be categorized by medical experts as massive records that consist of massive portions of facts. These facts can include medical health sufferers and their scientific conditions. Analyzing the quantitative and qualitative medical records further to produce relationships amongst a massive variety of samples requires the use of machine learning strategies. These strategies will unveil hidden scientific know-how in phrases of correlation and affiliation of reputedly impartial variables. This review intends to focus on the use of a predictive set of rules for the prediction of trauma sufferers on admission to the health center if the medical industry wants to are expecting the vital remedy for sufferers and furnished the vital measures for the trauma sufferers who are earlier than getting into the crucial situation. Managing large data sets is a challenge for most medical systems that involve Artificial Intelligence. This study offers an overview of machine learning applications in medical medication, and specifically the ability to respond to emergencies. The relevant, recently posted research on machine learning and scientific records with a focal went through various investigation procedures. The goal of this process was to address professionals and the challenge of such approaches in clinical medicine. The effects of this look may be utilized in the prediction of trauma patient's reputations six hours after admission to the health center.

Introduction

Scientific sciences and technology must deal with health issues and ensure people can receive quality health care at the right time. It is a particularly important concept in the modern-day world with diseases such as the Covid 19. Most necessities to attaining this intention are understanding the situation of the frame, its responses to outside and inner stimuli, and the way they affect the inner and outside elements of the frame's system. With a deeper knowledge of the human frame, the moves and interactions of its diverse organs can be decided and understood. Nevertheless, those achievements are constrained withinside the c language of viable experiments. Experimental outcomes display the reflex of various organs (subsystems) into inner and outside inputs withinside the frame. Therefore, as quickly as an alternative turn into more potent or wider, the range of subsystems worried about developing responses will increase. Machine learning has been crucial in the response to emergency issues such as the Covid 19 pandemic [1]. It must be referred to that the environmental effects are not frequently individual, and the elements that affect their interplay with subsystem will purpose greater complicated responses to be issued through the frame. This count number can be greater complex while the frame is modified through underlying illnesses withinside the everyday population. This country will purpose one-of-a-kind responses and problems for predicting the frame's changes using machine learning techniques (see Fig. 1).

Machine learning has been crucial in relieving the burden medical health experts undergo when managing large batches of information. The machine has allowed medical researchers to improve the speed and efficiency with which they can come up with useful data for helping patients with emergency care challenges. With the opportunity of accumulating an affected person's records and the emergence of large statistics in numerous regions associated with health, statistical checks misplaced their cap potential to research the scenario and discover the most important factors. As noted above, figuring out the complexity of the frame and the interplay of this complicated source of data is regularly often a serious challenge. So, computation tools such as artificial intelligence are proving to be crucial in the medical industry [2].

Over the past few years, machine learning has not been of significant focus in the medical industry. It is a form of technology that has come to the foreground in the past few years, and medical experts are still figuring useful ways to leverage such technology. The want for a pinnacle evaluation gadget coincided with the emergence of machine learning - the procedure of expertise discovery- which becomes an aggregate of system learning, professional structures, statistics, etc. Such gadgets confirmed higher information of the procedure and prediction of the destiny overall performance of complicated structures with evaluation in their performance in financial and navy fields. Machine learning can display the underlying styles of a gadget together with the capabilities of every subsystem withinside the face of changes [3], [4]. The most important purpose of machine learning is to extract hidden expertise from completely massive data sources which are not always feasible to examine through traditional techniques [5]. The traditional machine learning procedures make it feasible for proprietors of large statistics to higher apprehend the dependency on a few of the attributes of the samples in a large dataset and interpret the subsystem techniques and create laws and predictions of the corresponding subsystem behavior. Table 1 below shows the coefficients for the GLM model. It is a figure that provides information on the coefficients for the 9 model features of a machine learning system that has proven successful in the medical industry.

Emergency techniques are at the front line of sanatorium scientific offerings and are a branch that human beings are trying to find hospital treatment at once after an emergency. Machine learning is a brand-new approach that increases the synthetic intelligence and ability of medical systems to manage data using modern measures. It is that specialty in database re-evaluation which includes the purpose of coming across the precious records approximately unknown databases and additionally to decide the statistics pattern. Machine learning is utilized in scientific associated studies to discover the discount of affected person proceedings which stand up from inadequate and unsuitable remedies [6]. Therefore, machine learning and statistics, and machine learning will improve the scientific first-rate and additionally shop the waste of scientific resources. Shi et al. confirmed that emergency triage and the scheduling shift of physicians with the aid of machine learning analysis techniques will lessen the type of noises and decide the classifying degrees of triage with the aid of using type. Machine learning techniques will grow the consistence of triage type in emergency remedy wherein they used 3 strategies of machine learning to grow this consistence. Computer gadgets may be used to generate requires a reservation. Also, they located that machine learning of affected person's remedies will assist to tell wondering the character paintings of emergency departments. The wondering with the aid of using procedure-primarily based had been used to derive an easy version of emergency branch operation.

Section snippets

3. Discussion

In current years, numerous researches had been completed on the usage of facts and machine learning schemes in distinctive clinical fields. Machine learning has proven to be important in the management of big data in the medical field [7], [8], [9]. Engineers have evaluated the adequacy of machine learning algorithms and fashions in distinctive regions of health. Based on the distinctive factors stated at the start of this article, a few pieces of research are mentioned below:

This count became…

Motivation

“Patients going with the drift is a subject that has been studied considerably with the aid of using numerous researchers of differing backgrounds. As a result, the literature related to the development of affected person go with the drift is huge and a various variety of strategies from one-of-a-kind disciplines are hired in a try and address the hassle. In this evaluation, we can often attend at the records of the way affected person go with the drift has been handled, in addition to…

Literature review on machine learning

Currently, imaging identity has grown to be a remarkable area of ML. Given the traits of an everyday series of the everyday backbone and the irregularity of scoliosis, ML has superiority in figuring out this disorder. To correctly display and diagnose an affected person with scoliosis, ML has been transformative. Screening can also additionally come across scoliosis in advance than it'd be clinically detected. With early detection, maximum instances may be managed with decrease charges and…

Outline

Figure one has done well to show that the system of hospitalization should involve the patients and every person that is involved in the entire process. Using this approach will ensure that the machine learning system for the organization can meet its goals and provide beneficial results. The system developers are also having to take factors such as the data, patient lifestyle, and various other emergency factors for the best results.

Using visualization techniques for this process will provide…

Prediction of emergency admissions

The impact of negative useful resource control on affected persons float inside the health facility is properly known. Conceptually, excessively affected person float may be carried out through the powerful stability of delivery and call for inside the system. If the delivery of beds, workforce, and the gadget is effective to be had to fulfill the wishes of sufferers arriving on the door, then few perceivable boundaries exist to save you their on-the-spot usage. That said, research on the…

Results and discussion

There are numerous problems with machine-mastering algorithms to bear in mind whilst we observe those clinically. One is its hassle with overfitting, that's a capability hassle with any prediction version. Overfitting takes place whilst the mastering set of rules acknowledges the fake sign or noise withinside the dataset because the sign and applies the prediction to the check dataset, ensuing in negative overall performance on new statistics or a lack of ability to externally validate the…

Conclusion

The ability to identify a useful system that can benefit modern medical facilities is crucial. In this case, we found out that the use of machine learning systems is proving crucial for managing big data in medicine. Furthermore, the use of resources such as NLP and various other resources are sitting at the heart of modern research methods and solutions. Using NLP is important because it's the way a machine learning resource can communicate. Researchers have to come up with better ways and…

CRediT authorship contribution statement

Ratchana Rajendran: Investigation, Writing – original draft. **Bhagyalaxmi Singirikonda:** Conceptualization, Writing – review & editing, Supervision. **Bhagyalaxmi Navpreet:** Formal analysis, Data curation. **Neetu Jain:** Conceptualization. **Mohd Naved:** Writing – review & editing. **Md. Khaja Mohiddin:** Conceptualization, Writing – review & editing, Supervision.…

Declaration of Competing Interest

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

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Cognitive Dissonance in Online Shopping in an Emerging E-tailing Market

Haritha S.[1] and Bijuna C Mohan[2]

Abstract

The paper investigates cognitive dissonance in the context of online shopping of electronic products. The study attempts to analyze the influence of product involvement and perceived risks on cognitive dissonance. To the best of the authors' knowledge, this is one of the first studies to assess the impact of perceived risks on cognitive dissonance in the online purchase of electronic products in an emerging and thriving market like India. This study contributes significantly in understanding online buying behavior in electronics product category which is currently growing exponentially due to the pandemic. The study further analyzes the impact of cognitive dissonance on satisfaction. It also attempts to address the impact of satisfaction on repurchase intention and Electronic Word of Mouth (EWOM). The study analyzed the reaction of 716 respondents to a structured self-administered questionnaire. Data were analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM).The study reveals that cognitive dissonance significantly impacts satisfaction and satisfaction largely impacts repurchase intention and EWOM. The study further shows that product involvement influences cognitive dissonance. On the other hand, perceived risks did not have a significant relationship with cognitive dissonance.

Keywords: *Cognitive dissonance; product involvement; perceived risks; repurchase intention; EWOM; online shopping; electronic products*

Introduction

The global retailing scenario experienced a massive change with the advent of E-tailing. With a shift in the demographics across countries, E-tailing boomed with consumers widely accepting the same. In the year 2020, E-retail sales surpassed 4.2 trillion US dollars worldwide (Coppola, 2021). However, developed economies are witnessing a saturation in the number of online shoppers. Developing economies are witnessing significant growth in E-tailing companies. In such situations, the retention of consumers becomes very important. Understanding the behavior of online shoppers from the perspective of cognitive dissonance theory can aid in positive outcomes pertaining to repurchase intention, satisfaction and EWOM. After making a purchase decision, a consumer can face anxiety concerning the adverse consequences of the chosen alternative or the positive outcomes of the unchosen alternative (Brehm , 1956). Within the context of online shopping, these anxieties can lead to order cancellation, product returns (Lee, 2015; Powers and Jack, 2015), dissemination of negative EWOM. Any of these adverse outcomes can lead to the loss of customers.

Cognitive dissonance is one of the most extensively researched concepts in psychology. In recent years, there has been a surge in research on cognitive dissonance in management studies

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(Hinojosa et al., 2016). Cognitive dissonance as a theory has been applied in marketing extensively in areas of services marketing (Kim, 2011; Mousavi et al.,2020), online retailing (Clark and Das, 2009; Li and Choudhary, 2020), product returns (Lee, 2015; Powers and Jack, 2015) etc. Cognitive dissonance in itself can lead to either positive or negative outcomes. Once an E-tailer identifies the same, they can try to reduce cognitive dissonance through multiple ways.The majority of the studies focusing on the relationship between satisfaction and cognitive dissonance differ either in context (Koller and Salzberger, 2009; Mao and Oppewal, 2010; Kim, 2011; Wilkins et al., 2016) or theoretical underpinnings (Lin et al., 2018; Balakrishnan et al., 2020). Many of these studies were primarily conducted in developed economies. The demographics of developed economies significantly differ from developing economies in terms of ethno-socio-economic aspects (Tandon and Kiran, 2019), and each economy also differs in terms of regulatory aspects. To the best of our knowledge, there is no empirical study conducted to address this research gap in the context of online shopping in an emerging E-tailing market like India. The current research is motivated to fulfil this research gap. The study extends the existing literature by focusing on the relevant drivers of cognitive dissonance in a growing economy like India.The study further aims to analyze the relationship between satisfaction, repurchase intention, and EWOM.

E-tailers in India are trying to figure out ways to become profitable. To date, the top most E-tailers are only incurring huge losses year on year despite the growing adoption of online shopping. E-tailing giants Flipkart and Amazon incurred losses of 747 million US dollars (ET Bureau, 2019) and 958 million US dollars (PTI, 2019). Online shopping has become more critical, with more customers purchasing online due to multiple reasons like demonetization, pandemic (Manoharan et al., 2021; Statista, 2021). With an increasing customer base, it is essential to identify cognitive dissonance and its repercussions and mitigate losses in terms of returns, order cancellations, cart abandonment. The present study focuses mainly on the Electronics product category. It contributes to the highest Gross Merchandising Value (GMV) of 40 percent among all the product categories sold on online shopping portals in India (IBEF, 2020). The few studies that tried to assess cognitive dissonance in the purchase of related product categories like mobiles and computers were either experimental in nature or student surveys (Graff and Kittipong, 2012; Liao, 2017), and hence one cannot generalize the findings. Even though cognitive dissonance as a theory was explored in various contexts, researchers have not empirically tested the same for the consumer electronics category in online shopping. Consumer Behavior may vary significantly across categories. Applying cognitive dissonance theory across all the categories in online shopping may not appropriately justify the reason and impact of cognitive dissonance among consumers. Hence, the present study focuses on a single product category i.e. electronics product category.

Literature Review and Hypotheses

Product Involvement

Any purchase requires consumer involvement, the level of involvement can either be low or high depending on the relevance of the product and situation. There are different kinds of involvement that have evoked the interests of researchers. However, the most commonly researched involvement is product and purchase decision involvement. Product involvement is viewed as a consumer's enduring perception of the product category based on the consumer's inherent needs, values and interests (Wulf et al., 2001). Different products garner

different levels of involvement Tyebjee,1979). The amount of effort and time spent on purchasing a high involvement product is generally higher than a low involvement product due to the rigorous list of logical activities that are a part of decision making (Greenwald and Leavitt, 1984). Usually, high involvement products require more financial investment and have a higher impact than a low involvement product (Gu et al., 2012). Automobiles, consumer electronics are some of the commonly considered high involvement products (Laurent and Kapferer, 1985). (Ko, Jung, Kim, & Shim, 2013)

Perceived Risks

Perceived risk is defined as a combination of uncertainty and the seriousness of the outcome involved (Bauer, 1960). Consumers' perception of risk plays a significant role in influencing their evaluations and purchasing behaviors (Ko et al., 2004). Consumers often perceive higher risks with online purchases than a purchase made in a traditional offline store. As consumers perceive higher risk, the purchase intention of a consumer decreases (Lee and Tan, 2003). Consumers perceive several risks in online shopping like product performance risk, financial risk, security risk, privacy risk, etc. Chang et al.(2005) identified product risk, credit card fault risk, and security risk as significant to online shopping. Forsythe et al.(2006) summarised financial risk, product risk, psychological and convenience risk as more important in online shopping. However, the importance of these perceived risks may vary in order based on whether the economy is developed or developing economy. Perceived performance risk, perceived financial risk, perceived time loss risk affect the buying decision of Indian consumers to a greater extent (Guru et al., 2020). The present study incorporated items of perceived performance risk, perceived financial risk, perceived time loss risk to measure overall perceived risks.

Cognitive Dissonance

There has been a considerable spike in the study of cognitive dissonance in management (Hinojosa et al., 2016). However, due to the complexity of the construct, measurement and constant use of experiments have drawn much criticism from researchers (Aronson,1992; Cooper,2007). Marketing researchers have realized the importance of understanding this complex construct as it can significantly impact post-purchase constructs like repurchase intention, satisfaction, Word of Mouth (WOM). Festinger's (1957) seminal research states that a person facing conflicting beliefs will experience cognitive dissonance. A consumer experiencing dissonance will try to mitigate the same by various techniques and restore the psychological balance (Brehm, 1956; Festinger, 1957). Marketers use terms like regret, post-purchase anxiety to address such situations. E-commerce can attract more scenarios of consumers experiencing cognitive dissonance since customers lack touch and feel of the product, a massive assortment of products, purchasing process; hence it becomes all the more important to understand this construct within online settings (Soutar and Sweeney, 2003; Yap and Gaur, 2014).

Satisfaction

In addition to profitability, satisfaction drives the long-term growth of online stores (Chen and Cheng, 2012). Satisfaction is one of the most extensively researched topics in marketing, as satisfaction is considered a precursor to many positive outcomes like loyalty, positive recommendations, etc. A consumer tends to be satisfied when the perceived performance of

a service or a product exceed consumer expectations leading to a pleasurable outcome (Oliver,1999). Researchers have analyzed satisfaction as a dependent variable (Ballantine 2005; Tandon and Kiran, 2017) and have identified different factors that influence satisfaction in the online shopping context. Understanding satisfaction is more relevant and vital in the online shopping context. The chances of a dissatisfied customer switching to a different online shopping portal are high due to low switching costs (Jones et al., 2000; Zhang et al., 2012).

Repurchase Intentions

A customer's judgement of repeat buying of a designated service from a company considering his/her current situation and likely circumstances can be referred to as repurchase intention (Hellier et al., 2003). The profitability of E-tailing firms is a significant concern. According to Baveja et al.(2000), in a study conducted along with Bain and Company, the average online shopper was profitable only if consumers purchased atleast four times from the retailer. A firm's profitability is highly dependent on consumer's loyalty and repurchase intentions. (Chiu et al., 2009). Retention of customers is far less expensive than acquiring new customers (Spreng et al., 1995), indicating the importance of repurchase intentions.

Electronic Word of Mouth

EWOM has become an essential communication tool, information search, and product recommendations for consumers while shopping online. EWOM is defined as the dynamic process of communicating any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet (Hennig-Thurau et al., 2004; Ismagilova et al., 2017). Off late information provided by other consumers as EWOM has become an unprecedented source of information for consumers compared to traditional sources like salespeople or marketers (Bickart and Schindler, 2001). Disseminating WOM is much easier in online portals than offline, and more often higher the positive EWOM shared, the higher is the sales (Chevalier and Mayzlin, 2006). However, researchers have identified that negative reviews can be more harmful than positive reviews (Mizerski, 1982; Bone, 1995; Chevalier and Mayzlin, 2006).

Product Involvement and Cognitive Dissonance

The relationship between product involvement and cognitive dissonance has evoked considerable interest from several researchers (Aronson, 1968; Brehm and Cohen, 1962; Korgaonkar and Moschis, 1982; George and Edward, 2009; Kim, 2011) since the 1960s. However, this relationship may vary in online shopping. It is assumed that, unlike traditional channels, the consumer may be more involved in the purchase of high involvement products like electronics owing to intangibility and product delivery risks. Cognitive dissonance is generally associated with purchases of high product involvement (Korgaonkar and Moschis, 1982; Sweeney et al., 2000; Kim, 2011). However, few researchers identified cognitive dissonance relevant to low product involvement (Gbadamosi, 2009; Nordvall, 2014). Most of the research on product involvement and cognitive dissonance was conducted in developed economies and used either experiment or focus group discussions. The present study uses a large-scale survey to analyze the relationships. The following hypothesis is suggested based on literature review

H1: Product involvement positively influences cognitive dissonance in the context of online shopping.

Perceived Risks and Cognitive Dissonance

Medical research on health hazards on smoking most commonly examined the relationship between perceived risks and cognitive dissonance. This relationship was later studied in different subject areas of management. Perceived risk and cognitive dissonance occur in similar situations of lack of information about product/service and familiarity with the product or brand (Soutar and Sweeney, 2003). Hence, Sweeney (2003) suggested that perceived risk could act as an antecedent to cognitive dissonance. Perceived risks in the pre-purchase phase lead to cognitive dissonance in the context of holiday bookings (Koller and Salzberger, 2009). Not many studies have analyzed the relationship between cognitive dissonance and perceived risks in online shopping. According to Koller et al.(2008), the relationship between perceived risk and cognitive dissonance was insignificant in an e-commerce setting compared to the offline environment. In the situation of a consumer exposed to low quality-website information, a consumer might assume higher perceived risks leading to lower expectations and lower cognitive dissonance (Li and Choudhary, 2020). However, researchers are yet to explore the relationship between perceived risks and cognitive dissonance in reputed online shopping portals like Amazon, Flipkart, etc. We can see that the nature and directionality of the association are varying according to different contexts. E-tailers need to understand this relationship better to ensure their consumers make the final purchase on their shopping portals. There is extremely sparse literature on understanding the relationship between perceived risks and cognitive dissonance in an emerging E-tailing market. Based on the literature review, the following hypothesis is considered.

H2: Perceived risks influence cognitive dissonance in the context of online shopping.

Cognitive Dissonance and Satisfaction

Generally, cognitive dissonance leads to arousal of discomfort, doubt about the purchase in a consumer. These doubts, discomfort if not reduced, leads to cognitive dissonance. Across different contexts, researchers (Montgomery and Barnes, 1993; Oliver, 1997; Sweeney et al., 2000; Koller and Salzberger, 2009; Salzberger and Koller, 2010; Mao and Oppewal, 2010; Kim, 2011; Park et al., 2012; Esfidani, 2014; Marikyan et al., 2020) have posited that cognitive dissonance negatively impacts satisfaction. Furthermore, in online shopping, cognitive dissonance better explains satisfaction than disconfirmation under similar conditions (Park et al., 2015). Researchers have excluded concern over the deal dimension, stating that it is relevant to only offline. However, the dimension has been considered for the present study by excluding a measurement item that was relevant for offline retail. The intent of considering the dimension of concern over the deal is, online retailers are equally persuasive as the offline salesmen in terms of promoting offers, and discounts through emailers, push notifications, text messages, cart abandonment messages and so on. Despite being enthusiastic about buying in such offers, customers have concerns and second thoughts post-purchase. Even though researchers have consistently proven that cognitive dissonance impacts satisfaction, the quantum of impact may vary across different contexts, and this might provide a case for organizations to strategize for reducing cognitive dissonance. Based on the extensive literature review, the below hypothesis is considered for empirical testing.

H3: Cognitive dissonance negatively impacts satisfaction in the context of online shopping.

Satisfaction and Repurchase Intention

Satisfied customers generally but not always tend to be loyal customers. They are the customers who end up buying again from the online portals. Satisfaction acts as a determinant in consumers' decision to continue or stop their relationship with the product or service they used. (Chung and Shin, 2010). In online shopping, the relationship indicating satisfaction leads to repurchase intention was validated by several researchers (Sanchez-Garcı´a et al., 2014; Lin and Lekhawipat, 2014; Javed and Wu, 2019). Within the framework of cognitive dissonance, the relationship between satisfaction and repurchase intention was empirically tested by Keng and Liao (2009) in offline shopping of electronic products, Mao and Oppewal (2010) in choice of university, and Salzberger and Koller (2012) in the purchase of books and results across these studies indicated a positive relationship between satisfaction and repurchase intention. However, there were certain limitations in these studies, many of these used experiments and categorical questions to measure repurchase intention, and these relationships were tested in different contexts. An attempt is made to address the gap of understanding the relationship within online purchases of electronic products.

H4: Satisfaction positively impacts repurchase intention in the context of online shopping

Satisfaction and EWOM

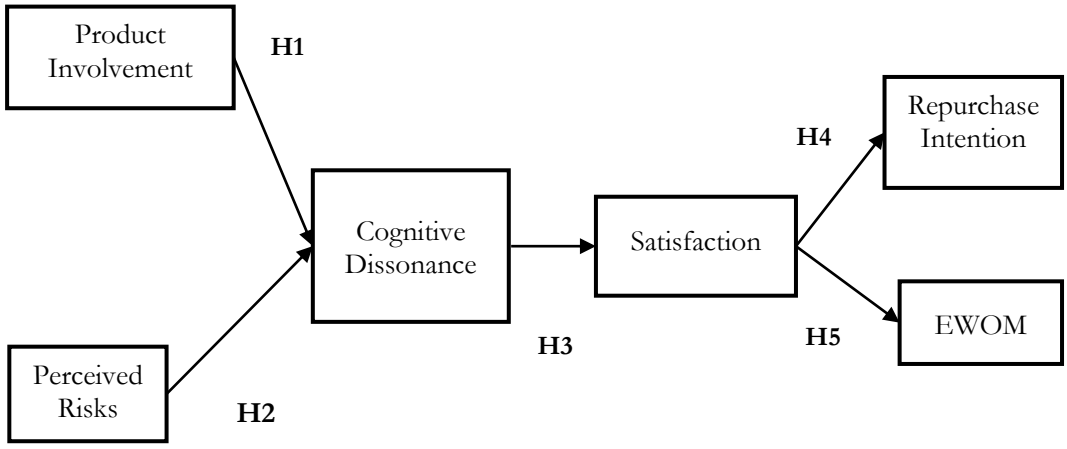
Satisfied customers are the most likely to share positive recommendations or positive EWOM about a product or a service they have used; not all satisfied customers end up giving positive reviews. Researchers in different contexts have consistently proven that satisfied customers are more likely to engage in positive WOM (Duarte et al., 2018; Anastasiei and Dospinescu, 2019; Leung, 2020). In the current times, it is evident that before making a purchase decision, a consumer scans for EWOM about the product/service as consumers find user-generated EWOM to be more accurate and trustworthy (MacKinnon, 2012; Park et al., 2011). An E-tailer must ensure customer satisfaction is achieved as a dissatisfied consumer is considered to generate more negative EWOM than a satisfied consumer (Anastasiei and Dospinescu, 2019). Within the framework of cognitive dissonance, Mao and Oppewal (2010) identified that satisfaction positively impacts WOM. The present study aims to understand the relationship between satisfaction and EWOM in the context of online shopping, and hence the hypothesis follows.

H5: Satisfaction positively impacts EWOM in the context of online shopping

Conceptual Framework

Based on the extensive literature review, the conceptual framework in figure 1 is proposed.

Figure 1. Conceptual Framework



Research Methodology

Data Collection and Sampling

A descriptive research design was used for the present study. Descriptive research studies focus on understanding characteristics of the study population. The present study focuses on online shoppers who have made an online purchase of electronics products.The present study is a quantitative study that uses a structured approach for data collection and analysis. To collect data, a self-administered questionnaire was used. The questionnaire was administered to respondents in the metropolitan cities of Mumbai, Delhi, Bengaluru, Hyderabad, and Kolkata. These cities were considered as the online shoppers from these cities, contributed to a higher percentage of total online sales in the country (IBEF,2020). Convenience sampling was used as sampling frame for online shoppers is not accessible. Several studies in the domain of online shopping have used the same sampling technique (Amaro and Duarto, 2015; Daroch et al.,2021; Nguyen et al., 2021), The questionnaire was administered to a total of 977 people, out of which 716 responded successfully. It was ensured that all the respondents made an online purchase of electronic products.

Research Instrument

The research instrument was based on prevalidated measurement scales which were identified through literature review. The measurement items and their sources are clearly mentioned in the table 1.

Table 1. Research Instrument Development

Construct	Measurement Items	Source
Product Involvement (PINV)	The measurement items measured the "importance", "relevance", "interest", "expertise", for the specified product category	O Cass (2004) and Hong (2015)
Perceived Risks (PR)	The measurement items measured risks pertaining to "products", "confidentiality of personal information", "lack of tangibility", "delivery	Forsythe et al.(2006) and Cases (2011)

	risks", "difficulties in placing order online" "security risk pertaining to credit card/debit card"	
Cognitive Dissonance (CD)	The emotional dimension measured if the respondent felt "depressed", "anger", "pain". The wisdom of purchase dimension measured if the "product was really needed" "if the product was the right choice". The concern over the deal dimension measured if the respondent was "fooled" by the deal or if "something was wrong with the deal".	Sweeney et al. (2000)
Satisfaction (SAT)	The satisfaction scale measured if the respondent would "recommend" the online shopping portal, if one was "pleased", "satisfied" and considered the decision to be a "wise" decision.	Pappas et al.(2013), Olorunniwo et al.(2006)
Repurchase Intention (RI)	The repurchase intention scale measured if the consumer is likely to "continue" online shopping in future. It also measured the "probability" of purchasing from the preferred online shopping portal.	Khalifa and Liu (2007); Zhou et al.(2009)
EWOM	The EWOM scale measured if the respondent spoke "frequently" "spoke to many people" about the online shopping portal. It also measured if the consumer spoke "favorably", "positively" about the online shopping portal.	Goyette et al. (2010).

Data validation and Analysis

SPSS 23 and Smart PLS 3.0 were used for analysis. SPSS was used to analyze descriptive statistics, and PLS was used to analyze both the measurement model and structural model. PLS is considered to be an effective second-generation data analysis technique. According to Hair et al. (2018), it is ideal to use PLS-SEM in extension of existing structural theory. PLS is generally used in the early stage of theoretical development to test or validate exploratory models (Henseler et al., 2009). PLS is considered appropriate in research when assumptions of multivariate normality and interval scaled data cannot necessarily be made (Hair et al., 2016).

Common Method Bias

Common Method Bias (CMB) may occur due to the incomplete cognitive effort of respondents while answering long structured questionnaires. Common Method Variance (CMV) identifies if CMB exists (Fuller et al., 2015). For the present study, construct anonymity was maintained to reduce the bias (Podsakoff and Organ, 1986). To further check the existence of CMB, Harman's single factor test was conducted; the first factor accounted for 32.14 percent of the total variance, which is less than the threshold of 50 percent (Podsakoff and Organ, 1986). Hence we can safely assume that the CMB is not a threat to the current study.

Socio-Demographic Profile of Respondents

Respondents' socio-demographic profile is shared in table 1. The majority of the respondents belonged to the age group of 25-34 years, followed by 18-24 years. Female respondents were slightly higher than male respondents at 53.8 percent. 55 percent of the respondents were post graduates.41.3 percent of the respondents earned a monthly income of more than 1,20,000 Rs. The majority of the respondents were married. Sixty-two percent of the respondents were wage employed. Respondents with internet experience of greater than 12 years were the highest with a percent of 45.40. The frequency of purchase of respondents was low, with 36.2 percent of the respondents purchasing only 1-2 times.

Table 2. Socio-Demographic Profile of Respondents

Demographic characteristics	**Number of Respondents**	**Percent**
Age Groups		
18-24 years	169	23.6
25-34 years	309	43.2
35-44 years	148	20.7
45-54 years	48	6.7
55 years and above	42	5.8
Gender		
Male	331	46.2
Female	385	53.8
Educational Qualification		
Matriculation	1	0.1
Higher Secondary	61	8.5
Under Graduate	210	29.3
Post Graduate	394	55.0
Doctoral	50	7.0
Marital Status		
Married	424	59.2
Unmarried	292	40.8
Employment Status		
Self-employment	125	17.5
Wage Employment	450	62.8
Unemployed	91	12.7

Source: Research Survey Data

Structural Equation Modeling

SEM analysis is divided into two stages: the measurement model and the structural model (Henseler and Chin, 2010). A measurement model is used to calculate the reliability and validity of data (Hair et al., 2014). Construct reliability is measured both by the outer loadings of individual items which were above the acceptable value of 0.6 (Sarstedt et al.,2014), and Cronbach's alpha which was all above the acceptable value of 0.7 (Nunnally, 1978; Hair et al., 2016), the same has been shown in table 3.

Convergent Validity

Convergent validity measures the extent to which each measurement item is related to its theoretical construct. According to Fornell and Larcker (1981), a construct is said to possess

convergent validity if more than 50 percent variance is explained by its underlying construct, i.e., the mean of the squared multiple correlations should be at least 0.50 (Fornell and Larcker,1981). This is measure using the Average Variance Extracted (AVE) values which are expected to be above 0.5 for convergent validity to exist (Hair et al., 2010).

Table 3. Reliability statistics of the study constructs

Constructs	Items	Loading	AVE	CR	Alpha
Product Involvement (PINV)	PINV1	0.829	0.605	0.902	0.849
	PINV2	0.758			
	PINV3	0.714			
	PINV4	0.719			
	PINV5	0.828			
	PINV6	0.810			
Perceived Risks(PR)	PR1	0.889	0.626	0.953	0.860
	PR2	0.798			
	PR3	0.789			
	PR4	0.761			
	PR5	0.861			
	PR6	0.877			
	PR7	0.798			
	PR8	0.862			
	PR9	0.850			
Cognitive Dissonance (CD)	CD1	0.818	0.692	0.953	0.945
	CD2	0.862			
	CD3	0.849			
	CD4	0.895			
	CD5	0.803			
	CD6	0.860			
	CD7	0.767			
	CD8	0.811			
	CD9	0.817			
Satisfaction(SAT)	SAT1	0.937	0.864	0.974	0.959
	SAT2	0.951			
	SAT3	0.951			
	SAT4	0.948			
	SAT5	0.954			
	SAT6	0.831			
Repurchase Intention(RI)	RI1	0.838	0.835	0.953	0.928
	RI2	0.937			
	RI3	0.943			
	RI4	0.932			
EWOM	EWOM1	0.837	0.678	0.913	0.715
	EWOM2	0.914			
	EWOM3	0.899			
	EWOM4	0.713			
	EWOM5	0.728			

Discriminant validity

Discriminant validity indicates the extent to which the items of a construct are different from those of other constructs. Discriminant validity can be assessed using the cross-loading indicator, Fornell and Larcker criterion, and Heterotrait-Monotrait (HTMT) of correlation. For the present study, Fornell and Larcker criterion and Heterotrait-Monotrait (HTMT) were used to assess discriminant validity. Based on the Fornell and Larcker criterion (1981), the AVE values across the diagonal are greater than the squared latent correlations, which indicate that the assumption of discriminant validity is supported.

According to Henseler et al., (2015), for a structural model to possess discriminant validity, the HTMT values should be below 0.9; as seen in table 5, all the values are below the threshold of 0.9, indicating discriminant validity.

Table 4. Discriminant validity using the Fornell Larcker Criterion

Study Constructs	PINV	PR	CD	RI	SAT	EWOM
PINV	**0.778**					
PR	0.336	**0.791**				
CD	0.156	0.037	**0.832**			
RI	-0.023	0.076	-0.341	**0.914**		
SAT	0.041	0.054	-0.365	0.889	**0.929**	
EWOM	0.071	0.031	-0.305	0.732	0.772	**0.823**

Table 5. Discriminant validity using HTMT ratio

Study Constructs	PINV	PR	CD	RI	SAT	EWOM
PINV						
PR	0.373					
CD	0.149	0.045				
RI	0.075	0.057	0.350			
SAT	0.117	0.066	0.366	0.878		
EWOM	0.126	0.124	0.318	0.810	0.857	

As the research instrument has adequate convergent validity and discriminant validity, the independent constructs were tested for multicollinearity. The Variance Inflation Factor (VIF) obtained was below the threshold value of 5 (Hair et al., 2014), indicating multicollinearity was not a concern for the present study.

Structural Model Assessment

Based on the structural model, hypothesis H1 is accepted with a β-value of 0.152 and with a significance level of <0.01, indicating the relationship is highly statistically significant. Hence product involvement positively affects cognitive dissonance in the online purchase of Electronic Products. However, hypothesis H2 is rejected because the β-value of 0.01 is statistically insignificant with a P-value of 0.855. The directionality of the relationship is in tandem with past research (Koller et al., 2008; Kim, 2011). However, within the context of online shopping in India, the relationship is insignificant.

Hypothesis H3 is accepted with a β-value of -0.365 and p<0.01, indicating the relationship is highly statistically significant, these findings are in line with the findings of past researchers (Sweeney, 2000; Nadeem, 2007; Graff and Kittipong, 2012; Lin et al., 2018). This indicates

that cognitive dissonance has a negative impact on satisfaction. Satisfaction and repurchase intention have a strong positive relationship with the highest β-value of 0.879 and p<0.01, indicating that it is extremely important for consumers to be satisfied, and hence we accept H4. The relationship between satisfaction and EWOM is significant and positive with a β-value of 0.814 and p<0.01. All the items in the construct of EWOM are positively worded, indicating that a satisfied customer is a harbinger of positive EWOM.

Figure 2. Structural Equation Modelling

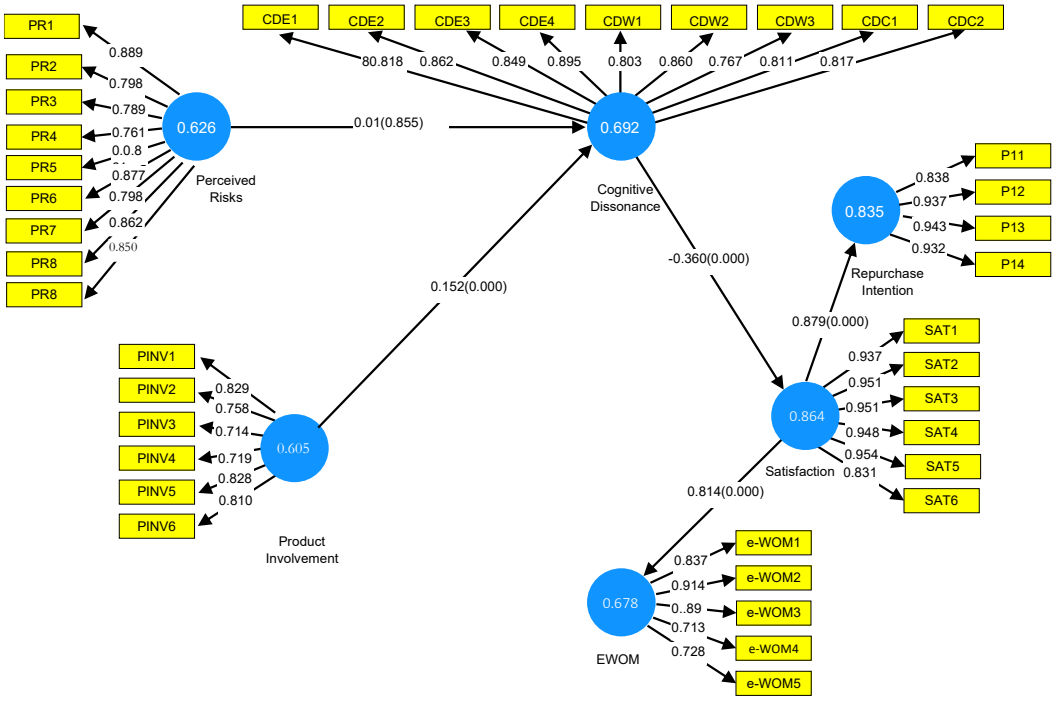


Table 6. Path Coefficients

Path	Hypothesis	β-value	t-value	Results
PINV → CD	Product involvement positively influences cognitive dissonance in the context of online shopping.	0.152**	4.288	H1 accepted
PR → CD	There is a significant positive relationship between perceived risks and cognitive dissonance in the context of online shopping.	0.01	0.183	H2 rejected
CD → SAT	Cognitive dissonance negatively impacts satisfaction in the context of online shopping.	-0.365**	9.798	H3 accepted
SAT → RI	Satisfaction positively impacts repurchase intention in the context of online shopping	0.879**	74.3	H4 accepted
SAT → EWOM	Satisfaction positively impacts e-WOM in the context of online shopping	0.814**	52.41	H5 accepted

Source: Research Survey Data. * Indicates statistical significance at p≤0.05** indicates statistical significance at p≤0.01

Results and Discussion

The study investigated the impact of product involvement and perceived risks on cognitive dissonance and examined the influence of cognitive dissonance on satisfaction in the context of online shopping. The study also assessed the impact of satisfaction on repurchase intention and EWOM. The results show that cognitive dissonance has a substantial impact on satisfaction in the online context. Satisfaction has a very strong impact on repurchase intention, followed by EWOM. The study also indicates that cognitive dissonance is influenced by product involvement and perceived risks has no significant impact on cognitive dissonance. β-value between product involvement and cognitive dissonance was 0.152, indicating product involvement does have a positive relationship with cognitive dissonance. The results are consistent with previous findings (Korgaonkar and Moschis, 1982; Sweeney et al., 2000 Kim, 2011).

Perceived risks did not have a significant relationship with cognitive dissonance; this is in line with the findings of Koller et al. (2008). Unlike other studies (Koller and Salzberger, 2009), where perceived risks in the pre-purchase phase led to cognitive dissonance in the post-purchase phase, the present study did not elicit any relationship between the two variables. The perceived risks experienced by consumers might be less owing to the efforts taken by the E-tailers on return policies, provision of a 1-year warranty from the manufacturer, proper invoicing, easy payment options, etc. Better clarity regarding the relationship can be obtained if the respondent is further probed to mention if the E-tailer or a marketplace vendor fulfils the order. Also with increasing double income families, internet penetration and pandemic, not many consumers might perceive online shopping as risky. The increasing adoption of digital payments, online shopping is not a choice but a necessity due to which people might be perceiving it as less risky (Nguyen, et al., 2021).

The relationship between cognitive dissonance and satisfaction with a β-value of -0.365 indicates that the higher the cognitive dissonance, the lower the satisfaction. The relationship between satisfaction and repurchase intention emerged as the strongest, with a high β-value of 0.879 indicating, how important it is to ensure consumers are satisfied. These findings align with past research (Mao and Oppewal, 2010, Park et al., 2012; Sharifi and Esfidani, 2014; Lin et al., 2018). The Electronics product category being a high ASP (Average Selling Price) category, repurchases would garner a good amount of revenue, unlike other categories. The relationship between satisfaction and EWOM indicates that the higher the satisfaction higher would be the dissemination of positive EWOM. Before making a purchase decision, consumers look for positive reviews and ratings across various online channels; this would help the consumer strengthen his stance on the purchase decision. It is essential to ensure that consumers positively recommend products they buy in the Electronics category mainly because consumers seek higher levels of EWOM as it is a high involvement product category (Fang et al., 2011).

Managerial Implications

This study has several implications for managers in the online shopping industry. The findings reveal that mitigating cognitive dissonance is of primary importance to increase satisfaction. Managers must understand cognitive dissonance and the factors influencing the same. Online

shopping is gaining momentum steadily, and Electronics as a product category has consistently been the highest contributor of sales. In post COVID era, unlike other sectors, online shopping has gained more popularity, and among the product categories that have gained popularity, and of all the categories electronics has gained maximum traction (UNCTAD, 2020). Hence, E-tailers can prioritize their marketing strategies by understanding better the consumer behavior of customers purchasing from this category. The empirical findings in the present study indicated that product involvement is positively related to cognitive dissonance. As online shoppers are more involved in purchasing electronic products, E-tailers can provide all the required information, product demo videos, installation videos and bifurcate the negative and positive reviews; this ensures consumers would stick to their particular online shopping portal for information rather than browse other websites. To ensure consumers do not face cognitive dissonance, E-tailers can improve their efforts in clearing consumer doubts and addressing their concerns regarding their purchase, these efforts can be focused on the direction of quicker turnaround time, better relationships with brands. Based on the findings, it is evident that cognitive dissonance has a significant impact on satisfaction, which eventually impacts repurchase intention and positive EWOM, which are extremely important for firms' profitability. Research has shown that it is challenging to get consumers to purchase again from the same online shopping portal than in traditional offline retail (Harris and Goode, 2004). Positive shopping experiences leading to satisfaction are likely to cause a positive evaluation and recommendation of the service provider and the brand of the product being purchased; this can be a win-win situation for both the brand and the E-tailers. Consumers who have more positive experiences and are satisfied with their purchase tend to post positive EWOM (Anastasiei and Dospinescu, 2019; Leung, 2020). E-tailers need to deep dive and try to determine what proportion of satisfied customers tend to post a review as this would give them a clearer picture of how to encourage more consumers to post positive EWOM.

Limitations and Future Research

Results represent the opinions of Indian consumers for the Electronics product category. Future researchers can break the parent category into different subcategories and check how cognitive dissonance varies across these subcategories. Future researchers can also explore how cognitive dissonance varies in other categories like Fashion, Home, and Kitchen products.

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Role of emerging markets vis-à-vis frontier markets in improving portfolio diversification benefits

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ABSTRACT

The study examines the value addition provided by frontier markets vis-à-vis emerging markets in improving the diversification benefits of an international portfolio. The analysis is performed for Asia-Pacific and Europe. It also surveys international investors to corroborate the empirical findings. The results indicate that though frontier markets offer higher diversification opportunities than emerging markets, the frontier market investments are recommended for investors with good risk appetite. Asia-Pacific emerging markets perform better than frontier markets in improving the portfolio's performance. European frontier markets' performance was adversely affected by Covid 19 pandemic. Overall, Asia-Pacific equity markets provide greater potential for diversification than their European counterparts.

1. Introduction

History does not repeat itself, but it often rhymes: Mark Twain

Frontier equity markets are reminiscent of the conditions that prevailed in emerging markets thirty years ago. Similar to the emerging markets of the 1990s, the frontier markets face issues like lack of political stability, weak macroeconomic environment, and poor physical infrastructure. However, over the last couple of decades, these markets have undertaken many reform measures, which have resulted in increased investors' confidence. Akin to the then emerging markets, investors today view frontier markets as an unexplored investment opportunity with great potential. High growth prospects, favorable demographics, low labor costs, along with low debt-to-GDP ratio, have made frontier markets an attractive investment avenue for global investors. Frontier markets have been consistently delivering good performance in terms of both risk-adjusted returns and dollar adjusted returns (Bloomberg, 2018). Since frontier markets serve as an attractive alternative asset class to investors, there is an upward trend amongst international institutional investors to shift their portfolio's exposure from emerging to frontier equity markets (Talbot, 2018). This evidences the ongoing debate

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amongst industry professionals if the value addition provided by frontier equity markets to an international portfolio is more than that of emerging equity markets.

This study empirically examines if the frontier markets outperform its emerging counterparts in enhancing the diversification benefits of an international portfolio. The analysis is performed across two geographies viz. Asia-Pacific and Europe. These regions are selected for two main reasons. First, both these regions house all three types of equity markets – developed, emerging, and frontier. Second, Asia-Pacific emerging and frontier markets are very dissimilar from European emerging and frontier markets. For instance, Asia-Pacific emerging markets have diverse regulatory environments and financial systems. In contrast, most of the European emerging markets are homogenous as they have taken a series of steps to get acceded to the European Union. In the universe of frontier markets, Asia-Pacific frontier markets are considered to be in a growing stage, whereas its European counterparts are considered to be the mature frontier markets. These reasons have motivated us to investigate if the roles of emerging and frontier equity markets in improving the performance of a portfolio differ across these two regions.

To assess the contribution of frontier and emerging equity markets in enhancing the diversification benefits of the portfolio, we first construct a benchmark portfolio (P1) that comprises only developed equity markets.[1] Then portfolios composed of developed and emerging markets (P2), developed and frontier markets (P3), and a combined portfolio of developed, emerging and frontier markets (P4) are constructed. The performances of the four portfolios are compared with each other to assess the value addition provided by frontier and emerging markets in a global portfolio. All four portfolios (i.e., P1, P2, P3 and P4) are formed by using three optimization models viz. Markowitz (1952) Minimum Variance Portfolio, Estrada (2008) Minimum Semivariance Portfolio, and Jorion (1985, 1986) Bayes-Stein portfolio. Studies like Platanakis and Urquhart (2020) and Kolm et al. (2014) argue that the application of different portfolio models reduces estimation risk in portfolio selection process and offer robustness in conclusions. Markowitz (1952) Minimum Variance Portfolio (MVP) is a widely used method of constructing an optimal portfolio.[2] The main advantage of using MVP is that it is based on risk parameters and is independent of return estimates. Chopra and Ziemba (1993) show that estimation error in returns have 10 times larger effect than the estimation error in covariance matrix. Further, Lagoarde-Segot and Lucey (2007) and Stevenson (2001) demonstrate that MVP is likely to display better performance in ex-post analysis. Ang et al. (2006) show that investors are more concerned about the downside volatility and would like to avoid investments that display frequent fluctuations below the expected return. Hence, Estrada (2008) Minimum Semivariance Portfolio (MSVP) method is used as it considers downside risk rather than the total risk of the portfolio. Jorion (1985, 1986) Bayes-Stein portfolio optimization method is employed as it attempts to reduce estimation errors in the inputs required for portfolio creation (DeMiguel et al., 2009); it also reduces the tendency for asset allocations to reach at corner solutions (Stevenson, 2001). Contemporary studies like Platanakis and Urquhart (2020), Bessler et al. (2017), Ayub et al. (2015) and Guidi and Ugur (2014) have used MVP method along with BSP method and/or MSVP method for construction of their portfolio. Finally, a primary survey is undertaken among international investors to corroborate the findings of empirical analysis.

The empirical analysis indicates that Asia-Pacific equity markets offer higher potential for diversification than their European counterparts. The analysis of portfolio performance measures suggests that Asia-Pacific emerging markets perform better than regional frontier markets in improving the risk-return profile of the benchmark portfolio. Till 2018, portfolios including European frontier markets displayed better returns and low risk levels. However, the onslaught of Covid-19 pandemic has adversely affected their performance. The primary survey analysis shows that investors are aggressive on emerging markets investment but are conservative when it comes to investment in frontier markets. The results also reveal investors' positive outlook towards the Asia-Pacific region. Further, investors seem to believe that frontier market investment is suitable for those with high-risk appetite and long-term investment horizons. International investors can use the findings of the study to formulate effective investment strategies.

This study makes significant contributions to the literature on international portfolio diversification. First, the study adds on to the limited work on the integration of frontier equity markets with other capital markets. Thomas et al. (2019), Pätäri et al. (2019) and Speidell (2017) demonstrate the importance of frontier markets in international portfolio and highlight the need for rigorous empirical investigation on frontier market investments. Second, the study performs a comparative analysis of frontier markets vis-à-vis emerging markets in improving the performance of an international portfolio. Past studies like Hadhri and Ftiti (2019), Oloko (2018), Chen (2018) and, Guidi and Ugur (2014) have focused primarily on benefits of including emerging markets in the global portfolio. With the advent of frontier markets, there is a need to empirically examine if frontier markets contribute more to the diversification benefits of an international portfolio (Berger et al., 2013; Pätäri et al., 2019). The extant literature lacks such comparative empirical analysis. Third, the study examines portfolio diversification benefits across two regions viz. Europe and Asia-Pacific. Investors often compare these two regions to make informed investment decisions. Annual investment sentiment surveys conducted by Franklin Templeton Investments and Credit Suisse testify the comparative assessments done by investors in different regions. Finally, the literature is deficient in studies that aim to understand international investors' viewpoints regarding emerging and frontier market investments. Surveys undertaken in the past (like Menkhoff, 2010; Fabozzi et al., 2007; Maditinos et al., 2007) primarily tend to understand the investment practices adopted by portfolio managers and brokers. According to World Federation of Exchanges (2019) report, market exchange operators and financial regulators from emerging and frontier markets endeavor to have a good understanding of international investors' perspective on equity market investments, so that they can take steps to enhance attractiveness of their own equity markets. The study attempts to fill this gap.

[1] The portfolio of developed markets is considered as the benchmark portfolio as investors are more likely to have high confidence of the stability of these well-established equity markets.

[2] Examples include Platanakis and Urquhart (2020), Chow et al. (2016), Guidi et al. (2016), Cha and Jithendranathan (2009), and Driessen and Laeven (2007).

The rest of the paper is organized as follows. Section 2 presents a brief literature review on diversification benefits provided by emerging and frontier equity markets. Section 3 describes the data. Section 4 presents the research methodology, while Section 5 displays the results. Section 6 concludes the paper by discussing the main findings of the study.

2. Literature review

2.1. Developed markets, emerging markets, and frontier markets

Morgan Stanley Capital International (MSCI), a leading provider of market indices, classifies equity markets into developed markets, emerging markets, and frontier markets according to three criteria viz. (i) economic development (ii) market size and liquidity requirement and (iii) market accessibility criteria. Developed markets enjoy high income, are open to foreign ownership, provide ease of capital movement and have efficient market institutions. Examples of developed markets include the USA, UK, Japan, Germany, and France. According to MSCI, emerging markets enjoy a suitable degree of openness to foreign ownership, offer reasonable level of ease in capital flows, and provide fair stability in the institutional system. Examples of emerging markets include India, Czech Republic, Egypt, and Peru. Investors are showing a keen interest in emerging markets as these markets are enjoying a good GDP growth rate, are providing attractive earnings yield, and are undertaking reform measures to strengthen their financial markets. According to MSCI, frontier markets have lower market capitalization, lower levels of liquidity and more investment restrictions than emerging markets. However, frontier markets are finding favor in the eyes of institutional investors as these markets are registering good economic growth rates, have young working population, enjoy low-cost labor, and have a low debt-to-GDP ratio (International Banker, 2019).

2.2. Role of emerging markets and frontier markets in improving the performance of an international portfolio

Literature includes studies that investigate the benefits of including emerging equity markets in a global portfolio. For instance, Harvey (1995) shows that the inclusion of emerging markets in a portfolio of developed markets decreases the risk of the portfolio by 6% while the portfolio's returns remain unchanged. Conover et al. (2002) demonstrate that an American investor can increase the portfolio returns by 1.50% per annum if he includes emerging markets in the portfolio. Cha and Jithendranathan (2009) recommend a minimum investment of 20% of the portfolio to emerging markets to earn substantial diversification benefits. Gilmore et al. (2005) and Stevenson (2001) suggest that an American investor must allocate at least one-fourth of its portfolio to European emerging markets to gain significant diversification benefits. Similarly, Oloko (2018) establishes that if UK investor allocates just 25% of his portfolio to the Nigerian equity market, then it will result in a substantial reduction in the portfolio's volatility. Guidi et al. (2016) encourage US and UK investors to allocate at least 30% of the domestic portfolio to China to enjoy the maximum Sharpe ratio. Gupta and Donleavy (2009) find that the inclusion of emerging markets in the portfolio enables the Australian investor to increase the portfolio's returns from 8.16% to 14.16% without a substantial increase in risk. Guidi and Ugur (2014) show that a portfolio composed of European developed markets and South-East European emerging markets will outperform the portfolio consisting of only European developed markets. Li et al. (2003) and Chiou (2009) observe that emerging markets provide substantial diversification benefits to an international portfolio, even when the investor is unable to short sell in emerging markets. Buchanan et al. (2011) find that the inclusion of emerging markets in a global portfolio provides dual benefit of risk reduction and return enhancement. Zhang and Li (2014) do not find any conclusive evidence regarding strong long run relationship between USA and China, thereby suggesting diversification benefits offered by the equity market of China. The findings of Christoffersen et al. (2014) and Hadhri and Ftiti (2019) render support to the claim that emerging markets are an attractive investment avenue for international investors. According to Chen (2018), the high degree of stock market interdependence between developed and emerging markets can be explained by the level of economic integration that the markets share with the world.

In the last decade, academia has started focusing on analyzing the benefit of including frontier markets in the international portfolio. Speidell (2017) believes that frontier markets will attract attention from investors as they will showcase high economic growth in the future. Berger et al. (2013) and Chan-Lau (2012) find that frontier markets significantly reduce risks of an international portfolio. Sukumaran et al. (2015) observe that Australian and American investors can gain considerably by diversifying into select frontier markets. Jayasuriya and Shambora (2009) also suggest that an American investor can earn a higher return at a lower level of risk if he includes frontier and emerging markets in his portfolio. Mensi et al. (2017) show that portfolio of developed markets and Asia-Pacific frontier markets will display better performance than the portfolio of developed markets and emerging markets of BRIC region. Ngene et al. (2018) document low levels of conditional correlation between USA and frontier markets, thereby suggesting that frontier markets offer diversification opportunities to investors. The results of Marshall et al. (2015) indicate that frontier markets provide diversification benefits to investors, even in the presence of short-sale constraints. According to Kohlert (2011), frontier markets offer diversification benefits. However, the study cautions against treating all frontier markets as the same.

The following key observations are deduced on the basis of the literature reviewed. Firstly, we observe that many studies have focused on analyzing the benefits of including emerging markets in the portfolio consisting of only developed markets. However, it can be reasonably assumed that due to globalization, emerging markets may have become more integrated with each other and with other developed markets. The increased integration may have reduced the potential benefits of diversifying into emerging markets, leading to an increased interest in the new investment alternative of frontier markets (Berger et al., 2011; Quisenberry & Griffith, 2010). Hence, there is a need to empirically demonstrate the diversification benefits provided by frontier markets vis-à-vis emerging markets. Secondly, the past studies have not compared how Asia-Pacific equity markets are distinct from its European counterparts in improving

the risk-return profile of an international portfolio. Thirdly, literature is deficient in studies that construct portfolios based on different combinations of developed, emerging and frontier equity markets. Finally, the literature lacks studies that undertake a primary survey to substantiate the empirical analysis with real-world experiences.

3. Data

The study covers developed, emerging, and frontier equity markets of Asia-Pacific and Europe. MSCI market classification framework is used to classify the equity markets into developed, emerging and frontier markets. The equity market classification is based on the criteria of economic development, market size and liquidity, and market accessibility. Table 1 presents the markets included in the study and their key economic indicators.[3] Weekly index data in US dollar terms are obtained from Thomson Reuters Datastream. Weekly data is preferred as monthly data may not be sufficient for performing out of sample analysis and daily data leads to large turnover resulting in high transaction cost (Platanakis & Urquhart, 2020). The closing values of the indices are differenced and are expressed in percentage form. Platanakis and Urquhart (2020), Hsiao et al. (2020), Bera, Park, and Y (2008), Lagoarde-Segot and Lucey (2007), Stevenson (2001) [4] have also used index data and then computed the returns for their portfolio optimization models.

Weekly index returns expressed in US dollar terms are used in the study.[5]The period of the study is from January 2010 to October 2020. The period of 11 years is chosen as the investors assess performance of only the recent past to make necessary investment decisions. Studies like Platanakis and Urquhart (2020), Hsiao et al. (2020), Jayasuriya and Shambora (2009), Lagoarde-Segot and Lucey (2007), Gilmore et al. (2005) have used time periods of a decade or less to investigate the diversification benefits of including an asset class of their interest in the global portfolio.

4. Methodology

Four optimal portfolios are created for both Asia-Pacific and Europe. The first portfolio (P1) comprises of developed markets only. The second portfolio (P2) includes developed and emerging markets. The third portfolio (P3) has developed and frontier markets and the last portfolio (P4) is a combination of developed, emerging and frontier markets. These four portfolios are constructed using three optimization methods. The portfolios are first constructed by using Markowitz (1952) Minimum Variance Portfolio (MVP) method. In MVP method, portfolio weights are selected, such that it minimizes the variance of the portfolio returns. The minimization problem is stated below:

$$\text{Minimize} \quad \sigma_P^2 = w' \sum w \tag{1}$$

$$\text{subject to} \quad \sum_{i}^{k} w_i = 1 \; and \; w_i \geq 0 \tag{2}$$

where σ_P^2 is the variance of the portfolio, w is the vector of portfolio weights and $\sum$ is the covariance matrix of asset returns. Equation (2) ensures that sum of weights of the securities invested in the portfolio is 100 percent and no short sales are allowed in the portfolio. However, the key shortcoming of MVP method is that it assumes that the investor is concerned only about the portfolio's total volatility and does not talk about the direction of the portfolio's volatility.

To overcome the shortcoming of the MVP method, this study employs Estrada (2008) Mean Semivariance Portfolio (MSVP). Unlike the MVP method, which considers the total risk of the portfolio, the MSVP method focuses only on the downside risk of the portfolio. According to Estrada (2008), the semi-covariance between asset x and asset y with respect to target return B is defined as

$$\odot_{xyB} = \frac{1}{T} \sum_{i=1}^{T} \left[\min(R_x - B,\ 0) * \min\left(R_y - B,\ 0\right) \right] \tag{3}$$

where R_x and R_y are returns of assets x and y respectively and B is the target rate which is set to zero.[6] This generates symmetric semi-covariance matrix Θ_{xyB}. Under the MSVP method, the optimization problem will be to minimize portfolio's semivariance, which is stated below

$$\text{Minimize} \quad \sigma_{PB}^2 = w' \odot_{xyB} w \tag{4}$$

[3] The Asia-Pacific developed market of New Zealand is excluded as it is not a prominent player in the investment community. MSCI Pacific Index which captures representation of Developed Markets of Asia-Pacific region, has only 0.84% weightage allotted to New Zealand. The study focuses on leading European developed markets like France, Germany, Switzerland, and UK. The fact that these four developed markets constitute about 71% of the MSCI Europe Index reflects the preference of these equity markets among investors. The European emerging markets of Poland is not included because of unavailability of consistent index data.

[4] The issue of currency hedging is considered by expressing returns in U.S. dollar terms (Stevenson, 2001; Sukumaran et al., 2015).

[5] A zero-benchmark return implies that the main objective of the investor is capital preservation which cannot be met if the returns are negative.

[6] Budget constraint of summation of portfolio weights to be one is realistic assumption (Bessler et al., 2017). Further, short selling is excluded as institutional investors are restricted to long positions only (Bessler et al., 2017; Lagoarde-Segot & Lucey, 2007).

Table 1
Economic Indicators of markets included in the study

Panel A: Asia-Pacific	GDP Growth Rate %	Fiscal Health Index	Financial Development Index	Panel B: Europe	GDP Growth Rate %	Fiscal Health Index	Financial Development Index
Developed Markets				*Developed Markets*			
Australia (ASX200)	1.90	86.2	0.88	France (CAC40)	1.51	64.9	0.79
Hong Kong (Hang Seng)	−1.19	100.0	0.78	Germany (DAX30)	0.56	91.8	0.73
Japan (Nikkei 225)	0.65	55.7	0.89	Switzerland (SMI)	0.93	96.3	0.96
Singapore (Straits Times)	0.73	80	0.75	UK (FTSE100)	1.41	68.6	0.90
Emerging Markets				*Emerging Markets*			
China(Shaghai SE A)	6.11	76.0	0.65	Czech(Prague SE)	2.57	97.6	0.48
India (Nifty 500)	5.02	14.7	0.44	Greece (Athex Comp)	1.87	79.0	0.51
Indonesia (IDX)	5.01	88.1	0.37	Hungary (BUX)	4.93	85.0	0.41
Malaysia (KLCI)	4.33	82.4	0.66	Russia (MICEX)	1.34	86.6	0.49
Philippines (PSEi)	6.04	97.1	0.37				
South Korea (KOSPI)	2.03	96.8	0.81				
Thailand (SET)	2.37	96.5	0.74				
Frontier Markets				*Frontier Markets*			
Bangladesh (MSCI Bangladesh)	8.15	77.6	0.23	Bulgaria (SOFIX)	3.37	98.8	0.38
Pakistan (Karachi SE 100)	0.99	49.2	0.24	Croatia (CROBEX)	2.94	85.4	0.49
Sri Lanka (Colombo SE)	2.28	30.4	0.28	Estonia (OMX Tallinn)	4.33	99.8	0.28
Vietnam (MSCI Vietnam)	7.02	40.7	0.41	Romania (BET)	4.08	89.3	0.31

Table 1 displays economic indicators for developed, emerging, and frontier markets of Asia-Pacific and Europe. The respective stock indices used in the study are presented in parenthesis. The data of GDP growth rate and Fiscal Health Index is obtained from World Development Indicators and The Heritage Foundation respectively and are for the year 2019. The Fiscal Health Index ranges from 0 to 100, wherein a higher score indicates better fiscal health. Financial Development Index is provided by the IMF, ranges from 0 to 1, and is for the year 2018. A higher score reflects greater level of financial development.

where σ^2_{PB} is the semivariance of the portfolio, w is the vector of portfolio weights and Θ_{xyB} is the semi-covariance matrix. The MSVP method is also subject to the constraints of summation of portfolio weights to be one and no short selling (equation (2)).

Jorion (1985, 1986) Bayes-Stein Portfolio (BSP) optimization method is the third optimization method used in the study. The BSP method is based on mean variance portfolio optimization approach which aims at maximizing investor's utility stated as below

$$\text{Maximize} \quad U = w^T \mu - w^T \sum w \tag{5}$$

where U is investor's utility, w is the vector of portfolio weights, μ is expected return of the securities forming the portfolio and $\sum$ covariance matrix. According to Jorion (1986), using the historical average as the true parameter estimate of the expected return is prone to high estimation risk, which will lead to suboptimal portfolio selection. The BSP method reduces estimation risk for mean return by converging the mean returns of assets to a common value. This reduces the difference between extreme observations, which leads to a better out-of-sample performance of portfolios (Jorion, 1985; Jorion, 1986). The BSP method computes the vector of expected returns i.e. μ_{BS} as

$$\mu_{BS} = (1-g)\mu + g\,\mu_G\,1 \tag{6}$$

$$g = \frac{(N+2)}{(N+2) + T\left(\mu - \mu_g 1\right)' \sum^{-1} \left(\mu - \mu_g 1\right)} \tag{7}$$

where μ is a vector of means, μ_G is the return on minimum variance portfolio, ***1*** is a vector of ones, g is shrinkage estimator, N is the number of markets, T is the sample size and $\sum$ is the sample covariance matrix. The BSP method defines covariance matrix $\sum_{BS}$ as

$$\sum_{BS} = \left(\frac{T+\varphi+1}{T+\varphi}\right) \sum + \frac{\varphi}{T\,(T+\varphi+1)} \frac{\boldsymbol{1}\boldsymbol{1}^T}{\boldsymbol{1}^{\mathbf{T}} \sum^{-1} \boldsymbol{1}} \tag{8}$$

where

$$\varphi = \frac{(N+2)}{(\mu - \mu_g 1)' \sum^{-1} (\mu - \mu_g 1)} \tag{9}$$

The BSP method uses the Bayes-Stein estimates $\left(\mu_{BS}, \sum_{BS}\right)$ in the optimization process defined in equation (5) and is subject to budget and no short selling restrictions[7] (equation (2)). Weekly data from January 2010 till December 2014 is used to construct ex-ante portfolios. During the out-of-sample period of January 2015 to October 2020, the optimal portfolios are formed (under the assumption of no short selling) on the basis of rolling monthly rebalancing of portfolios[8] using the 5-years of weekly ex-ante data. For example, weekly data from January 1, 2010 till December 31, 2014 is used to estimate optimal weights for the portfolio of January 2015. This portfolio will be held until a new portfolio on February 1, 2015 is formed. The new portfolio will be based on previous 5-yearly weekly data from February 1, 2010 till January 31, 2015. This leads to a series of 70 out-of-sample portfolios for each of P1, P2, P3, and P4.

The performance of each of these portfolios is assessed using Sharpe ratio, Sortino ratio, Diversification ratio, and Omega Ratio. Sharpe ratio is defined as $(R_p\text{-}R_f)/S_p$ where R_p is the return of the portfolio, R_f is the risk-free rate (assumed to be zero),[9] and S_p is the standard deviation of the portfolio. A portfolio with higher Sharpe ratio has a better risk-return profile. One of the limitations of Sharpe ratio is that it fails to distinguish between upside volatility and downside volatility of the portfolio. Investors are more apprehensive about downside volatility as they would like to avoid investments that experience large and frequent jumps below their target return. Hence, the Sortino ratio is also used to evaluate the performance of the portfolios as it penalizes only negative returns. Sortino ratio is defined as $(R_p\text{-}R_f)/DR_p$ where DR_p is downside risk (measured by semi standard deviation) of the portfolio. A conservative investor will prefer a portfolio with higher Sortino ratio. Another drawback of Sharpe ratio is that it uses only first order (i.e., mean) and second order (i.e., variance) moments of the portfolio returns. Omega ratio overcomes this limitation of Sharpe ratio as it uses the entire probability distribution of portfolio returns. In this method, portfolio returns above target threshold return τ (assumed to be zero) is taken as profit and portfolio returns below τ is considered as losses. The Omega ratio is the ratio between expected value of profits and the expected value of losses. A portfolio with higher Omega ratio is preferred. The diversification ratio is computed to assess the degree of diversification in a portfolio. It is computed as the ratio of the weighted average of volatilities divided by the portfolio volatility.

The performances of these four portfolios are compared to draw inferences regarding the contribution of frontier and emerging equity markets in enhancing international portfolio diversification benefits. To test the statistical difference between two Sharpe ratios, the study applies studentized circular block bootstrap by Ledoit and Wolf (2008) [10]. This method constructs studentized time series bootstrap confidence interval for the difference of the Sharpe ratios. If the interval does not include zero, then the Sharpe ratios are considered to be different. The bootstrap method uses data-dependent block size and is based on calibration method of Loh (1987). The bootstrap resamples is set at 1000.

The study collects primary data to understand the perception of international investors towards investment in emerging markets and frontier markets. The questionnaire was administered among top management, portfolio managers and equity research analysts of fund management companies that specialize in emerging and frontier markets investment. The questionnaire was prepared in QuestionPro, a leading provider of online survey software. The questionnaire link was sent via LinkedIn, a popular business social network. The survey was conducted in 2018 and 2019. More than 250 market practitioners were contacted, out of which 35 completed the survey. The survey results are analyzed using tables, graphs, and descriptive statistics.

5. Results

5.1. Preliminary analysis

Table 1 displays economic indicators of Asia-Pacific (Panel A) and European (Panel B) markets. In both regions, frontier markets have registered the highest average GDP growth rate. It is interesting to observe that the fiscal health index of European frontier and emerging markets are at similar levels and are better than the European developed markets. In contrast, the Asia-Pacific frontier markets (except Bangladesh) fare poorly in terms of fiscal health index. As expected, in both the regions, developed markets lead emerging and frontier markets in terms of financial development index. A comparison across geographies will highlight that Asia-Pacific markets are at a higher economic growth trajectory. Further, unlike Europe, there is a noticeable distinction between the financial development index of Asia-Pacific emerging markets and frontier markets.

Table 2 and Table 3 presents descriptive statistics of weekly stock returns of Asia-Pacific and European equity markets, respectively. The results of Table 2 suggest that emerging markets of the Asia-Pacific region provide a good investment opportunity as these markets enjoy higher returns per unit of risk (average 0.034) as compared to their regional developed (average 0.023) and frontier markets (average 0.025). In contrast, the results of Table 3 show that European emerging markets have the least impressive risk-return profile (average −0.006) as compared to its regional developed (average 0.026) and frontier counterparts (average 0.021). Most of the equity

[7] Rolling window estimation is used as it allows for responding to structural breaks (Bessler et al., 2017).

[8] Studies like Guidi, Savva, & Ugur, 2016, Guidi and Ugur (2014), and Gilmore et al. (2005) have also assumed risk-free rate to be zero as it simplifies the calculation and allows fair comparison across all investment strategies.

[9] The programming codes of the test is available at https://www.econ.uzh.ch/en/people/faculty/wolf/publications.html#Programming_Code.

[10] Since correlation cannot be averaged, we have taken the average of Fisher Z transformed values wherein Z is defined as $Z = 0.5 \ln\left[\frac{1+\rho}{1-\rho}\right]$. After the average of Z is computed, the correlation coefficient is calculated as $r = \frac{e^Z - e^{-Z}}{e^Z + e^{-Z}}$.

Table 2
Summary Statistics of weekly stock returns of Asia-Pacific equity markets from 2010 to 2020.

	Mean Return	Standard Deviation	Return/Risk	Skewness	Kurtosis
Developed Markets					
Australia	0.04	3.04	0.01	−0.87	6.07
Hong Kong	0.05	2.54	0.02	−0.07	1.20
Japan	0.15	2.53	0.06	0.05	11.93
Singapore	0.01	2.37	0.002	−0.04	4.92
Average	0.06	2.62	0.024	−0.23	6.03
Emerging Markets					
China	0.05	2.94	0.02	−0.45	2.29
India	0.11	3.01	0.04	−0.32	2.97
Indonesia	0.10	2.96	0.03	−0.81	10.37
Malaysia	0.01	2.10	0.01	−0.16	4.67
Philippines	0.16	2.79	0.06	−0.58	5.43
South Korea	0.11	3.02	0.03	−0.52	3.13
Thailand	0.13	2.58	0.05	−0.71	5.55
Average	0.10	2.77	0.034	−0.51	4.91
Frontier Markets					
Bangladesh	−0.002	3.15	−0.001	0.67	10.41
Pakistan	0.18	2.66	0.07	−0.63	3.65
Sri Lanka	0.04	2.02	0.02	0.22	3.70
Vietnam	0.07	3.79	0.02	2.08	42.97
Average	0.07	2.90	0.026	0.59	15.18

Table 3
Summary Statistics of weekly stock returns of European equity markets from 2010 to 2020.

	Mean Return	Standard Deviation	Return/Risk	Skewness	Kurtosis
Developed Markets					
France	0.04	3.18	0.01	−0.77	5.71
Germany	0.13	3.21	0.04	−0.68	5.67
Switzerland	0.11	2.23	0.05	−1.17	6.32
UK	0.00	2.64	0.00	−1.15	9.42
Average	0.07	2.81	0.027	−0.94	6.78
Emerging Markets					
Czech Republic	−0.04	3.06	−0.01	−0.95	6.09
Greece	−0.16	4.87	−0.03	−0.31	1.68
Hungary	0.06	3.81	0.02	−0.81	4.04
Russia	0.03	3.95	0.01	−0.52	2.79
Average	−0.03	3.92	−0.006	−0.65	3.65
Frontier Markets					
Bulgaria	−0.01	2.34	0.00	−0.69	6.32
Croatia	−0.06	2.23	−0.03	−1.39	11.39
Estonia	0.18	2.50	0.07	−0.01	7.54
Romania	0.09	3.12	0.03	−1.13	7.34
Average	0.05	2.55	0.018	−0.81	8.15

markets under study display negative skewness in returns indicating higher susceptibility to negative shocks.

Fig. 1 shows the correlation between returns of developed, emerging, and frontier equity markets of Asia-Pacific (Panel A) and Europe (Panel B). In Asia-Pacific, we observe that the degree of correlation between developed and emerging markets (average 0.57)[11] is higher than the correlation level between developed and frontier markets (average 0.17). Similarly, in Europe, developed and emerging equity markets share a higher degree of correlation (average 0.66) in comparison to developed and frontier equity markets (average 0.55). Hence it can be inferred that frontier markets of both regions share a lower degree of comovement with their regional developed counterparts. A comparative analysis of correlation values across the regions shows that a stronger correlation level exists between European equity markets as compared to Asia-Pacific equity markets. Therefore, it can be inferred that European equity markets may offer limited diversification opportunities to investors.

5.2. Asset allocation

Fig. 2 presents the average portfolio weights of P1 (DM), P2 (DM+EM), P3 (DM+FM), and P4 (DM+EM+FM) for the Asia-Pacific region. For the benchmark portfolio P1, all three optimization methods (i.e., MVP, MSVP, and BSP) suggest 85% of the portfolio

[11] For MSVP, allocation to Japan and Singapore falls to almost 45%.

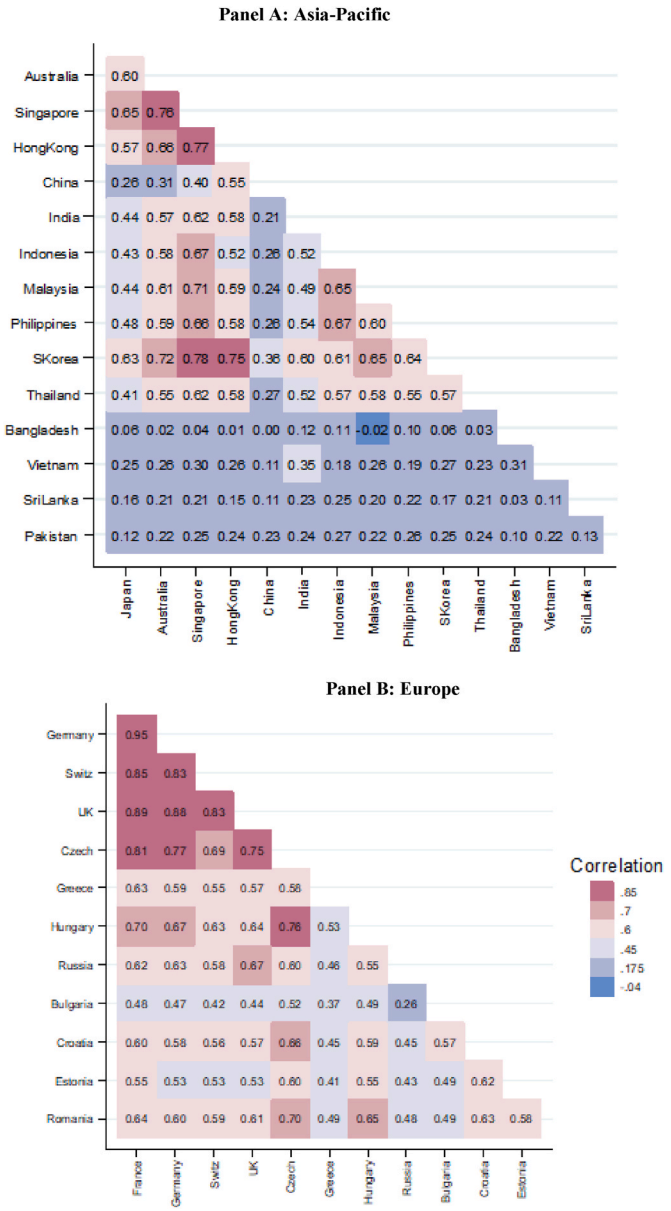

Fig. 1. Correlation between developed, emerging and frontier equity markets.

weights to be allocated to Japan and Singapore. However, the allocation to these two developed markets falls to almost 30% when emerging markets are included in the portfolio (refer to P2).[12] Similarly, when frontier markets are included in the portfolio (refer to P3) the developed markets occupy at most one-fourth of the portfolio weights. The exposure to developed markets gets further reduced to 14% when both emerging and frontier markets are included in the portfolio (refer to P4). In fact, in the combined portfolio of P4, frontier markets occupy almost 60% of the portfolio weights. It is interesting to observe that the diversification ratio is the highest in P4 which is closely followed by P3. High diversification ratio of P4 indicates that Asia-Pacific emerging and frontier markets together provide greater potential for diversification to investors.

Asset allocation in Europe, as represented in Fig. 3, is relatively distinct from the Asia-Pacific region. In the benchmark portfolio P1, Switzerland occupies four-fifths of the portfolio weights with the rest taken up by the UK. Interestingly, when European emerging markets are introduced to the portfolio (refer to P2), all the optimization methods suggest maximum allocation of just 15% to the

[12] Under MSVP method, emerging markets receive only 5% of the portfolio weights.

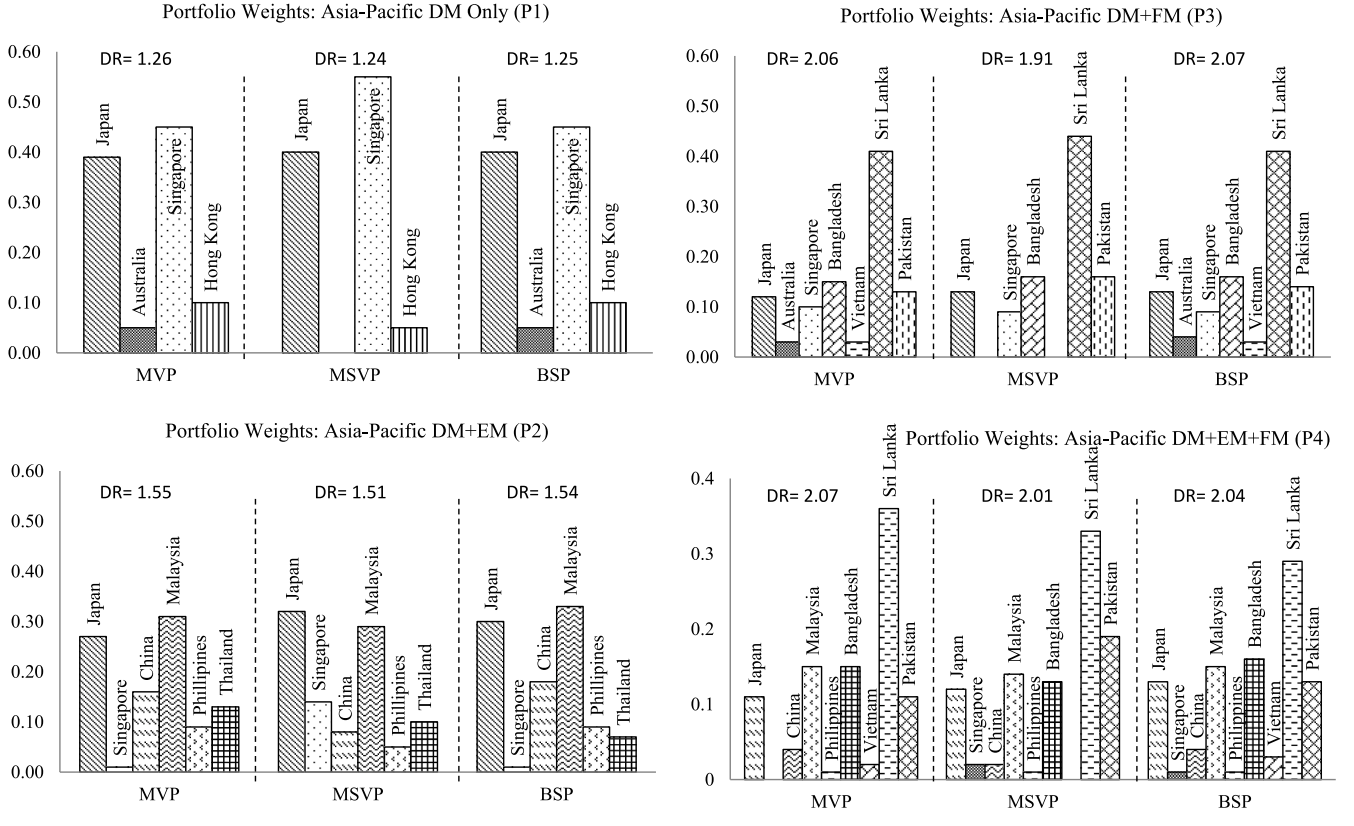

Fig. 2. Asset Allocation- Asia Pacific. Figure 2 represents asset allocation results for Asia-Pacific portfolios. Y axis presents portfolio weights. MVP, MSVP and BSP stand for Markowitz (1952) Minimum Variance Portfolio, Estrada (2008) Minimum Semivariance Portfolio and Jorion (1985, 1986) Bayes Stein Portfolio respectively. DR denotes Diversification Ratio.

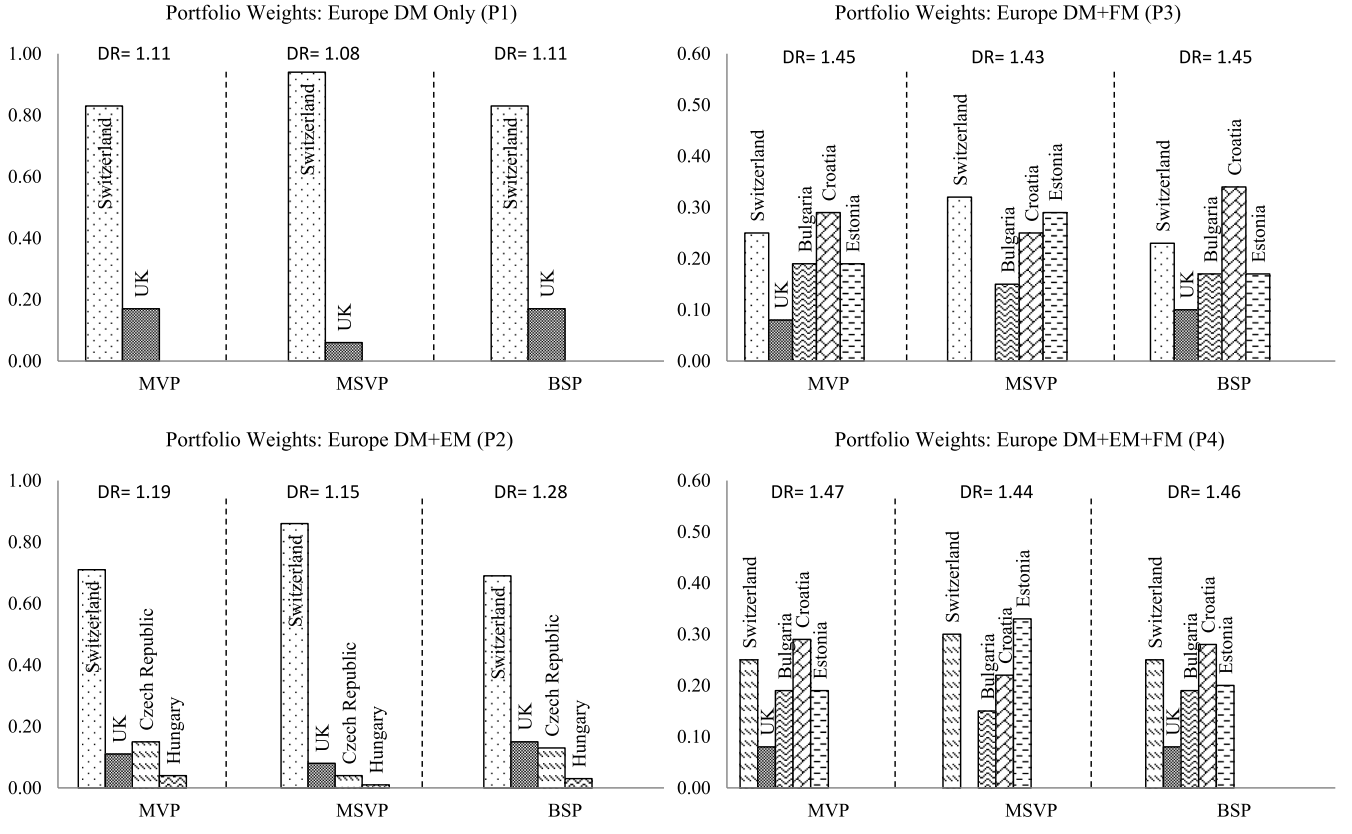

Fig. 3. Asset Allocation- Europe. Figure 3 represents asset allocation results for European portfolios. Y axis presents portfolio weights . MVP, MSVP and BSP stand for Markowitz (1952) Minimum Variance Portfolio, Estrada (2008) Minimum Semivariance Portfolio and Jorion (1985, 1986) Bayes Stein Portfolio respectively. DR denotes Diversification Ratio.

European emerging markets.[13] However, the asset allocation strategy changes when European frontier markets are introduced. At P3, we observe that more than 65% of the portfolio is allocated to frontier markets. In the combined portfolio of P4, we observe that all the methodologies recommend absolutely no exposure to emerging markets. Heavy exposure to European frontier equity markets (in both P3 and P4) may be propelled by the fact that these equity markets provide not only better risk-adjusted returns (refer Table 3) but also share a lower degree of correlation with the regional equity markets (refer Panel B of Fig. 1). The diversification ratios of European portfolios are lower than their Asia-Pacific counterparts. It confirms the findings from correlation analysis (Fig. 1) that European equity markets offer limited diversification opportunities to investors.

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5.3. Portfolio performance

Table 4 presents performance measures of P1 (DM), P2 (DM+EM), P3 (DM+FM), and P4 (DM+EM+FM) for the Asia-Pacific region. Table 5 reports the results of Ledoit and Wolf (2008) test of equality of Sharpe ratios to compare the performance of different Asia-Pacific portfolios.

The comparison of Sharpe ratios of P1 (DM) with P2 (DM+EM) in Table 4 indicates that emerging markets of the Asia-Pacific region offers diversification benefits to investors. The Sharpe ratio of P2 is higher than that of P1 in all the three optimization methods. Fig. 4 indicates that the portfolio returns of P1 and P2 are comparable; but the standard deviation of P2 is lower than P1 throughout the sample period. This probably explains better Sharpe ratio of P2 over P1. Interestingly, both Sortino ratio[14] and Omega ratio dissuades risk-averse investors to hold combined portfolio of developed and emerging markets. While comparing the performance of P1 (DM) with P3 (DM+FM) in Table 4, we observe that all the three performance measures i.e., Sharpe ratio, Sortino ratio and Omega ratio of P3 are far lower than P1. Fig. 5 shows the portfolio returns of P3 is less than that of P1. Hence, despite having reduced risk levels (i.e., low standard deviation and semi standard deviation), the performance measures of P3 are inferior to that of P1. The poor performance of P3 suggests that investors must be discouraged to diversify into Asia-Pacific frontier markets.

An examination of the Sharpe ratio, Sortino ratio and Omega ratio of P1 (DM) vis-à-vis P4 (DM+EM+FM) reveals poor performance of P4 against P1. Fig. 6 attributes the weak performance of P4 to its low portfolio returns. Hence, we can infer that investors do not benefit by holding a diversified portfolio of developed, emerging, and frontier equity markets of the Asia-Pacific region. The comparison of Sharpe and Sortino ratios of P2 (DM+EM) with P3 (DM+FM) in Table 4 indicates that Asia-Pacific emerging markets outperform their frontier counterparts in enhancing the risk-return profile of the benchmark portfolio. Fig. 7 indicates weak performance of P3 owing to its poor portfolio returns. Hence, we can deduce that investors should prefer Asia-Pacific emerging markets over their regional frontier counterparts to improve the diversification benefits of the benchmark portfolio.

Analysis of the OOS results of Figs. 4, Figs. 5 and 6 reveals steep increase in portfolio risk and steep fall in portfolio returns in March 2020. These results evidence the global panic which was caused by coronavirus pandemic. Interestingly, the fall in returns of the combined portfolios (i.e., P2, P3 and P4) is higher than that of P1. However, the sharp decline in portfolio risk and sharp rise in portfolio returns in the subsequent months show that the stock market crash was short-lived. Table 5 presents the Ledoit and Wolf (2008) test of statistical difference between Sharpe ratios of Asia-Pacific portfolios. The results (Panel A) show statistical difference between Sharpe ratios of P1 (DM) and P4 (DM+EM+FM), which supports our analysis that the investors will not benefit by holding a combined portfolio of Asia-Pacific equity markets. Table 5 also reports the statistical difference between Sharpe ratios for the sample period of 2010–2018 as it is of interest to assess the performance in the pre-covid era. The results disclose statistical difference between Sharpe ratios of P1 (DM) and P3 (DM+FM) in BSP method. The result lends support to our recommendation against investment in Asia-Pacific frontier markets.

Table 6 presents performance measures of P1 (DM), P2 (DM+EM), P3 (DM+FM), and P4 (DM+EM+FM) for the European region. Table 7 reports the results of Ledoit and Wolf (2008) test of equality of Sharpe ratios to compare the performance of different European portfolios.

The results of Table 6 indicate that Sharpe ratios of P1 (DM) and P2 (DM+EM) are at similar levels. Review of Fig. 8 shows that returns and risks of P1 and P2 are akin to each other. The probable reason for similar performance level can be the fact that P2 has only 15% exposure to European emerging markets. However, Sortino ratio and Omega ratio of P2 is lower than P1 across all optimization methods. The lower Sortino ratios of P2 can be explained by its slightly high semi−standard deviation in 2016, 2018, 2019 and 2020 (in Fig. 8). These results caution conservative investors against exposure to European emerging markets. The comparison of performance measures of P1 (DM) against P3(DM+FM) reveals inferior performance of P3. However, we will observe in Fig. 9 that P3 displayed a better risk -return profile till 2018. Till June 2018, portfolio returns of P3 were higher or at par with of P1 and its risk levels were lower than P1. The performance of P3 deteriorated in 2018 (second half), 2019 and 2020 when its returns declined and was lower than P1. Hence, the inferior performance can be possibly attributed to the panic caused by coronavirus pandemic in the last two years of the sample period.

The comparative results of P1 (DM) vis-à-vis P4 (DM+EM+FM) is not different from the results of P1 (DM) vis-à-vis P3 (DM+FM). The reason being there is not much distinction in the portfolio composition of P3 and P4, as discussed in Section 4.2. A comparison of the performance of P2 (DM+EM) with P3 (DM+FM) in Table 6 will highlight the weak performance of P3 against P2, which does not induce confidence amongst investors regarding European frontier markets. However, if we look at Fig. 11, we will observe that P3

[13] Except Sortino ratio under MVP method.

Table 4
Out of sample performance of Asia-Pacific portfolios.

	P1: DM	P2: DM+EM	P3: DM+FM	P4: DM+EM+FM
MVP				
Sharpe Ratio	0.12	0.13	- 0.02	- 0.01
Sortino Ratio	1.32	1.43	0.40	0.39
Omega Ratio	1.19	1.07	0.81	0.79
MSVP				
Sharpe Ratio	0.10	0.12	−0.06	- 0.09
Sortino Ratio	2.33	2.31	0.90	0.66
Omega Ratio	1.17	1.08	0.81	0.72
BSP				
Sharpe Ratio	0.12	0.13	- 0.02	- 0.01
Sortino Ratio	2.03	1.41	0.39	0.40
Omega Ratio	1.19	1.08	0.80	0.80

Table 4 presents out of sample performance of Asia-Pacific portfolios. P1 includes developed markets (DM) only. P2 includes developed and emerging markets (DM+EM). P3 includes developed and frontier markets (DM+FM) and P4 includes developed, emerging and frontier markets (DM+EM+FM). The four portfolios are constructed using three optimization methods viz. Markowitz (1952) minimum variance portfolio (MVP), Estrada (2008) Minimum Semivariance Portfolio (MSVP) and Jorion (1985, 1986) Bayes-Strein Portfolio (BSP)

Table 5
Statistical comparison of Sharpe ratios of Asia-Pacific portfolios.

	P1: DM		P2: DM+EM		P3: DM+FM	
	Panel A: 2010–2020	Panel B: 2010–2018	Panel C: 2010–2020	Panel D: 2010–2018	Panel E: 2010–2020	Panel F: 2010–2018
MVP						
P2: DM+EM	0.04	0.07				
P3: DM+FM	0.14	0.19	0.09	0.13		
P4: DM+EM+FM	0.15*	0.20**	0.10	0.13	0.01	0.01
MSVP						
P2: DM+EM	0.03	0.03				
P3: DM+FM	0.14	0.18	0.10	0.15		
P4: DM+EM+FM	0.16	0.23**	0.13	0.20*	0.03	0.05
BSP						
P2: DM+EM	0.04	0.06				
P3: DM+FM	0.14	0.20*	0.10	0.14		
P4: DM+EM+FM	0.14*	0.19*	0.10	0.13	0.03	0.05

Table 5 reports difference between Sharpe ratios between each of the portfolios. Portfolio P1 includes developed markets (DM) only. Portfolio P2 includes developed and emerging markets (DM+EM). Portfolio P3 includes developed and frontier markets (DM+FM) and P4 includes developed, emerging and frontier markets (DM+EM+FM). The four portfolios are constructed using three optimization methods viz. Markowitz (1952) minimum variance portfolio (MVP), Estrada (2008) Minimum Semivariance Portfolio (MSVP) and Jorion (1985, 1986) Bayes-Strein Portfolio (BSP). Working down each column, positive figure indicates a better performance. The statistical difference between Sharpe ratios is computed by using studentized circular block bootstrap method by Ledoit and Wolf (2008). ** and * denote statistical difference at 5% and 10% significance level respectively.

displayed better portfolio returns from 2015 till June 2018 and the risk levels of P3 has been lower than P2 throughout the sample period. It seems that the poor performance of P3 in 2019 and 2020 has affected its overall performance measures.

Figs. 8, Figure 9, Fig. 10 and Fig. 11 display steep rise in portfolio risk and steep fall in portfolio returns during March 2020, indicating the global panic caused by coronavirus pandemic. Results of Table 7 confirm the findings of Table 6 that there is no statistical difference between Sharpe ratios of European P1 and P2, and Sharpe ratios of P3 and P4. Though Ledoit and Wolf (2008) test does not indicate statistical difference in Sharpe ratios of European portfolios, it is interesting to observe that during the sub-sample period of 2015–2018, the benchmark portfolio of DM (P1) under-performed against both DM+EM (P2) and DM+FM (P3) portfolios. Similarly, Table 7 shows that European DM+EM (P2) under-performed against DM+FM portfolio. Overall, the results suggest that European frontier markets offered a better investment opportunity before the onslaught of the covid pandemic.

5.4. Primary survey analysis

Primary data is collected to analyze the perception of international investors towards emerging and frontier markets investments. An analysis of the work profile of the survey respondents shows that about 37% of the respondents belong to the top management of the company like CEO, CIO and VP. About 29% of the respondents are portfolio managers, and 23% are equity analysts. The rest of the respondents refused to divulge their designations.

Regarding the work locations, about 34% of the respondents work in firms located in Asia. About 23% of the respondents are from USA, and 17% are from UK. Around 11% of the respondents work in firms based in Europe. Rest of the respondents work across regions like Africa and Middle East. About one-third of the respondents have Assets under Management (AUM) of over USD 1 billion. Around

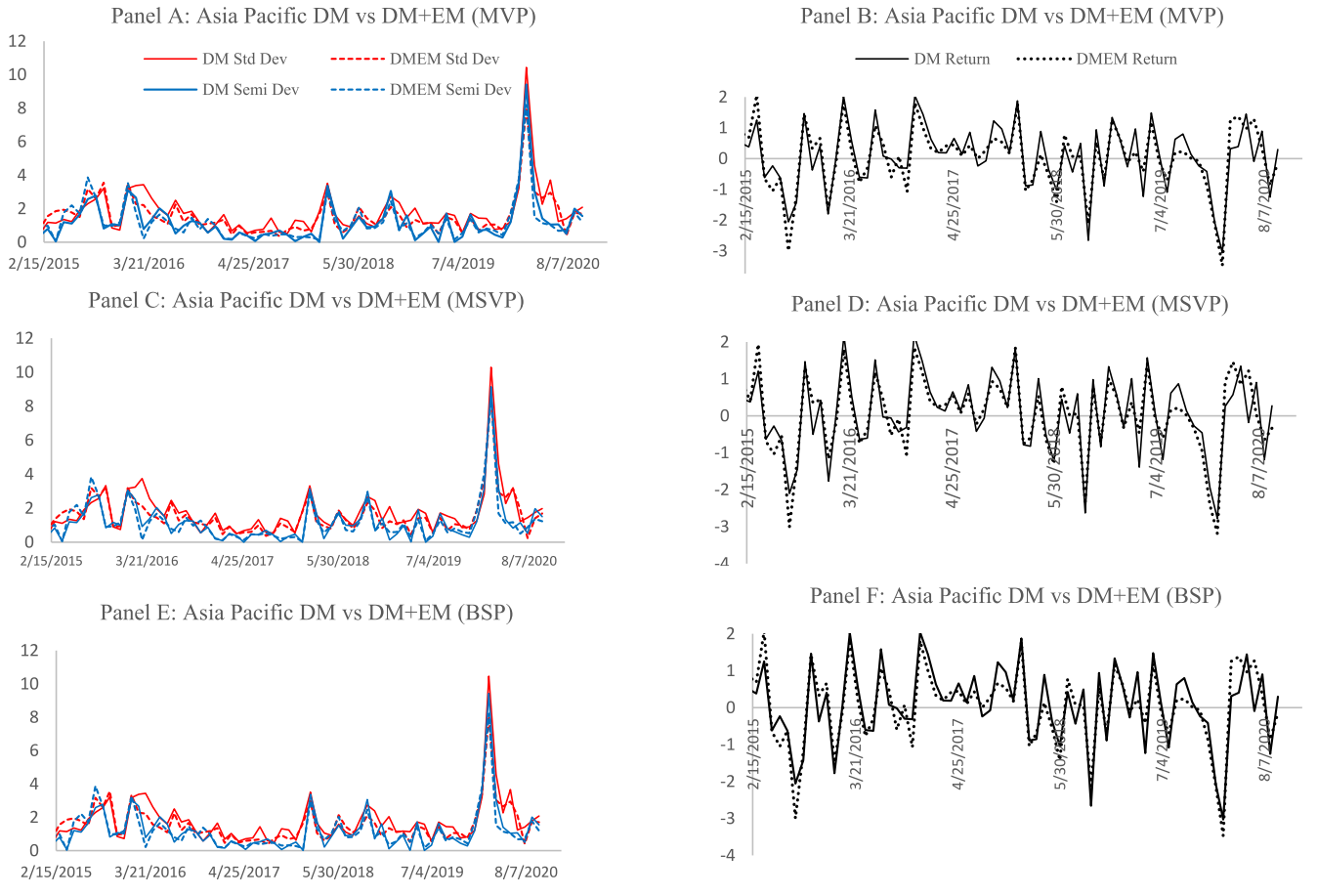

Fig. 4. Asia Pacific DM (P1) vs. DM+EM (P2): OOS Performance.

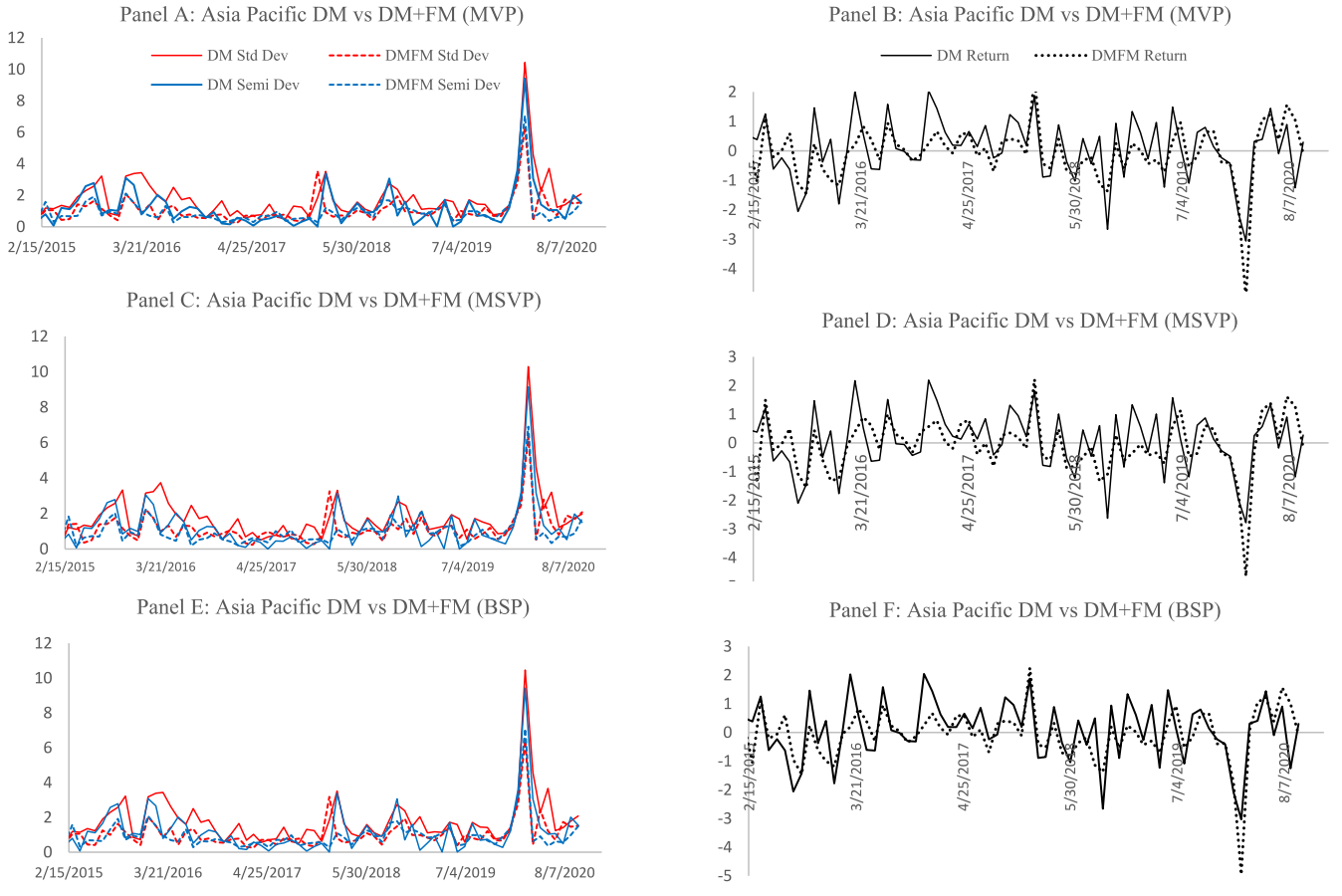

Fig. 5. Asia Pacific DM (P1) vs. DM+FM (P3): OOS Performance.

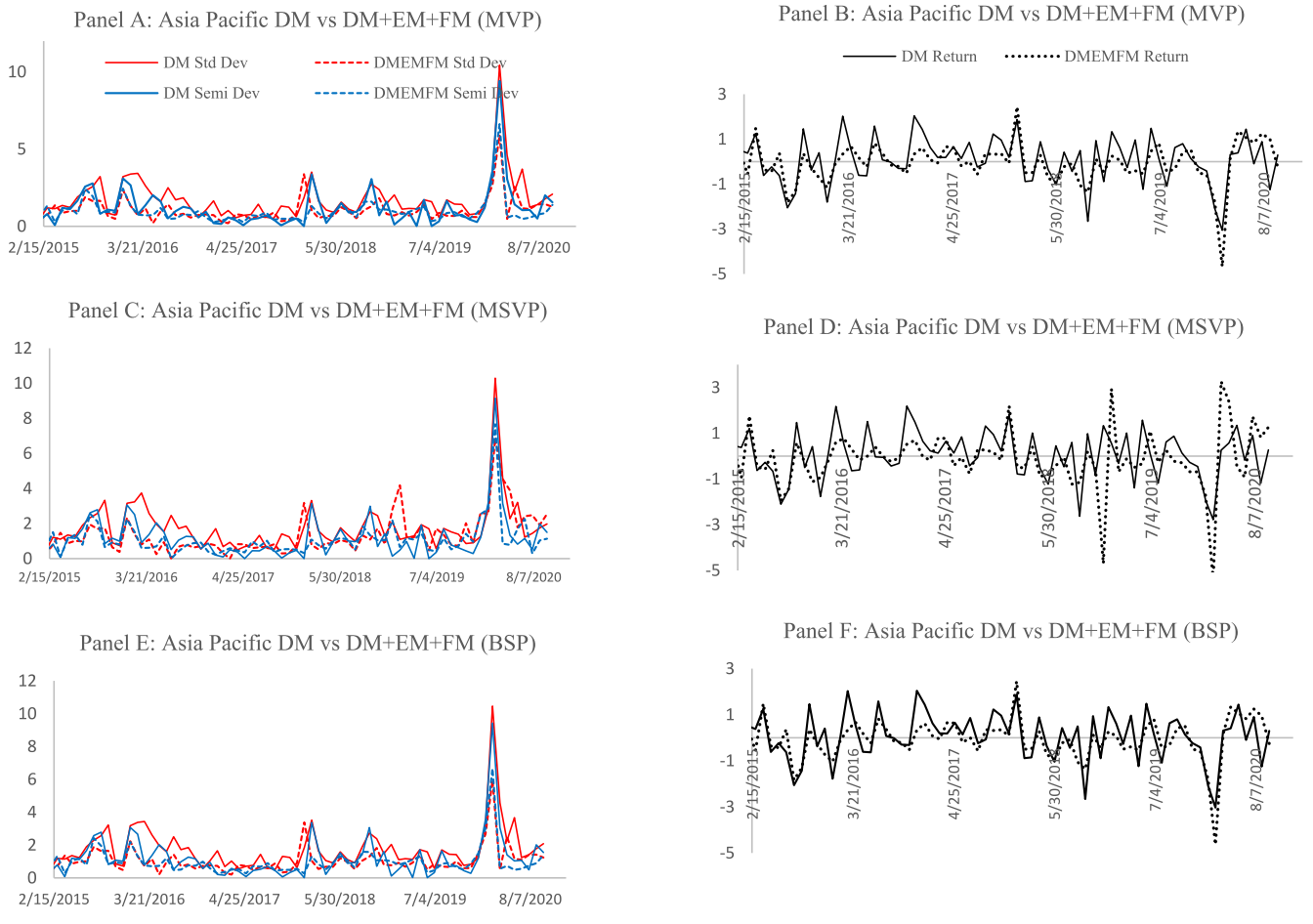

Fig. 6. Asia Pacific DM (P1) vs. DM+EM+FM (P3): OOS Performance.

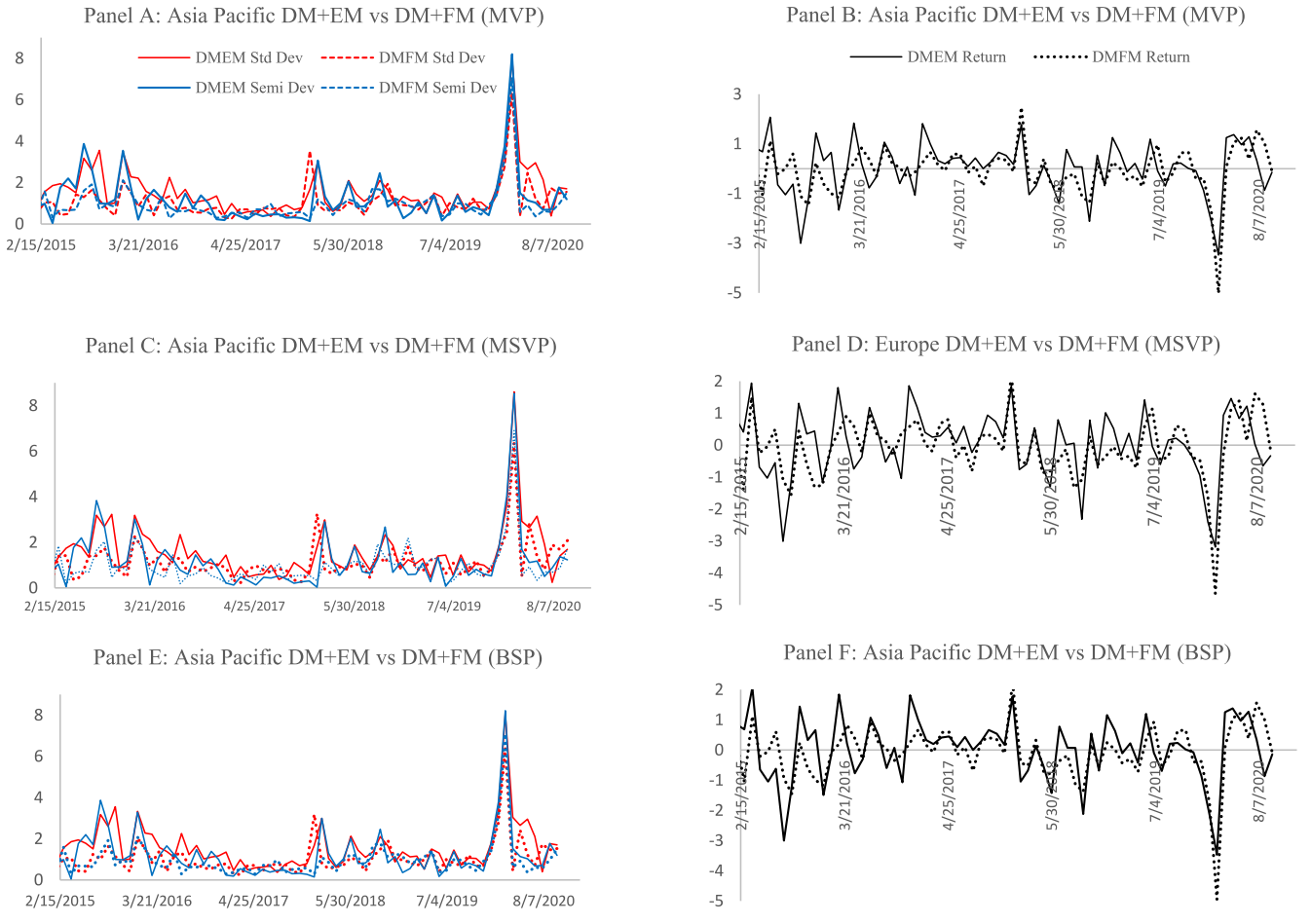

Fig. 7. Asia Pacific DM+EM (P2) vs. DM+FM (P3): OOS Performance.

Table 6
Out of sample performance of European portfolios.

	P1: DM	P2: DM+EM	P3: DM+FM	P4: DM+EM+FM
MVP				
Sharpe Ratio	0.09	0.09	0.07	0.07
Sortino Ratio	2.18	1.11	0.56	0.55
Omega Ratio	1.03	0.99	0.96	0.96
MSVP				
Sharpe Ratio	0.09	0.08	0.09	0.09
Sortino Ratio	1.40	1.19	0.65	0.64
Omega Ratio	1.09	0.98	1.02	1.02
BSP				
Sharpe Ratio	0.09	0.11	0.07	0.07
Sortino Ratio	2.12	1.08	0.56	0.56
Omega Ratio	1.04	1.03	0.96	0.96

Table 6 presents out of sample performance of European portfolios. P1 includes developed markets (DM) only. P2 includes developed and emerging markets (DM+EM). P3 includes developed and frontier markets (DM+FM) and P4 includes developed, emerging and frontier markets (DM+EM+FM). The four portfolios are constructed using three optimization methods viz. Markowitz (1952) minimum variance portfolio (MVP), Estrada (2008) Minimum Semivariance Portfolio (MSVP) and Jorion (1985, 1986) Bayes-Strein Portfolio (BSP).

Table 7
Statistical comparison of Sharpe ratios of European portfolios.

	P1: DM		P2: DM+EM		P3: DM+FM	
	Panel A: 2010–2020	Panel B: 2010–2018	Panel C: 2010–2020	Panel D: 2010–2018	Panel E: 2010–2020	Panel F: 2010–2018
MVP						
P2: DM+EM	0.02	−0.03				
P3: DM+FM	0.03	−0.07	0.01	−0.04		
P4: DM+EM+FM	0.03	−0.07	0.01	−0.04	0.0	0.0
MSVP						
P2: DM+EM	0.04*	−0.01				
P3: DM+FM	0.03	−0.09	−0.01	−0.09	0.0	0.0
P4: DM+EM+FM	0.03	−0.09	−0.01	−0.09		
BSP						
P2: DM+EM	0.01	−0.06				
P3: DM+FM	0.03	−0.07	0.02	−0.01		
P4: DM+EM+FM	0.03	−0.07	0.03	−0.01	0.01	0.01

Table 7 presents Ledoit and Wolf (2008) HAC test for equality of Sharpe ratios for Asia-Pacific portfolios. P1 includes developed markets (DM) only. P2 includes developed and emerging markets (DM+EM). P3 includes developed and frontier markets (DM+FM) and P4 includes developed, emerging and frontier markets (DM+EM+FM). The four portfolios are constructed using three optimization methods viz. Markowitz (1952) minimum variance portfolio (MVP), Estrada (2008) Minimum Semivariance Portfolio (MSVP) and Jorion (1985, 1986) Bayes-Strein Portfolio (BSP). ** and * denote statiscal difference at 5% and 10% significance level respectivel

11% of the respondents manage assets between USD 500 million to USD 1 billion. Almost 23% of the respondents have AUM worth between USD 100 million to USD 500 million. About 34% of the respondents have AUM up to USD 100 million.

According to Fig. 12, more than 85% of the respondents have exposure to emerging equity markets. Almost 46% of the respondents have more than half of their AUM allocated to emerging markets. As per Fig. 13, none of the respondents intend to reduce their exposure to emerging markets in the coming year. Overall, these results indicate a positive outlook toward emerging markets investment.

The respondents are asked to select top emerging markets which they consider will provide the best investment opportunity in the next five years. Fig. 14 displays the response distribution to each of the emerging markets. It is interesting to observe that 47% of the respondents believe that the Asia-Pacific emerging markets like India, China, Korea, Indonesia, and the Philippines will prove to be good investment avenues in the coming years.

Fig. 15 shows the percentage of AUM exposed to frontier markets. Though three-fourths of the total respondents have exposure to frontier markets, the proportion of AUM allocated to frontier markets is very low. For instance, only 17% of the respondents have more than half of their AUM exposed to frontier markets. About a third of the respondents have less than 5% of their AUM exposed to frontier markets. About a fourth of the respondents does not have any exposure to frontier markets. Fig. 16 displays respondents' outlook towards investment in frontier markets. About 67% of the respondents are not going to change their allocation to frontier markets. Interestingly, about 7% of the respondents intend to decrease their allocation to frontier markets in the coming year. One may infer from these results that investors have conservative approach towards frontier markets investment.

The respondents are asked to select top frontier markets, which they consider will provide the best investment opportunity in the next five years. Fig. 17 presents the results of this question. Almost 43% of the respondents identify Asia-Pacific frontier markets as

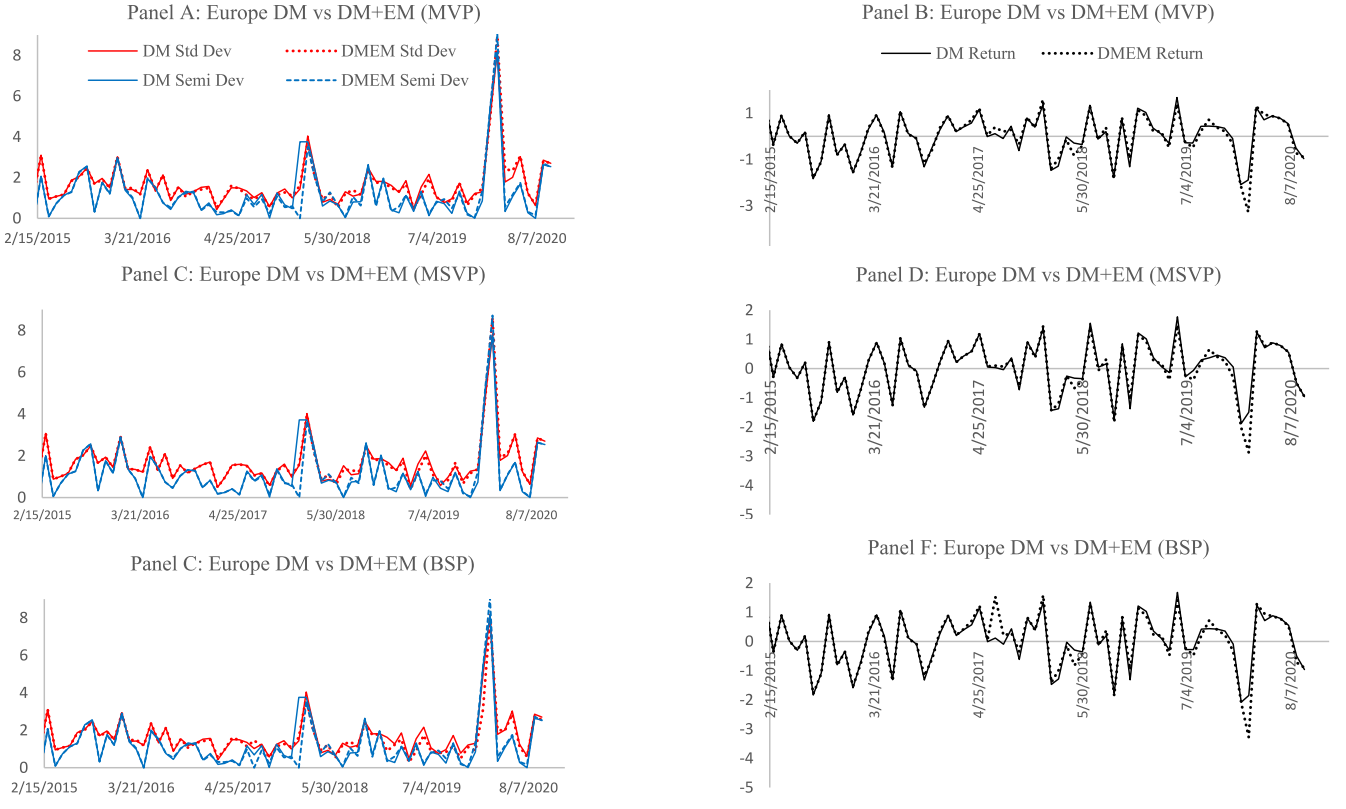

Fig. 8. Europe DM (P1) vs. DM+EM (P2): OOS Performance.

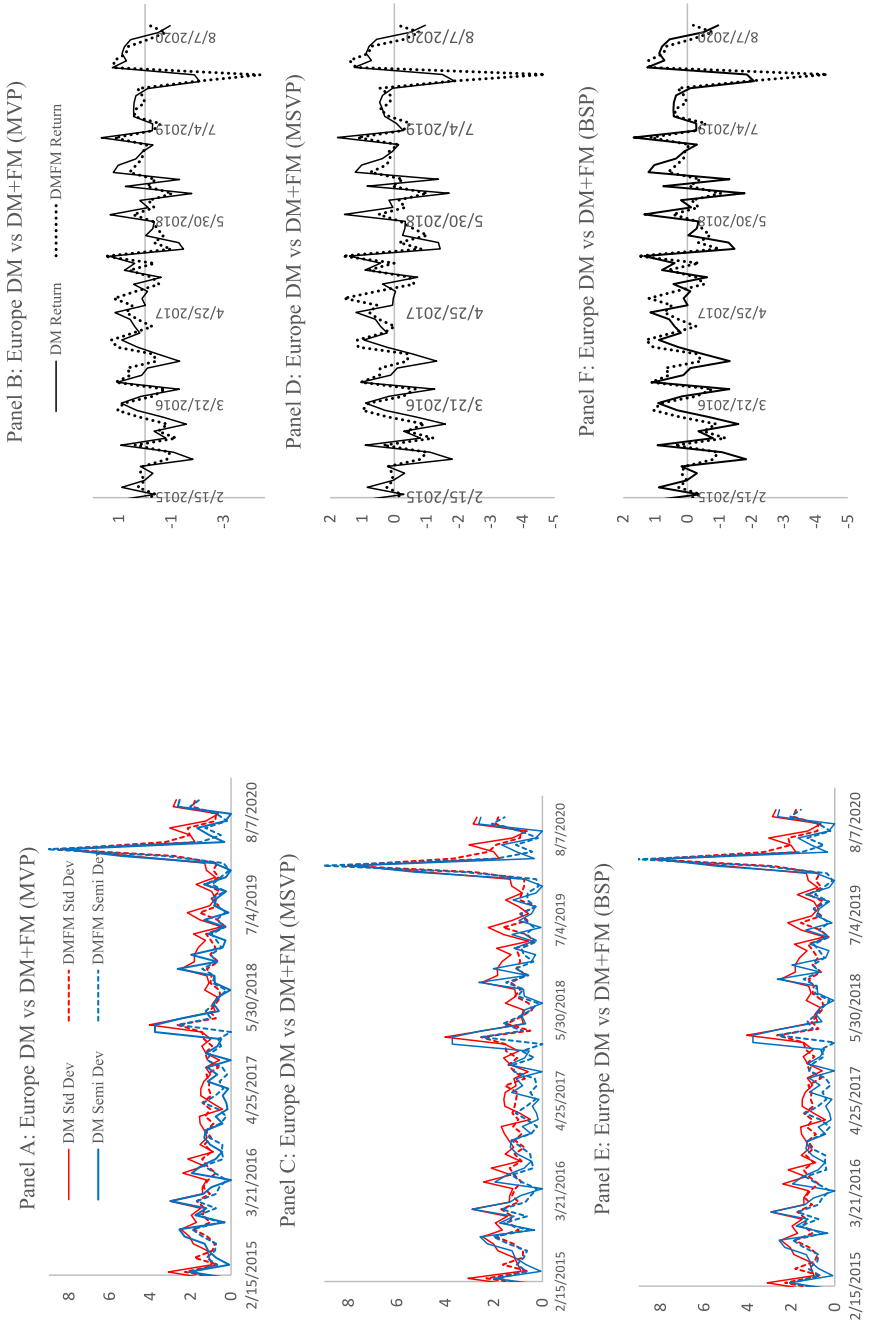

Fig. 9. Europe DM (P1) vs. DM+FM (P3): OOS Performance.

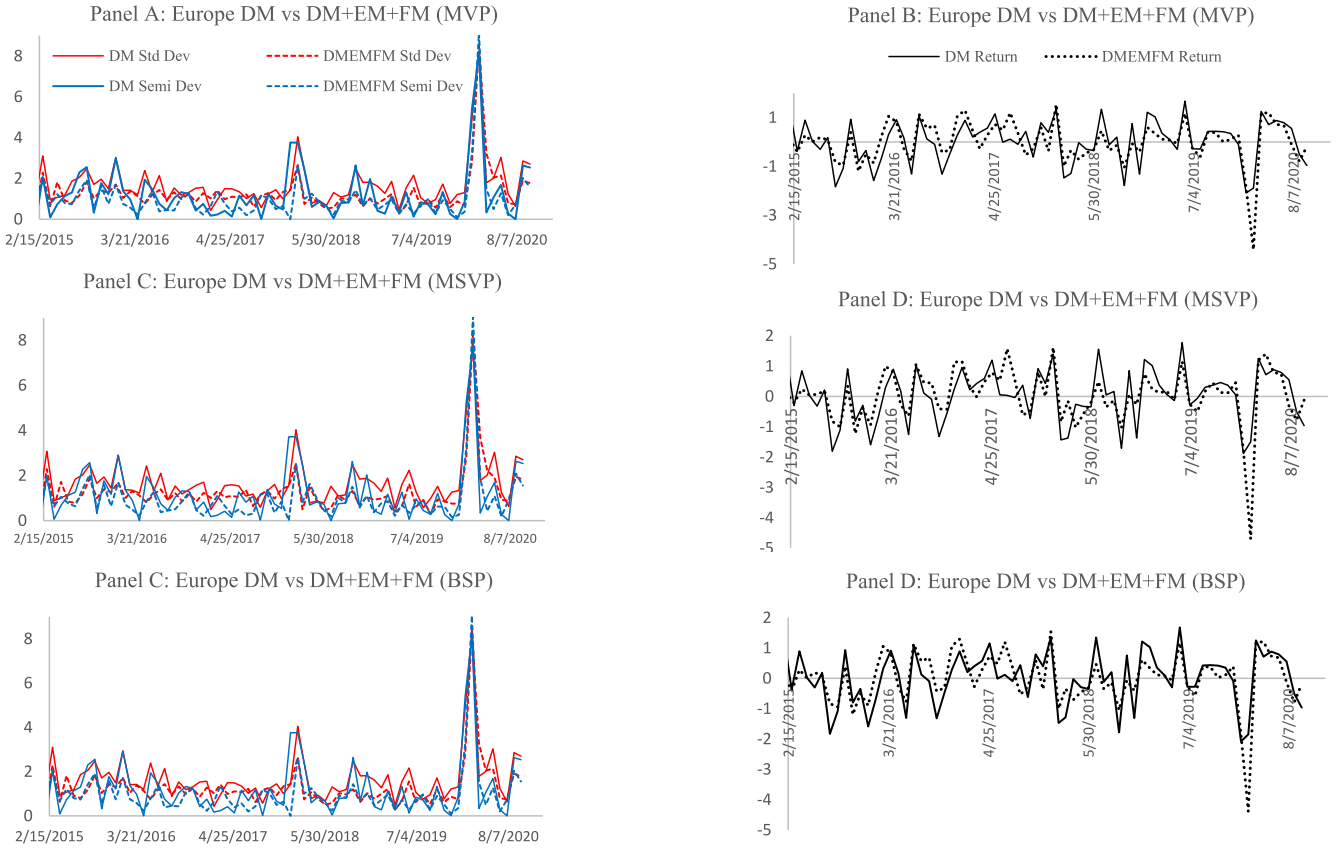

Fig. 10. Europe DM (P1) vs. DM+EM+FM (P4): OOS Performance.

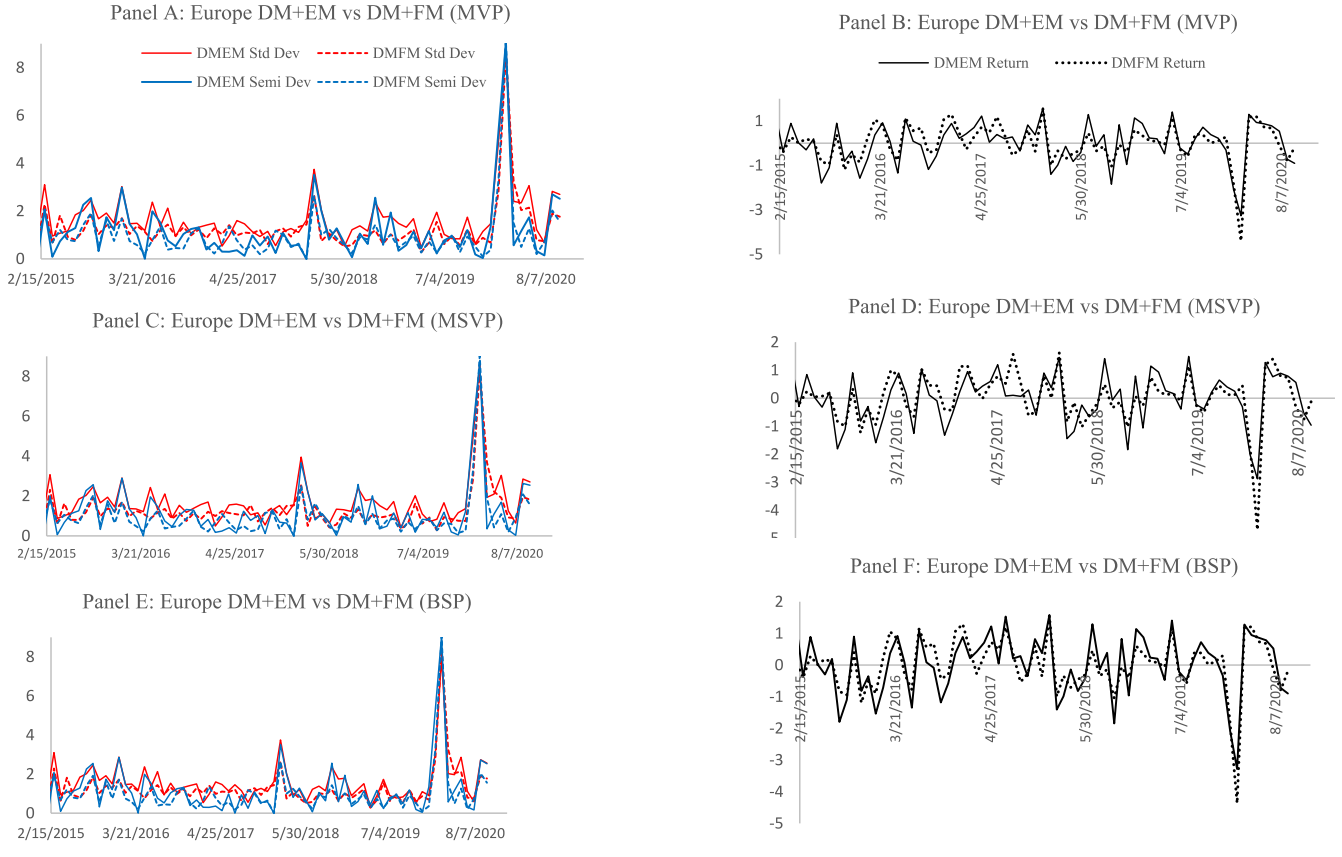

Fig. 11. Europe DM+EM (P2) vs. DM+FM (P3): OOS Performance.

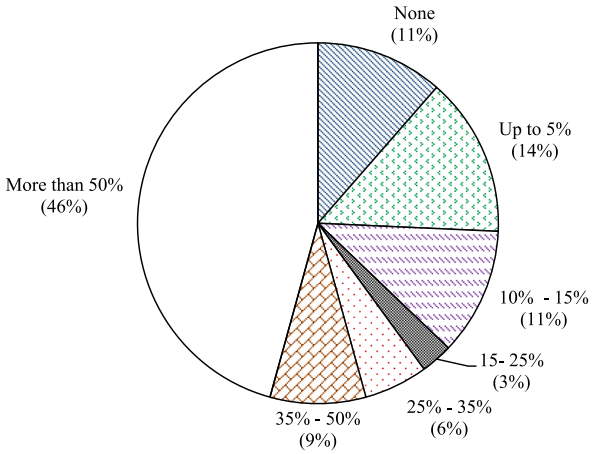

Fig. 12. AUM allocated to Emerging Markets (% of respondents).

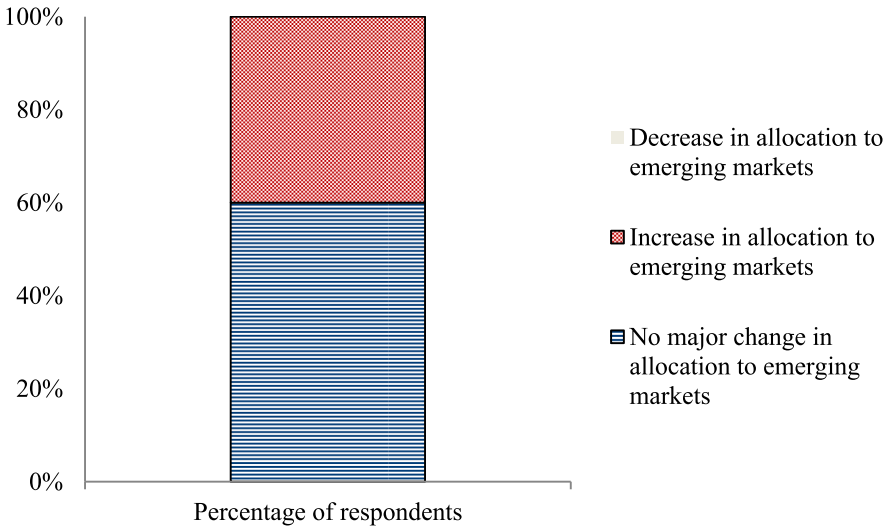

Fig. 13. Outlook towards investment in Emerging Markets (% of respondents).

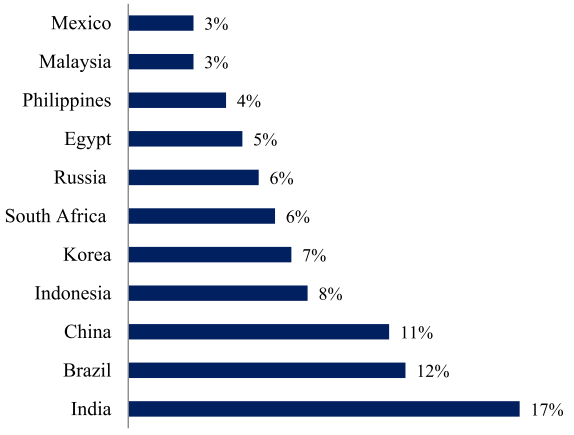

Fig. 14. Emerging Markets considered as best investment opportunities (% of respondents).

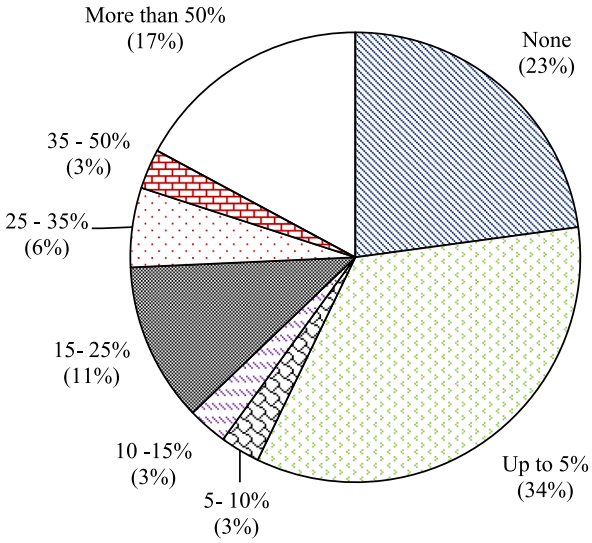

Fig. 15. AUM allocated to Frontier Markets (% of respondents).

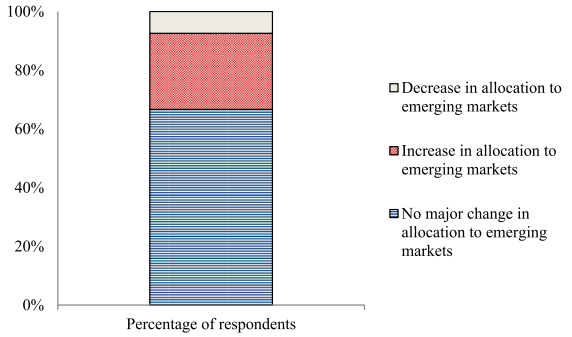

Fig. 16. Outlook towards investment in Frontier Markets (% of respondents).

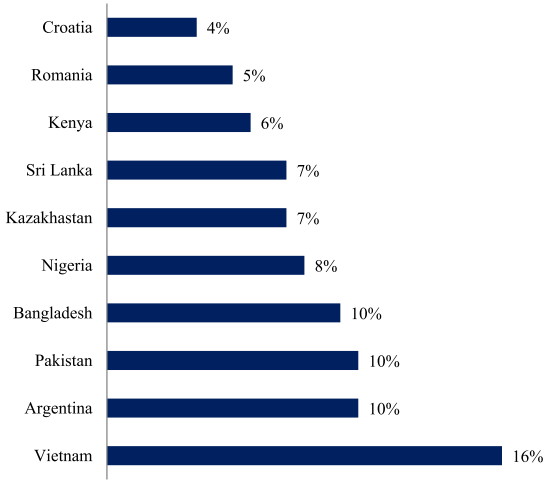

Fig. 17. Frontier Markets considered as best investment opportunities (% of respondents).

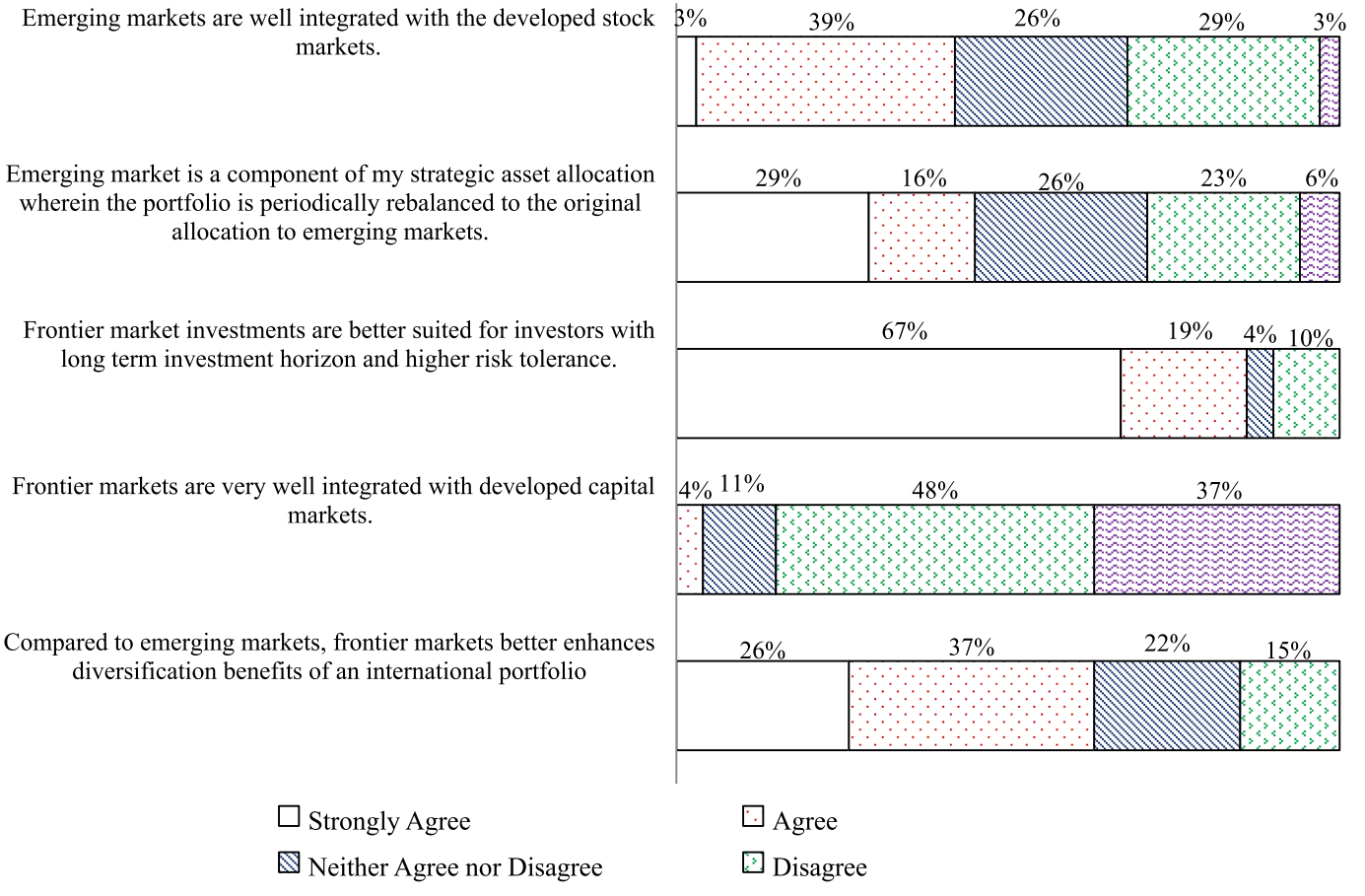

Fig. 18. Perception of investors towards Emerging Markets and Frontier Markets investments (% of respondents).

promising investment avenues.

The respondents are asked to rate some statements regarding emerging and frontier market investments. These statements are evaluated on the 5-point Likert scale. Fig. 18 shows the response distribution for each statement.

It is interesting to observe that investors are divided on the statement that *Emerging markets are well integrated with the developed stock markets.* About 42% of the respondents agree, while 32% of respondents disagree with the same. About 45% of the respondents agree with the statement *Emerging market is a component of strategic asset allocation.* About 67% of the respondents strongly agree with the statement *Frontier market investments are better suited for investors with long term investment horizon and higher risk tolerance*. About 85% of the respondents dissent with the statement *Frontier markets are very well integrated with developed capital markets,* with 37% strongly disagreeing with it. About one-fourth of the respondents strongly agree with the statement, *Compared to emerging markets, frontier markets better enhance diversification benefits of an international portfolio* while 37% of the respondents concur with the same. Only 15% of the respondents strongly disagree with the statement.

6. Discussion and concluding observations

The study compares the role of the frontier and emerging equity markets in enhancing the performance of an international portfolio. The comparative analysis is performed across two regions viz. Asia-Pacific and Europe. To examine the value addition provided by frontier and emerging markets in the international portfolio, the study constructs four portfolios for both the regions. The first portfolio includes only developed markets (P1), the second portfolio comprises of developed and emerging markets (P2), the third portfolio contains developed and frontier markets (P3) and the last portfolio includes developed, emerging and frontier markets (P4). Three optimization models viz. Markowitz (1952) minimum variance portfolio, Estrada (2008) minimum semivariance portfolio, and Jorion (1985, 1986) Bayes-Stein portfolio are used to construct the portfolios. The out-of-sample performances of all the portfolio strategies are compared by using the Sharpe ratio, Sortino ratio, Diversification ratio, and Omega ratio. Further, Ledoit and Wolf (2008) test is used to test the equality of Sharpe ratios across the portfolios.

The results of asset allocation and out-of-sample performance suggest that Asia-Pacific emerging markets is a better choice than its regional frontier counterparts in improving performance of the benchmark portfolio. In all the optimization methods, Sharpe ratio of P2 (DM+EM) are higher than P3 (DM+FM) (though not statistically significant) (Table 4). The result is in concurrence with Dunis and Shannon (2005), who also report that Asian emerging markets provide attractive diversification benefits to investors. A possible explanation for the dominance of Asia-Pacific emerging markets over the frontier markets may be that these markets offer better risk-adjusted returns (refer Table 2) and enjoy better fiscal health and have well developed financial markets (refer Table 1).

It is interesting to observe that though Asia-Pacific frontier markets offer higher potential for diversification than the Asia-Pacific emerging markets (compare diversification ratios of P2 and P3 of Fig. 2), they do not enhance risk-adjusted returns of the portfolio (compare performance measures of P2 and P3 in Table 4). Overall, these results recommend investors to be cautious of investing in Asia-Pacific frontier markets. It should be noted that Asia-Pacific frontier markets suffer from poor fiscal health and are at lower levels of financial sector development (refer to Table 1). Thomas et al. (2019) also advise investors to be prudent while investing in Asia-Pacific frontier markets, owing to its weak financial system.

In Europe, all the optimization methods suggest substantial allocation to European frontier markets (refer P3 and P4 in Fig. 3). Substantial allocation to European frontier markets may be propelled by the fact that these markets not only provide better risk-adjusted returns (refer Table 3) but also share low levels of correlation with its matured counterparts (refer Panel B of Fig. 1). Till 2018, portfolios including European frontier markets displayed better returns and low risk levels. However, the onslaught of covid19 pandemic has adversely affected their performance. It should be noted that the inclusion of frontier equity markets results in a reduction of the Sortino ratio. This result suggests that only bold investors with good risk appetite should invest in European frontier markets.

The diversification ratios of Asia-Pacific portfolios are higher than that of European portfolios. A review of summary statistics (Panel A of Table 1) shows that there is a noticeable difference in the financial development index of Asia-Pacific developed, emerging, and frontier markets. Since these markets are distinct in terms of stock market breadth, depth, and efficiency, a portfolio of Asia-Pacific markets is exposed to diverse sources of risk. This probably explains the high diversification ratio in the Asia-Pacific region (Fig. 2). On the contrary, the financial development index of European emerging markets and frontier markets are at similar levels (Panel B of Table 1), which can be the probable explanation of low diversification ratios of European portfolios. Voronkova (2004) also provides evidence of low diversification opportunities in the portfolio of European equity markets.

A few inferences can be drawn (which applies to both the regions) by analyzing all the portfolio performance measures together. First, we find that the increase in diversification ratio is associated with the fall in total risk of the portfolio. Second, we observe that the diversification ratio of P3 (DM+FM) is higher than P2 (DM+EM) in both regions. This result shows that frontier markets offer higher diversification opportunities (i.e., exposure to more diverse sources of risk) than the emerging equity markets. Third, we observe that the Sortino ratio of P3 (DM+FM) is lower than Sortino ratios of both P1 (DM) and P2 (DM+EM). This evidence implies that frontier market investments are not for investors with low-risk appetite. Lastly, we observe steep rise in portfolio risk and sharp fall in portfolio returns during March 2020, evidencing the global shock caused by covid19 pandemic.

The primary survey analysis corroborates with empirical analysis on several parameters. The investors believe that the emerging equity markets are slowly getting more integrated with the global equity markets, while frontier markets are relatively separated from developed equity markets (Fig. 18). The correlation analysis (Fig. 1) supports this perception. Investors also perceive that frontier markets provide better diversification opportunities than their emerging counterparts (Fig. 18). This opinion is confirmed by the asset allocation results (Figs. 2 and 3). In both the figures, we observe that the diversification ratio is relatively higher in portfolios

comprising of frontier equity markets. The investors believe that frontier market investment is meant for investors with high-risk appetite and long-term investment horizon (Fig. 18). This perception is validated by portfolio performance measures that show that portfolios comprising of frontier markets have lower Sortino ratios. The primary survey also reveals that investors are aggressive on emerging markets investments but are conservative on investments in frontier markets (refer Figs. 12, Figure 13, Figs. 15 and 16). Further, the survey indicates investors' positive outlook towards investment in the Asia-Pacific region (refer Figs. 14 and 17). However, the portfolio performance measures (Table 4) cautions investors against Asia-Pacific frontier markets. The findings of this study have practical implications for institutional equity investors. Institutional investors can use the results of the study in designing a suitable asset allocation strategy that can enhance the performance of their investment portfolios. An interesting area for the future scope of work can be taking the perspective of emerging markets and frontier markets and examining how the inclusion of developed markets will enhance the diversification benefits for them.

CRediT author statement

Nisha Mary Thomas: Conceptualization, Methodology, Software, Formal Analysis, Writing- Original Draft, Writing- Review and Editing **Smita Kashiramka:** Conceptualization, Writing- Original Draft, Writing- Review and Editing, Supervision, **Surendra Singh Yadav:** Conceptualization, Writing- Original Draft, Writing- Review and Editing, Supervision, **Justin Paul:** Writing- Original Draft, Writing- Review and Editing.

Declaration of competing interest

None.

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FinTech credit: uncovering knowledge base, intellectual structure and research front

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Abstract

Purpose

Owing to the dramatic rise of FinTech credit in the financial sector, this study describes its knowledge and intellectual structure and paves the way for future research.

Design/methodology/approach

The study employs citation analysis, keyword analysis, co-author analysis, co-citation analysis and bibliographic coupling on 268 peer-reviewed articles published during 2010–2021 and extracted from the Web of Science database.

Findings

Research on FinTech credit has picked up momentum from 2016, with majority contributions from China, followed by UK and USA. *International Journal of Bank Marketing* is found to be the most productive journal. Co-citation analysis reveals that past studies have focused on three dominant themes, viz. (a) factors that influence user intention to adopt technological products and services (b) borrowers' and lenders' characteristics that impact fund-raising in FinTech credit platforms and (c) evolution of FinTech market over the years. Bibliographic coupling reveals that recent trends in FinTech credit include (a) impact of emerging technologies like blockchain, artificial intelligence, big data on financial system, (b) factors that encourage consumers to adopt the FinTech products and services, (c) mechanisms by which FinTechs have transformed formal credit markets, (d) factors that lead to successful fundraising in FinTech platforms and (e) critical perspectives on digital lending platforms.

Originality/value

To the best of the authors' knowledge, this is a pioneering study undertaking an exhaustive analysis of FinTech credit as a research area. The study offers valuable insights on potential topics of research in FinTech credit domain like investigating Balance Sheet Lending Model, investigating the impact of FinTechs on financial system, and new markets by collaborating with scholars of other regions.

Keywords

FinTech | Credit market | Innovation | Bibliometrics | Web of science

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S.I. : GREENWASHING

What facilitates and impedes the adoption of sustainability in global value chains? A Grey-DEMATEL analysis

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Abstract
Trade was deep rooted in the world locally. The global doors opened up more recently and new ideas for trading and making product in multiple locations are even more nascent, close to the 80 s. This gave us the topic of global value chains (GVC) to study, reflect and understand the shift in global trade. Since then, the subject has gained interest from both academics and decision-makers. Since the development of the topic of global value chains (GVCs), production has altered a lot. Due to lower transportation and communication charges, many firms have abandoned the custom of making all their products and services in a single nation and inside their organisational borders. GVCs can offer various benefits for firms and countries, such as access to new markets, technologies, skills, and resources. However, GVCs also pose challenges like coordination costs, quality control, environmental and social standards, and value-added distribution. This has led to the advancement of literature; however, there remains a gap in understanding how the barriers and drivers of Sustainability in GVC affect it. This study has been undertaken to address this gap and has used the Grey-DEMATEL technique. Study shows significant relationships among factors like Greenwashing, the COVID-19 pandemic, and Blockchain technology, which policymakers can use to improve Sustainability within the value chains.

Keywords Sustainability · Grey relational matrix · DEMATEL · Global value chains · Critical success factors · Grey theory

1 Introduction

Since the early 1980s, the structure of international trade flows has undergone a substantial alteration, giving rise to what some have dubbed the "Age of Global Value Chains" in a somewhat Hobsbawmian fashion (Amador & Di Mauro, 2015; World Bank, 2020). The topic has been on the rise ever since, drawing the attention of academicians and policymakers alike. The advancement of the GVCs has completely transformed how production is carried out. Due to decreased expenses of communication and transportation, many businesses have given up the tradition of manufacturing all their commodities or services inside their organisational bounds and within a single country (Ambos et al., 2021). This

Extended author information available on the last page of the article

outsourcing has led to the advancement of topics of offshoring, production networks, and network fragments, among others. Furthermore, scholars have quickly jumped on the trend and advanced their knowledge. A significant body of literature has examined the geographic distribution of GVCs over the past 20 years (Suder et al., 2015; Turkina et al., 2016), the variables affecting the location decisions (Doh et al., 2009; Jensen & Pedersen, 2011; Ma & Van Assche, 2016), and related to governance (Gereffi et al., 2005). Other investigations explore what drives the dispersion of global production(Kedia & Mukherjee, 2009; Schmeisser, 2013), who are likely to pursue this trend (Farinas & Martín-Marcos, 2010), and how GVC scattering affects a company's output or employment (Brandl et al., 2017; Hummels et al., 2014; Kasahara & Rodrigue, 2008). Sustainability is an integral part of the global trade system. It is a crucial driver in the next stage of globalisation, as it will help ensure that trade will be more sustainable. Value chains consist of multiple industries that connect producers and consumers. Each stage in the chain creates a product with value and adds to the total sales figures. Consumers can influence sales by buying products; this leads to economic growth and creates jobs. Manufacturers can move from low-volume to higher-volume products by switching suppliers- these increase sales and create even more jobs. Firms can earn extra revenue by reselling products to other companies or individuals. This allows for a broader range of products at lower prices for more significant profit margins. Essentially, global value chains are essential for creating jobs and making money. However, these systems can be corrupted if not managed carefully. A vast and complicated term, Sustainability may signify multiple things depending on the situation and viewpoint. The ability to support a process or activity over time without endangering the environment or depleting natural resources is a popular definition of Sustainability. It frequently entails striking a balance between present and future requirements while also taking the economic, social, and environmental effects of human activity into account. Vandenbrande (2019) proposed a new definition of carry forward our present ecosystem to the future in a better shape. It is essentially a synergy between the present and future for an organic growth. Companies follow a sustainable value chain when following ethical guidelines at each stage. Firms should respect the cultures of countries where they manufacture goods. They should also respect workers' rights at each value chain stage. The environment should also be protected during manufacturing- only environmentally friendly materials should be used when creating new products. After manufacturing, products should be exported only to countries that uphold similar moral standards regarding worker rights, environmental protection, and ethical business practices. This way exported products can benefit both countries economically and culturally while maintaining ethical standards regarding global value chains. Therefore, we must study global value chains to prepare for the future. These systems have proven themselves helpful in creating jobs and selling goods worldwide. However, they can become problematic if not managed carefully. Green logistics do not necessarily add financial value to the organisation (Barut et al., 2023), but Wan et al. (2022) argue that it positively impacts environmental Sustainability. Companies need to follow responsible guidelines when following the chain- or risk ruining an effective system for creating wealth internationally. Researchers must stress how global value chains affect our future if they want to promote awareness about these issues in their writing. Only through careful study and public awareness will we be able to properly manage these complex systems for creating international wealth. To understand the subject area better, we must understand what factors facilitate and act as impediments when adopting sustainable practices. This research has been undertaken to keep in mind the same, and through this study, the below Research questions will be answered.

RQ 1—What are the major impediments/barriers and facilitators/enablers to adopting sustainable practices in global value chains?
RQ 2—Which criteria stand out the most from the views of both stakeholders?
RQ 3—How may decision-makers assess the connections between the cited facilitators and barriers?

The study is focussed on the barriers and enablers of Sustainability practises in the global value chain. This paper looks to answer the above research questions using data collected from a group of experts—both academicians and industry experts and then model their responses using Grey relational theory and the Decision-making trial and error laboratory(DEMATEL) technique of the Multi-criteria decision-making (MCDM) techniques available. The paper is arranged as follows—Section 2 is a comprehensive literature review with an introduction to the factors under study. Section 3 is methodology; Section 4 is the result section, which computes individual results for each respondent category and total. Section 5 is the discussion section with policy implications, and Sect. 6 is the conclusion.

2 Literature review

Gereffi is one of the founding fathers of the knowledge body of global value chains and has done sufficient work for scholar to understand the topic well. In his study of 2018, he describes value chains to be the forebearers of the intermediate goods more so than the final ones. He essentially talks about a diminishing north south divide when we dig deeper into "GVC economy". As a result, nations at all stages of development are today more linked than ever before (Backer & Flaig, 2017; OECD, 2013). It is not surprising that sufficient literature is available on the topic. Despite that, the studies available do not answer the specific questions we wish to discover through this research work. A summary of the research work has been included and presented in Table 1.

The previous authors have made significant contributions to the subject of global value chains, but a lot of the time, the study is limited to specific industries or regions (Gereffi, 2018). Oelze (2017) has worked on the barriers and enablers, but the study is limited to the Textile industry. Özaşkın and Görener (2023) have used impressive techniques, including DEMATEL and others, for their study on supply chain management, but again work is limited to only barriers. The present study focuses on the global value chains. The authors have taken Enablers/Facilitators and Barriers/Impediments to the entire chain. There is no restriction to this study's geographical or industrial applicability since neither has been a constraint in factor selection.

Itakura (2020) talks about the trade war between the world's two large economies—the USA and China (B5). When GVCs are considered, the negative impacts on bilateral trade are more felt globally, and the modified model shows a decline in global GDP, of almost US$450 billion. This implies that the GVCs significantly influence trade responses at the segmented level. Many are blaming weak supply chains and rising transportation costs as inflation rises. In the global trade network, seaports are locations where supply chain bottlenecks may be seen. Normally, not a lot of attention is drawn to the topic of the Supply chains, but with vacant supermarkets and exorbitant prices for the products available in the USA, a new page was turned. Among the problems, the press and industry associations have emphasised the significant delays that port

Table 1 Summary of previous work done

References	Title	Description	Research Gap
Kumar et al. (2008)	Flexibility in global supply chain: Modeling the enablers	The authors have identified and created a hierarchy of the enablers of the global supply chain using ISM analysis	This study uses the Interpretive Structural Modelling method for analysis of enablers. Regardless, the topic of GVC has shifted since, and the factors identified vary greatly
Oelze (2017)	Sustainable Supply Chain Management Implementation–Enablers and Barriers in the Textile Industry	The author here explores how barriers and enablers of the textile industry supply chain can be managed for sustainable operations	This paper uses a case study analysis method but focuses only on the textile industry
Lahane et al. (2023)	Evaluation and ranking of solutions to overcome the barriers of Industry 4.0 enabled sustainable food supply chain adoption	For sustainability, the authors examine how to apply and integrate Industry 4.0 in the food supply chain	This study uses a multi-criteria decision-making approach; however, it focuses on Industry 4.0 and focuses on the food supply chain
Özaşkın and Görener (2023)	An integrated multi-criteria decision-making approach for overcoming barriers to green supply chain management and prioritising alternative solutions	The authors have modelled the barriers to green supply chain in this study using DEMATEL approach	This study uses DEMATEL, EDAS and COPRAS methods of MCDM technique. Nevertheless, the focus is on green supply chains only. Furthermore, the study is on barriers alone

Source Authors' compilation

congestion results in when transporting goods to clients and businesses (Komaromi, Cerdeiro & Liu 2022). Increased pricing and delayed shipping have brought attention to the ports of Los Angeles and Long Beach and those of increased pricing (Isaacson & Rubinton, 2022). The intermodal chain's vulnerability on the landside was highlighted further by the rising port obstacles and pressure on ecosystems and health of the public. This led to more reliance on trucking services inland and a rise in overall emissions (Vukić & Lai, 2022). This brings us to the next Barrier—Shipping congestion in US Ports (B6). Market-based regulations (B7) talk about regulations and rules set up at the marketplaces to define and put in order the practises and identified best practices. According to the findings of research by Luo, Salman, and Lu (2021), market-based regulation (MER) has a detrimental impact on green innovation in China. Lade et al., (2018), argue that policy shocks, like market-based regulations, reduce the incentives for firms to invest in technologies that enable more sustainable manufacturing practises. Indigenous Technology (B10), discussed in Mahoney et al. (2022), talks about resilience by design and intervention, exploring the case of a tribe and supply chain shock from the pandemic. Such strategies help the community do away with the supply chain, but on the other hand, it implies lesser reach for the global manufacturer and consumer.

2.1 Barriers

To answer the first research question (RQ1), we have done an extensive literature review and found the following Facilitators or enablers and the Impediments/Barriers. The factors were further screened through expert opinion, and insignificant and overlapping factors were dropped after the discussion. Using a questionnaire created based on the variables, data are gathered from the expert panel using judgmental sampling. Some variables were eliminated owing to redundancy after expert judgement on the appropriateness and dependability of factors. When an agreement was formed, the experts discussed their findings and knowledge and only those elements that were both theoretically and practically reliable were incorporated. Following the removal of overlapping variables, a record of the finished factors was given to the specialists for approval. This list included definitions and references. The process was repeated until every possible combination was attained.) Pollution has become a menace in the past few years and, even so, is entangled in the global trade scenario. Chitaka (2021) talks about the desire of the value chain participants to reduce this pollution, but most of the time, they end up greenwashing (B1) rather than finding a sustainable solution. Lashitew (2021) also discusses their paper given the Sustainable development goals (SDGs) and from a measurement and reporting perspective. Antras (2020) has put together literature and brings evidence to prove that the world is now at the start of de-globalisation (B2), which may very well be the end of the global interconnected trade, although it may not hamper it entirely. Pegoraro et al. (2020) argue that the anti-globalisation movement is a more significant societal movement born out of dissatisfaction with globalisation. Circular economy (B3) has been found in the literature in multiple places, and authors have varied views, although they all expect it to have a specific impact on GVCs (Hofstetter et al., 2021; Awan et al., 2022; Schroeder et al., 2018). Kejžar et al. (2022) talk about the collapse of the trade network in the wake of the pandemic, COVID-19 (B4) in the European context, and Freidt and Zhang (2020) talk about the same in the Chinese scenario (Table 2).

Table 2 List of barriers

Barriers	Denotation	Description
Greenwashing	B1	"Greenwashing" refers to presenting a misleading impression or incorrect facts about how a company's products are more ecologically friendly. Does this have an impact on the longevity of GVCs?
De-globalisation	B2	Reducing the dependence on foreign country/ies for trade and supply
Circular Economy	B3	A method of manufacturing and consumption that prioritises sharing, renting, reusing, mending, and recycling already-existing materials and goods. Will this have an impact on the integration of sustainability and supply chains?
COVID-19 Pandemic	B4	The pandemic is a barrier to implementing Sustainability in the value chain
US-China Trade war	B5	Does the trade war affect the global value chains?
Shipping congestion in US Ports	B6	The shipping congestion of containers at the US ports. Also, congestion at other ports worldwide
Market-based Regulation (MER)	B7	Marketplace behaviour encourages organisations to pick up good practices. Will they function as a barrier to implementing Sustainability practices in the GVCs
Information Asymmetry	B8	Lack of information or adequate information along the value chain between parties
Best available techniques (BAT) permissions	B9	Best practises for minimising or eliminating emissions and environmental consequences are referred to as "best available techniques" (BAT)
Indigenous Technology	B10	Local production techniques or tradesmen-ships that do not require the import of technology

Source Authors' compilation from literature

2.2 Enablers

Coming to the enablers or facilitators of Sustainability in global value chains, we look at 11 items picked from an extensive literature review. The same has been enlisted in the table below. Blockchain (E1) has been identified as one of the main facilitators of Sustainability. Egwuonwu et al., (2022) suggest that Value chain participants will get fresh, timely insights into their supply chains using blockchain and more precise and trustworthy information about crucial processes, activities, and product characteristics, including quality, performance, and availability. IoT and blockchain integration would enhance start-to-end tracking and visibility and enable the quick recall of dangerous items. The information may be evaluated fluidly thanks to the openness. Some nodes (or system participants) can offer sustainability guarantees that can be verified inside the system, and data can also be verified using group consensus (Nikolakis et al., 2018). With Digital Transformation and Technology (E2) in the value chains, new business prospects open in the digital sphere, leading to the Globalisation of research and development and Interaction-intensity supply of customised digital services (Szalavetz, 2020). Strange et al., (2022) also add to this by focussing on how digital transformation can help expand the internalisation theory. Consumer habits and behaviours (E3) are another important aspect of how well Sustainability practises can be adopted by the GVCs. Growing supply chains and concepts like supply chain 4.0 are directed towards more consumer-centric chains than manufacturer-driven ones (Ferrantino & Koten, 2019). These also exhibit inherent sustainability goals. A consumer-centric chain also means much power in the hands of consumers, which can alter outcomes. This can be a game-changer, positively or negatively. The most common consumer buying behaviours are Collaborative, transactional, dynamic, and innovative solutions (Gattorna, 2013). In the past, economies have had command and control regulations (CCR) (E4) in all aspects, especially in the manufacturing industry. A study by Tang, Qi, and Zhou (2020) in the Chinese market suggests that the government should take down the homogeneity of CCR and make more suitable laws in the face of green innovation. Sinclair (1997) has also pointed out this right in the beginning, how a more flexible system should work better than just regulations, which may or may not change as per the change in scenario. Li et al., (2019), suggest that counties should not cut back all CCR; however, they may use it prudently along with other factors, implying we cannot rely fully on CCR to enable green innovation and other Sustainability practices in the value chains. The pandemic (E10) brought many challenges to the world of supply chains. Nevertheless, it also brought innovations that arose from the bosom of those challenges. Indigenous R&D (E5) is one such blessing. We have evidence to believe that this hampers the adoption of Sustainability into the Global value chains. Mahoney et al. (2022) talk about resilience by design and intervention, exploring the case of a tribe and supply chain shock from the pandemic. Such strategies help the community do away with the value chain, but it implies lesser reach for the global manufacturer and consumer. When we talk about the Virtual industry clusters (E6), Swierczek and Kisperska-Moron (2016), through their study, talk about how highly specialised industry support virtual clustering. Lopez et al. (2017) speak of how Best available techniques (BAT) (E7) implementation does not necessarily imply a pollution reduction, as per data and evidence from their paper. In the study by Huybrechts et al. (2018), for BAT-based rules to work as a possible facilitator – and not as an impediment– for strengthening the chain, three approaches are suggested for a more systemic evaluation of supply chain factors in the BAT understanding process. These methods include choosing "collaboration with upstream and downstream partners in the value chain" as a common rule for all industries, determining

the "value chain BAT", and considering pertinent "cross-sector impacts". The manufacturers now need a better understanding of green practices and certifications (E8) to come into the picture. Studies show how certified firms can make better outcomes (Migdadi & Elzzgaibeb, 2018). Schaefer and Crane (2005) talk about how environmentally sustainable consumption (E9) is meagre and is generated only from few environmentally influenced consumers. This can be borrowed for the value chains as well. Since the end users, the consumers, are not asking for it, the manufacturers do not go out of their way to make things greener. This acts as an impediment to Sustainability and GVC. In the study by Bloom and Hinrichs (2011), they talk about how informal regulations (E11) and mechanism, although branches of trust, fails to make a thorough connection and require more formal commitments (Table 3).

3 Methodology

3.1 Research design

The research followed is in two parts. The data once collected through questionnaires from experts are then converted into linguistic scales and further analysed to get the result. Thomas (2023), in their paper has done similar methodology for the modelling of factors in the FinTech domain.

Figure 1: Research Plan for Factor Identification and Analysis.

Table 5: Profile of the respondents.

3.1.1 Grey-DEMATEL method

Step 1: *Compute Initial Relation Matrices.*

Let '*n*' be the total number of recognised crucial factors and '*l*' be the total number of participants. The effect of factor '*i*' over component '*j*' is evaluated by each participant '*k*' using a six-point normal scale, with 0 denoting no influence and 5 denoting extremely high influence. Table 3 shows the corresponding grey values. As a result, we will have '*l*' initial relation matrices (Table 4).

Step 2: *Compute Grey Relation Matrices.*

Step 3: *Compute Average Grey Relation Matrix.*

Step 4: *Compute Crisp Relation Matrix.*

Step 5: *Compute Normalised Direct Crisp Relationship Matrix.*

Step 6: *Compute Total Relation Matrix.*

Step 7: *Identify prominent factors; Obtain causal relationship; Plot cause-and-effect diagram.*

Step 8: *Set the threshold value to identify a significant causal relationship.*

The Total Relation Matrix illustrates how one element affects another. To simplify things and prevent insignificant consequences, a threshold value must be specified. The mean and one standard deviation of the matrix *T*'s components are added to get the threshold value. If D_{ij} is true, factor *i* strongly affects component *j* (Table 5).

4 Research results

4.1 Data collection and respondent information

Table 3 Respondent profile

Category	Profile of respondent/organisational role	Type of organisation/Department	Education	Experience	Count
Industrial Practitioner	Vice President, Director, Senior Manager	World Economic Forum, Supply Chain industry	Master's Degree-4	Average = 20.2 years with a standard deviation of 3.5 years	4/7 = 57.14%
Academic Researcher	Professor, Associate Professor	Operations Management, Supply Chain Management, Transportation Engineering	PhD-3	Average = 16.7 years with a standard deviation of 2.4 years	3/7 = 42.8%s

Source Authors' compilation

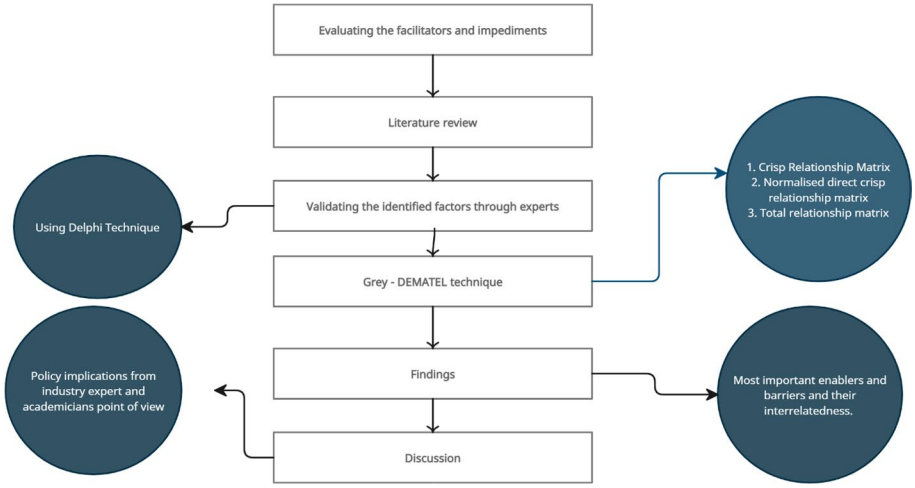

Fig. 1 Research methodology

4.2 Grey-DEMATEL results

4.2.1 Enablers

We analysed the enablers by taking responses from 3 academicians and four industry experts, a total of 7 participants. The results are as follows for the two categories and the combined results.

4.2.2 Academicians

The above table, Table 6 shows the computed values of the analysis. Here we have the relationship values for the Enablers. The results are based on the responses from the Academic experts. In the rest of the paper, we have similar table for each expert category and factor type as well. The values that are in bold font are the ones that are higher than the threshold values. The higher the value, the more its power.

This section talks about the Enablers or the Facilitators. Critically reviewing, we are looking at the factors that will help promote the Sustainability of processes, products and people within the value chain. The values that are in bold font are the ones that are above the threshold value (θ) (Table 7).

The highest value of the Di column is the most prominent factor. Similarly, the highest positive value in the Ei column is the factor with the highest driving value (Fig. 2).

Table 4 List of enablers

Enabler	Denotation	Description
E1: Blockchain	E1	Blockchain is a force in the global value chain. Its application or underapplication
E2: Digital Transformation and Technology	E2	Has technology and evolution had any positive impact on the value chain
E3: Consumer Habits and Behaviour	E3	Do consumers' habits and behaviour affect the global trade and supply chain?
E4: Command and control regulation (CCR)	E4	Government regulations are imposed to comply with environmental status, e.g., vehicle pollution checks—such regulations in the supply chain industry impact imposing Sustainability practices
E5: Indigenous R&D	E5	Local production techniques or merchants that promote Sustainability
E6: Virtual industry clusters	E6	Instead of actual clusters, having virtual clusters that enable knowledge transfer
E7: Best available techniques (BAT) permissions	E7	Techniques specifically designed to control or reduce emissions
E8: Certifications on green manufacturing	E8	If companies and stakeholders get certified in green manufacturing, will it promote Sustainability in the global value chain?
E9: Consumption Pattern Towards Sustainability	E9	The consumer preference and consumption pattern towards sustainable products
E10: COVID-19—global pandemic	E10	The impact of COVID-19 as a pandemic positively on supply chains
E11: Informal Regulation (IER)	E11	A code of conduct is informally formed that channels businesses to adopt suitable practices. Are informal regulations strong enough to promote Sustainability in value chain companies?

Source Authors' compilation from literature

Table 5 Linguistic Scale and corresponding grey value

Linguistic terms	Normal scale	Grey scale
Very High Influence	5	(0.9, 1.0)
High Influence	4	(0.6, 0.9)
Medium Influence	3	(0.4, 0.7)
Low Influence	2	(0.2, 0.5)
Very Low Influence	1	(0.1, 0.3)
No Influence	0	(0.0, 0.1)

4.2.3 Practitioners

The above table, Table 8 shows the computed values of the analysis. Here we have the relationship values for the Enablers. The results are based on the responses from the Industry/ Practitioner experts. The values that are in bold font are the ones that are higher than the threshold values. The higher the value, the more its power (Fig. 3) (Table 9).

4.2.4 Total

We have the total computed values for all the respondents here in Table 10. We can see that certain factor like Blockchain, Digital Transformation and COVID-19 have many value that are in bold. Combining these results with those in Table 11, we can see that the factors that have most prominence are Digital Transformation and Consumer Behaviour, whereas the factor that has the highest driving power is COVID 19. It means, it can influence the other enablers more (Fig. 4).

4.2.5 Barriers

4.2.5.1 Academicians The above table, Table 12 shows the computed values of the responses from Academicians for the Barriers/ Impediments. The prominent factors are identified here and are marked in bold. In the next step of the analysis, we identify the driving and driven factors.

When we look at Table 13, we can see that the significant Barriers have been narrowed down to just three (Marked in bold), as compared to Table 12. While De-globalisation and Circular Economy are both prominent, COVID-19 still is the most influential and driving factor in the play of barriers. This analysis is based on the responses from the Academicians (Fig. 5).

4.2.5.2 Practitioners When we look at Tables 14 and 15, we see that the responses are slightly variant. While the prominent factors are still the same, industry practitioners have reason to believe that trade wars, information asymmetry and greenwashing have important roles to play in the realm of global value chains. Again, looking at prominence and driving factors, we have the same candidates as before, with the inclusion of Trade war having high influence over other barriers to GVC and sustainability (Fig. 6).

Table 6 Total relationship matrix for enablers (Academicians)

Enablers	Blockchain	Digital transformation	Consumer Behaviour	CCR	Indigenous R&D	Virtual Clusters	BAT	Certifications	Consumption Pattern	COVID-19	Informal Regulation
Blockchain	0.50142	0.79061	0.67110	0.69355	0.63847	0.68477	0.67351	0.67166	0.64925	0.14823	0.65382
Digital transformation	0.73555	0.81327	***0.86583***	0.81552	0.74095	0.80489	0.83978	0.78747	0.80750	0.18508	0.79175
Consumer Behaviour	0.65182	***0.88930***	0.74324	0.79525	0.74536	0.78235	0.80852	0.80957	0.84274	0.20915	0.81581
CCR	0.69472	***0.87463***	0.82166	0.70161	0.70922	0.71751	0.79554	0.83101	0.80658	0.17231	0.82775
Indigenous R&D	0.66794	***0.93083***	***0.89394***	0.84788	0.68377	0.83140	0.80029	0.85221	***0.88698***	0.21282	0.82638
Virtual Clusters	0.63073	0.79878	0.75651	0.70149	0.68392	0.61338	0.73058	0.70743	0.72809	0.14446	0.70649
BAT	0.51043	0.75898	0.68291	0.63238	0.63505	0.63696	0.57284	0.63560	0.64683	0.13147	0.64143
Certifications	0.54090	0.79201	0.72033	0.71645	0.61591	0.64343	0.68741	0.61374	0.72682	0.13831	0.71826
Consumption Pattern	0.57268	0.83405	0.79223	0.73163	0.67118	0.68135	0.74431	0.75611	0.66070	0.14773	0.74294
COVID-19	0.60506	0.80260	0.71023	0.64448	0.64188	0.70139	0.68553	0.65709	0.69369	0.13592	0.64027
Informal Regulation	0.60020	0.82540	0.73624	0.74191	0.68185	0.70743	0.73272	0.74457	0.75345	0.18373	0.64609

Source Authors' compilation

Table 7 Degree of Prominence (Di) and Net Cause (Ej) for Enablers (Academicians)

	ri	cj	$D = \text{ri} + \text{cj}$	$E = \text{ri} - \text{cj}$
Blockchain	6.77637727	6.711458515	13.48783578	0.064918755
Digital transformation	8.187597688	9.110453747	**17.29805144**	−0.922856058
Consumer Behaviour	8.093096856	8.394223201	16.48732006	−0.301126345
CCR	7.952545987	8.022146725	15.97469271	−0.069600739
Indigenous R&D	8.434444732	7.447565176	15.88200991	0.986879555
Virtual Clusters	7.201878945	7.804855033	15.00673398	−0.602976088
BAT	6.484869256	8.071031145	14.5559004	−1.586161889
Certifications	6.913574389	8.066457378	14.98003177	−1.152882989
Consumption Pattern	7.334901749	8.202636537	15.53753829	−0.867734789
COVID-19	6.918135553	1.809199534	8.727335087	**5.108936019**
Informal Regulation	7.353578616	8.010974048	15.36455266	−0.657395433

Source Authors' compilation from analysis

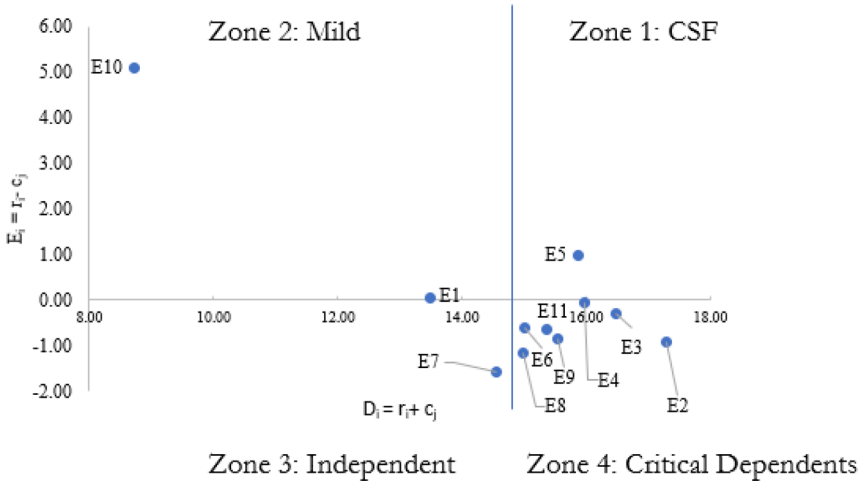

Fig. 2 Prominent causal relationship for enablers (academician)

4.3 Total

The total responses, when computed add more clarity to the analysis and gives us an outlook into the lens of Academics vs practitioners. We can see through Tables 16 and 17, that overall, the factor with the highest driving force is COVID 19. This is also an interesting look into the topic of GVC as both the driver and enablers is coinciding to be the same. This gives us fresh perspective to dig deeper and understand how boon for one is bane for another (Fig. 7).

Table 8 Total relationship matrix for enablers (Practitioners)

Enablers	Blockchain	Digital transformation	Consumer Behaviour	CCR	Indigenous R&D	Virtual Clusters	BAT	Certifications	Consumption Pattern	COVID-19	Informal Regulation
Blockchain	0.481601609	**0.624045664**	**0.581935921**	0.509016773	**0.533928869**	**0.542837536**	0.437095269	0.473707807	0.490505279	0.424549933	0.430993355
Digital transformation	**0.579688866**	0.48192931	**0.557254207**	0.440206224	**0.540732583**	**0.52002604**	0.417722117	0.441929049	0.491540653	0.374839272	0.397021203
Consumer Behaviour	**0.555336307**	**0.582223017**	0.447506161	0.434276835	0.49351389	0.482912644	0.395039017	0.443228772	0.49734802	0.409824054	0.420679957
CCR	0.464450444	0.498289581	0.465757269	0.342528106	0.433022499	0.40575329	0.399415725	0.401514217	0.399453377	0.353980222	0.368612342
Indigenous R&D	0.440529032	0.466284468	0.444957311	0.407500681	0.356677441	0.417648005	0.400603015	0.395248608	0.40320144	0.320126365	0.349991718
Virtual Clusters	0.504625087	**0.528446227**	0.40967814	0.443258067	0.451374689	0.351180036	0.384379539	0.360204868	0.39268576	0.336700549	0.365965897
BAT	0.418151805	0.44502412	0.454848006	0.385307384	0.426107859	0.37303653	0.281309948	0.350544658	0.382204924	0.294507265	0.332586634
Certifications	**0.521152129**	**0.521161865**	**0.512199135**	0.450762045	0.468717287	0.407313283	0.389832431	0.343487693	0.466240438	0.317239281	0.385890844
Consumption Pattern	0.499251927	**0.522082184**	**0.513633633**	0.425866278	0.461353104	0.413018194	0.389128572	0.455904594	0.368247467	0.344862538	0.396508303
COVID-19	**0.556114186**	**0.632867881**	**0.616601614**	**0.53357822**	**0.555863309**	**0.527639648**	0.453618751	0.429604585	0.523877614	0.349706279	0.488318897
Informal Regulation	0.367486914	0.407905871	0.383209104	0.348885412	0.329033495	0.337365391	0.280573144	0.309435137	0.34868976	0.285550471	0.244626888

Source Authors' compilation from analysis

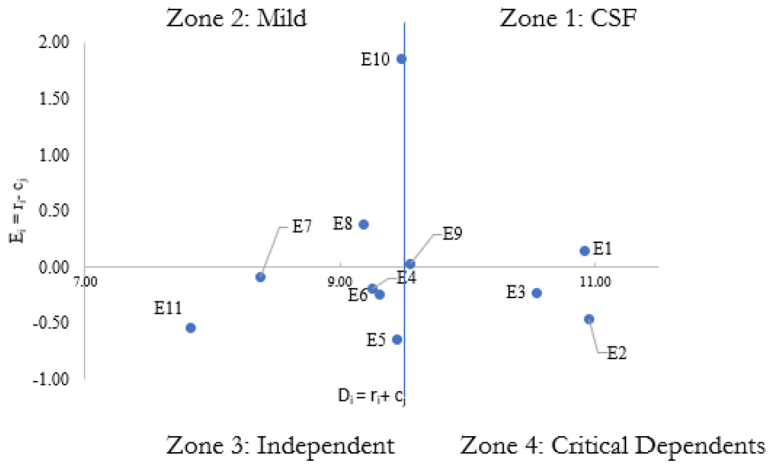

Fig. 3 Prominent causal relationship for enablers (Practitioners)

Table 9 Degree of Prominence (Di) and Net Cause (Ej) for Enablers (Practitioners)

	ri	cj	$D = \text{ri} + \text{cj}$	$E = \text{ri} - \text{cj}$
Blockchain	5.530218016	5.388388306	***10.91860632***	0.14182971
Digital transformation	5.242889524	5.71026019	***10.95314971***	− 0.467370665
Consumer Behaviour	5.161888674	5.387580502	***10.54946918***	− 0.225691829
CCR	4.532777073	4.721186026	9.253963099	− 0.188408952
Indigenous R&D	4.402768082	5.050325024	9.453093106	− 0.647556942
Virtual Clusters	4.528498859	4.778730597	9.307229455	− 0.250231738
BAT	4.143629133	4.228717527	8.37234666	− 0.085088395
Certifications	4.783996432	4.404809986	9.188806418	0.379186446
Consumption Pattern	4.789856794	4.763994732	9.553851526	0.025862062
COVID-19	5.667790984	3.81188623	9.479677213	***1.855904754***
Informal Regulation	3.642761587	4.18119604	7.823957627	− 0.538434453

Source Authors' compilation from analysis

5 Discussion

5.1 Outlook on barriers/impediments from different groups

We look at the factors in-depth to answer the second and third research questions (RQ2 and RQ3). The most critical barriers to Sustainability in the global value chains are Barriers to sustainable global value chains, which remain challenging in our modern world. Sustainable global value chains involve firms combining and utilising global resources to achieve long-term benefits. A few critical issues must be addressed if these chains are to be successful. The first barrier to sustainable global value chains is the inconsistency in legislation and regulations worldwide. Many countries have different laws surrounding areas such as labour, environmental protection, consumer protection, and competition policies. This

Table 10 Total relationship matrix for enablers (Practitioners)

Enablers	Blockchain	Digital transformation	Consumer Behaviour	CCR	Indigenous R&D	Virtual Clusters	BAT	Certifications	Consumption Pattern	COVID-19	Informal Regulation
Blockchain	0.810263667	***1.058762986***	***0.960260257***	0.89547741	0.902252501	0.91692998	0.839512047	0.863060291	0.870566227	0.490150592	0.821530583
Digital transformation	***0.983306141***	***0.984449784***	***1.034979562***	0.906986804	0.956607657	0.957349646	0.896746411	0.891497464	0.940688712	0.497039644	0.858196446
Consumer Behaviour	0.920935352	***1.064931911***	0.898532976	0.883009045	0.917546177	0.912332856	0.858757854	0.890931774	0.947326402	0.521731483	0.872299297
CCR	0.864835919	***0.981799368***	0.923043494	0.760771631	0.842180466	0.814254379	0.830445186	0.852862558	0.849605529	0.465072514	0.823459816
Indigenous R&D	0.839963412	***0.987472585***	0.939692794	0.86504379	0.784086133	0.871438964	0.829253087	0.854768611	0.885352217	0.468671763	0.807876687
Virtual Clusters	0.850509933	0.957671336	0.847073727	0.815444653	0.8324889	0.726392418	0.78783051	0.766509672	0.802642884	0.42713837	0.761178652
BAT	0.718199902	0.864844695	0.820036171	0.729964994	0.773887622	0.729939739	0.633841828	0.70836246	0.739497941	0.381480227	0.693574713
Certifications	0.820667502	0.957827783	0.902463748	0.836321239	0.818906568	0.781556826	0.779887921	0.72156971	0.85468913	0.411317537	0.788533549
Consumption Pattern	0.827989608	***0.980536443***	0.938285045	0.829371332	0.843189077	0.804850029	0.807071348	0.856026782	0.767802767	0.437884611	0.806502574
COVID-19	0.916828113	***1.086340004***	***1.014661972***	0.902702392	0.932293756	0.929013535	0.868502816	0.845041788	0.926736585	0.446476556	0.863814978
Informal Regulation	0.721366731	0.854500574	0.786433384	0.741755771	0.723541278	0.724728548	0.689084264	0.714762977	0.75029996	0.408445994	0.621921515

Source Authors' compilation from analysis

Table 11 Degree of Prominence (Di) and Net Cause (Ej) for Enablers (Total)

	ri	cj	$D = ri + cj$	$E = ri - cj$
Blockchain	9.428766541	9.27486628	18.70363282	0.153900261
Digital transformation	9.907848271	10.77913747	***20.68698574***	− 0.871289197
Consumer Behaviour	9.688335125	10.06546313	***19.75379825***	− 0.377128004
CCR	9.008330859	9.16684906	18.17517992	− 0.158518201
Indigenous R&D	9.133620043	9.326980135	18.46060018	− 0.193360092
Virtual Clusters	8.574881053	9.168786919	17.74366797	− 0.593905866
BAT	7.79363029	8.820933271	16.61456356	− 1.027302981
Certifications	8.673741514	8.965394086	17.6391356	− 0.291652572
Consumption Pattern	8.899509616	9.335208353	18.23471797	− 0.435698737
COVID-19	9.732412494	4.95540929	14.68782178	***4.777003204***
Informal Regulation	7.736840995	8.71888881	16.45572981	− 0.982047815

Source Authors' compilation from analysis

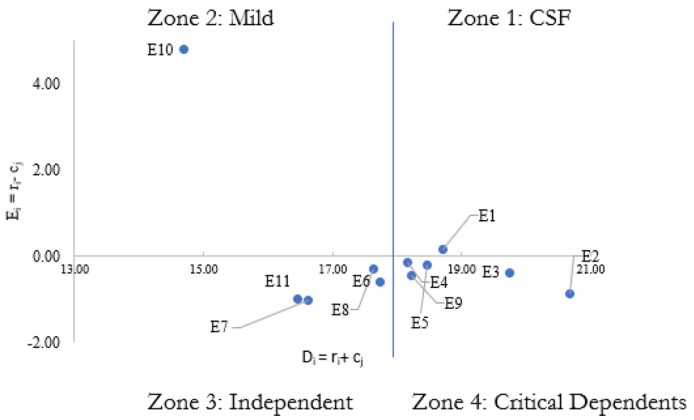

Fig. 4 Prominent causal relationship for enablers (Total)

makes it difficult for firms to achieve long-term Sustainability as they must adjust to the ever-changing regulatory environment.

"Greenwashing" means claiming something as environment friend while it is not, to be simply put. The circular economy is a system that aims to lessen waste and increase the usable life of commodities. Greenwashing and the circular economy have a complicated and contentious relationship. According to Choudhury, Islam, and Sujauddin (2023), greenwashing may promote circular consumption by increasing customer knowledge of environmental issues and encouraging them to learn more about Sustainability. Nevertheless, greenwashing sometimes prevents the circular economy and sustainable development by deceiving customers, diminishing consumer confidence, and undercutting sincere environmental impact reduction initiatives (Lopes et al., 2023).

In some cases, firms may also incur additional costs to comply with different laws in different countries. Another challenge faced is the cultural diversity of countries and regions. In different countries, workers have different values and perspectives, making it difficult for firms to ensure that all their employees understand their environmental and social

Table 12 Total relationship matrix for barriers (Academicians)

Barriers	Greenwashing	De-globalisation	Circular Economy	COVID-19	Trade war	Shipping congestion	MER	Information Asymmetry	BAT permissions	Indigenous Technology
Greenwashing	0.048945038	0.112498934	0.113458402	0.038125897	0.054325096	0.039474667	0.107072316	0.08095221	0.085980271	0.11939801
De-globalisation	**0.208985094**	**0.331379433**	**0.362987242**	0.162084061	0.259646164	0.265427513	0.32989428	0.251917316	***0.36755318***	***0.429040381***
Circular Economy	0.233311661	***0.434500614***	0.304442873	0.117168856	0.300772847	0.216317798	0.365013965	0.277320438	***0.387145434***	***0.39997093***
COVID-19	0.183356058	***0.370758628***	0.356924712	0.083366772	0.211784006	0.186134494	0.240653218	0.211138495	0.234628184	0.289704177
Trade war	0.220661547	***0.466257102***	***0.39660455***	0.134291082	0.190456121	0.242654774	0.30407744	0.238203937	0.329041627	***0.378409212***
Shipping congestion	0.170423762	0.31191866	0.275392091	0.070952881	0.18998285	0.102319041	0.207459798	0.170511614	0.214288554	0.251158106
MER	0.28628652	***0.44958937***	***0.429422808***	0.141920672	0.289419288	0.172815635	0.256881309	0.297176033	0.363456776	***0.40426573***
Information Asymmetry	**0.221140402**	***0.391396875***	**0.340321104**	0.144892288	0.214857571	0.136137989	0.28690883	0.161992752	0.236109496	0.307485079
BAT permissions	0.198896035	***0.375661709***	***0.376242471***	0.088183726	0.201350135	0.140338059	0.278186593	0.239237253	0.211006706	0.306222698
Indigenous Technology	0.278582277	***0.544127244***	***0.470501993***	0.220324693	0.310017979	0.226668721	***0.422159221***	0.344648443	***0.429680472***	0.341734823

Source Authors' compilation from analysis

Table 13 Degree of Prominence (Di) and Net Cause (Ej) for Barriers (Academicians)

Barriers	ri	cj	$D = ri + cj$	$E = ri - cj$
Greenwashing	0.80023084	2.050588394	2.850819234	−1.25035755
De-globalisation	2.968914665	3.788088569	***6.757003234***	−0.8191739
Circular Economy	3.035965417	3.426298246	***6.462263663***	−0.39033283
COVID-19	2.368448745	1.201310928	3.569759673	***1.167137817***
Trade war	2.900657392	2.222612058	5.12326945	0.678045334
Shipping congestion	1.964407358	1.72828869	3.692696048	0.236118667
MER	3.091234141	2.798306971	5.889541113	0.29292717
Information Asymmetry	2.441242385	2.273098492	4.714340877	0.168143893
BAT permissions	2.415325387	2.8588907	5.274216087	−0.44356531
Indigenous Technology	3.588445866	3.227389147	***6.815835013***	0.361056719

Source Authors' compilation from analysis

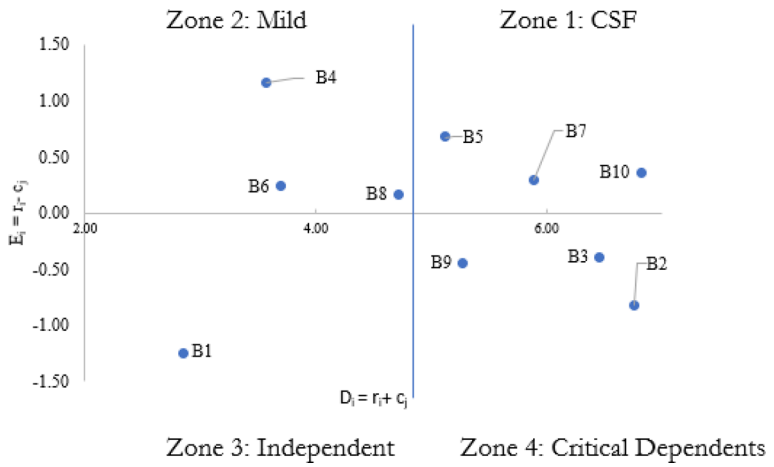

Fig. 5 Prominent causal relationship for barriers (Academicians)

responsibilities. Cultural differences can also lead to misunderstandings in how countries view products and services, making it hard to understand the firm's value chain globally. Furthermore, there is the challenge of inadequate infrastructure. Many developing countries lack the necessary infrastructure to efficiently transport goods and services, making it difficult for firms to achieve Sustainability. It is also crucial for firms to access reliable energy sources to reduce their emissions. Access to clean energy sources is still a significant challenge in many countries.

China is a big developing economy and contributes well to the global economy through its imports and exports. In a study by Jacob et al., (2023), China was the largest developing economy in global trade, accounting for the largest in the Asian economies. The literature also supported this notion with many emerging authors and articles from China. The trade war reduced China's exports to the US by 8.5 per cent in 2018 and 2019, affecting sectors such as electrical machinery, furniture, and plastics. This led to a loss of income and employment for some Chinese workers, especially those in the manufacturing sector.

Table 14 Total relationship matrix for barriers (Practitioners)

Barriers	Greenwashing	De-globalisation	Circular Economy	COVID-19	Trade war	Shipping congestion	MER	Information Asymmetry	BAT permissions	Indigenous Technology
Greenwashing	***0.868592414***	***0.875433499***	***0.907971841***	0.789611971	0.775670306	0.689008234	0.75399251	***0.987199208***	0.766880226	0.779998546
De-globalisation	***0.984375972***	0.792022152	***0.879499009***	0.817969245	0.796949201	0.710334388	0.761899166	***0.939573851***	0.781058458	0.801863028
Circular Economy	***0.890159894***	0.775243201	0.695800389	0.690722	0.686413487	0.619571608	0.651236408	***0.870602734***	0.67292946	0.709363467
COVID-19	***0.973090822***	***0.913971863***	***0.874434346***	0.718221073	0.812341623	0.732551547	0.745711905	***0.989645205***	0.740225739	0.805871025
Trade war	***0.955863232***	***0.905611248***	***0.885355969***	0.81005096	0.689317972	0.703364955	0.730869266	***0.943230633***	0.736492622	0.782471383
Shipping congestion	0.756669848	0.720213979	0.716510079	0.657861637	0.639493734	0.490000993	0.572188934	0.727858577	0.578362826	0.626135083
MER	0.80416066	0.720062872	0.729661901	0.649078215	0.617449888	0.546147576	0.528058372	0.777028858	0.621966864	0.601875926
Information Asymmetry	***1.036175437***	***0.919223833***	***0.91810698***	0.836933503	0.80045861	0.686223071	0.746275273	***0.868107255***	0.784892302	0.798082529
BAT permissions	0.699931258	0.601495565	0.609127054	0.520801898	0.531467054	0.475929092	0.531694831	0.642450381	0.45998225	0.568618171
Indigenous Technology	0.749212622	0.69957939	0.678379977	0.612245635	0.629208382	0.553670342	0.569241082	0.749682925	0.579210291	0.540530792

Source Authors compilation from analysis

Table 15 Degree of Prominence (Di) and Net Cause (Ej) for Barriers (Practitioners)

Barriers	ri	cj	$D = ri + cj$	$E = ri - cj$
Greenwashing	8.194358755	8.71823216	***16.91259092***	−0.5238734
De-globalisation	8.265544472	7.922857602	***16.18840207***	0.342686869
Circular Economy	7.262042646	7.894847545	15.15689019	−0.6328049
COVID-19	8.306065148	7.103496136	15.40956128	***1.202569012***
Trade war	8.14262824	6.978770257	15.1213985	***1.163857983***
Shipping congestion	6.485295692	6.206801806	12.6920975	0.278493886
MER	6.595491132	6.591167747	13.18665888	0.004323384
Information Asymmetry	8.394478792	8.495379627	***16.88985842***	−0.10090083
BAT permissions	5.641497554	6.722001037	12.36349859	−1.08050348
Indigenous Technology	6.360961439	7.01480995	13.37577139	−0.65384851

Source Authors compilation from analysis

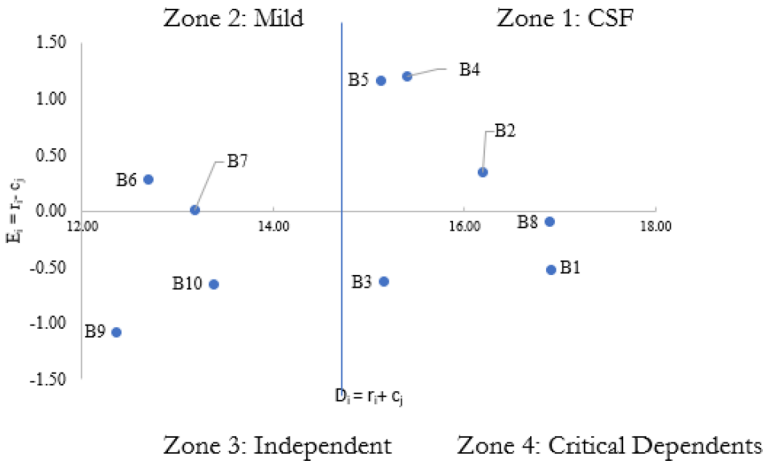

Fig. 6 Prominent causal relationship for barriers (Practitioners)

According to a research (by the National Bureau of Economic Research), the 2.5% of China's population who were the most exposed had a 2.52 loss in per-capita income and a 1.62 decrease in manufacturing employment. On the contrary, Yu, Zhao and Yeng (2023) talk about China's GVC trade cycle and industrial structure, emphasising the synchronicity between the two.

Finally, the rise of multinational corporations has made sustainable value chains more challenging. Multinationals have the resources to shift production to countries with weak labour laws, fewer environmental restrictions, and inadequate infrastructure. This can lead to firms cutting corners in wage, environmental, and labour standards, which could have a long-term adverse effect on the chain. Sustainable global value chains are possible, but the above-mentioned challenges must be addressed. Firms must focus on understanding different countries' regulatory environments and cultural differences to develop a successful and sustainable value chain. They must also focus on investing in infrastructure projects and looking for areas to reduce emissions. Finally, firms must focus on increasing anti-trust

Table 16 Total relationship matrix for barriers (Total)

Barriers	Greenwashing	De-globalisation	Circular Economy	COVID-19	Trade war	Shipping congestion	MER	Information Asymmetry	BAT permissions	Indigenous Technology
Greenwashing	0.537274697	0.673975132	0.688196735	0.455867764	0.517400481	0.432468181	0.567944772	0.645497134	0.553921298	0.595622084
De-globalisation	***0.8059829***	***0.816204755***	***0.883039823***	0.627124723	0.718381863	0.629515749	0.757040221	***0.802377829***	0.768966614	***0.83292269***
Circular Economy	0.770468599	***0.847333444***	0.738330383	0.540437106	0.669817244	0.557573926	0.702799794	0.781144916	0.71001625	0.759298106
COVID-19	0.759105166	***0.890144152***	***0.855336862***	0.504539529	0.684617704	0.590764083	0.687975356	0.792527467	0.666715893	0.755001684
Trade war	0.792520722	***0.944831632***	***0.90058455***	0.609726925	0.616300995	0.614412691	0.724783776	0.798128643	0.723013828	0.796363388
Shipping congestion	0.60740138	0.71287689	0.693620493	0.4612145	0.553939745	0.393285552	0.543269187	0.595631272	0.539163615	0.602065998
MER	0.755183638	***0.828027667***	***0.826736935***	0.54084398	0.634406931	0.503792855	0.583923309	0.746908143	0.6772141	0.702395092
Information Asymmetry	***0.818276958***	***0.901400134***	***0.876047954***	0.608138858	0.67778184	0.536755508	0.709485305	0.690329312	0.695917048	0.756971267
BAT permissions	0.621723566	0.683347652	0.689654211	0.414656964	0.512340715	0.422607686	0.56700683	0.604362974	0.480938043	0.606393796
Indigenous Technology	0.758095481	***0.890199811***	***0.844965723***	0.585509726	0.681894175	0.560324609	0.713243886	0.787877178	0.708670995	0.665613071

Source Authors compilation from analysis

Table 17 Degree of Prominence (Di) and Net Cause (Ej) for Barriers (Total)

Barriers	ri	cj	$D = ri + cj$	$E = ri - cj$
Greenwashing	5.668168276	7.226033107	12.89420138	− 1.55786483
De-globalisation	7.641557167	8.188341267	***15.82989843***	− 0.5467841
Circular economy	7.077219766	7.99651367	***15.07373344***	− 0.9192939
COVID-19	7.186727895	5.348060075	12.53478797	***1.83866782***
Trade war	7.52066715	6.266881693	13.78754884	1.253785458
Shipping congestion	5.702468633	5.241500839	10.94396947	0.460967794
MER	6.79943265	6.557472435	13.35690508	0.241960216
Information asymmetry	7.271104184	7.244784867	14.51588905	0.026319316
BAT permissions	5.603032437	6.524537684	12.12757012	− 0.92150525
Indigenous technology	7.196394655	7.072647176	14.26904183	0.123747479

Source Authors compilation from analysis

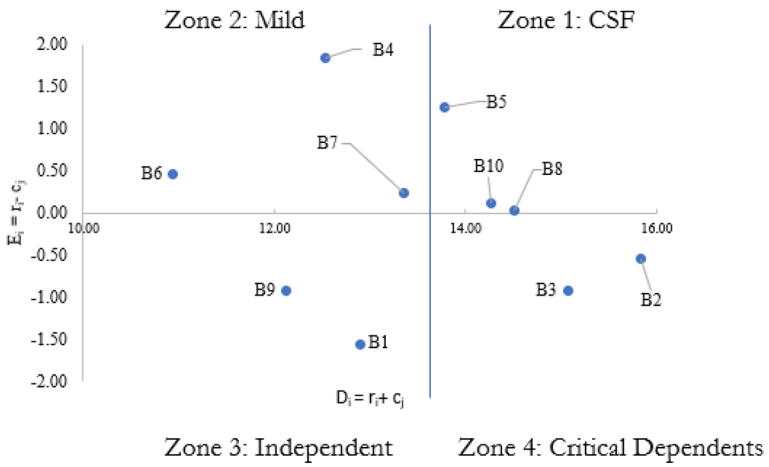

Fig. 7 Prominent causal relationship for barriers (Total)

regulation to limit the power of multinationals and ensure fair competition. If these barriers are successfully addressed, sustainable global value chains can be achieved.

5.2 Multi-stakeholder perspectives for facilitators/enablers

Value chains came through the advent of internationalisation. The internationalisation theory proposes why and how firms look to gain foreign exposure. Using the Uppsala model, we see that firms first try to test the waters using exports and imports, slowly increasing the threshold for international business risk, implying trust (Benito, Petereson & Welch, 2019) and then we find ourselves amid completely fledged value chains. When we look at the results of our study, we find E3, E4, E5 and E9 to be our critical dependents. They are Consumer habits and behaviour, command and control regulations, Indigenous R&D and Consumption patterns towards Sustainability, respectively. We can see that they are

dependent on other factors. Namely, as per the analysis, our major critical factor is E1, Blockchain Technology. This implies that blockchain technology can drive the other factors to success for a sustainable value chain in the future. We also see the COVID-19 pandemic (E10) as a factor that can mildly affect and drive the other factors to success. Resilience to pandemics, like COVID-19, in the value chain governance significantly boosts the participants (Choksy et al., 2022). In a rapidly globalising economy, businesses have increasingly faced the challenge of creating sustainable value chains. Most regulatory factors, like Informal regulations (E11) and Best available techniques (E7), have come out as independent factors, and as such, we can understand that their impact is not directly affecting other facilitators.

Sustainable value chains emphasise creating long-term economic, social, and environmental returns while helping businesses remain competitive. To achieve this aim, enablers of sustainability need to be found and incorporated into value chains. Firstly, collaboration is one of the critical enablers of sustainable global value chains. To be sustainable, value chains must be developed in multi-stakeholder platforms with collaboration among suppliers, customers, environmental groups, and government agencies. This enables sharing goals and objectives and encourages understanding the importance of Sustainability in every aspect of the chain. Second, certification is another enabler of sustainable global value chains. This involves businesses implementing certifications and standards—such as Global Organic Textile Standard (GOTS), Fair Trade or SAS—to ensure the sustainable sourcing of ingredients and materials. This can enable businesses to ensure they are not sourcing ingredients that have been produced in an unsustainable or unethical way. Third, lifecycle analysis enabled businesses to understand the sustainability aspects of their value chain. This analysis considers the environmental, social, and economic aspects of production processes, from the sources of the raw materials to end-of-life disposal of products. Different parts of the chain—from sourcing to production and customer satisfaction—can be measured so businesses can identify sustainable options within the chain and make decisions accordingly. Fourth, thought leadership is vital in enabling sustainable global value chains. Business leaders must be informed and knowledgeable of sustainability issues, trends, and strategies to incorporate Sustainability into their decision-making processes. This should also be supported by business models designed to embed Sustainability in their operations, like the "triple bottom line" approach, which considers "economic, social, and environmental" factors when making operational decisions. Trade openness, especially green openness for the trade of goods, is crucial, and we have evidence to believe that green openness and environmentally sustainable goods have a positive impact (Can et al., 2021).

6 Conclusion

The globe has seen a steady rise of value chains in recent decades, yet only relatively recently have efforts been put into assessing their role in achieving sustainable development. GVCs are integral to the global economy and continuously grow as a trade tool. These chains typically involve multiple countries, with goods and services being bought, produced, and sold between countries, usually at a lower cost than individual nations could produce them alone. At the core of sustainable development are efforts to reduce poverty and provide equitable opportunities based on core principles such as access to resources and human rights. GVCs can significantly impact achieving this due to the interconnectedness

of the countries and resources involved. Developing countries, for example, are often left on the margin of GVCs despite their need to catch up, which means that matters of Sustainability tend to take a backseat. However, it has been found that increasing the involvement of developing countries in GVCs can often improve their economic standing. GVCs can thus be utilised to pursue sustainable development actively, but how they are managed and organised needs to be appropriately leveraged. This includes carefully considering power dynamics between countries, including their size, level of economic development and bargaining power, and various actors' roles and limitations along GVCs. GVCs can also drive equality through job creation and access to resources in poorer nations, but only if governments and private sector entities adhere to corporate and environmental regulations. The current pandemic has acted as a backdrop for further discussions around GVCs, labour and the environment, meaning the discussions on GVCs and sustainable development have taken on new importance. Communication and collaboration between private and public sectors and civil society are essential to ensure that GVCs can be leveraged to their most outstanding ability in driving sustainable development.

Furthermore, GVCs should be supported with the active engagement of indigenous peoples, who may offer unique perspectives and ideas on facilitating the most successful and resilient GVCs. In conclusion, GVCs offer an essential avenue for pursuing sustainable development, yet this requires their management and organisation to be tailored accordingly. Systemic shifts are also necessary, including private and public sectors and people in civil society, if meaningful progress is to be made. In conclusion, the success of sustainable global value chains depends on the ability of businesses to incorporate the right enablers. Effective collaboration, certification, lifecycle analysis and thought leadership are critical enablers that can help businesses build eco-friendly, resilient global value chains that create value for stakeholders, customers, and society.

Data availability The data for the paper will be made available to the team based on request to the author/s.

Declarations

Conflict of interest The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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