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How do green financing and green logistics affect the circular economy in the pandemic situation: key mediating role of sustainable production

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ABSTRACT

Emerging economies are striving to realize their potential for sustainable production in achieving zero-carbon agenda. Due to natural resource constraints, businesses must focus on green production resources to develop the circular economy. Therefore, this study aims to identify the key role of green financing and logistics in adopting sustainable production and circular economy. We have collected the data from 240 respondents from the Chinese manufacturing sector following the COVID-19 peak in late 2020 and analyzed using structural equation modeling. As per research findings, green financing and green logistics have a significant and positive effect on sustainable production and the circular economy. Second, sustainable production has a significant positive influence on the circular economy. Manifestly, sustainable production was discovered to play an important mediating role among these variables. Besides, the novel Importance-performance map analysis shows each constructs performance and importance value towards the circular economy. This paper contributed to the literature and highlighted the importance of each construct. Moreover, the study findings implied that green financing and green logistics should be integrated into organizational procuring and financing strategies for manufacturing green and sustainable goods, and advancing the circular economy goals.

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1. Introduction

The notion of circular economy (CE) has captured the interest of scholars and practitioners during the last decade. They have been vocal in their support for its adoption (Khan et al., 2021). CE refers to a manufacturing process or regenerative natural resources system as United Nations has approved the Sustainable Development Goals (SDGs) (Shahzad et al., 2020; Tseng et al., 2020). These activities are growing more critical in both emerging and established economies. It encourages sustainable consumption and guides public and private green finance (GF) and procurement (Hao et al., 2021), resulting in economic growth (Akram et al., 2020; An et al., 2021; Irfan & Ahmad, 2021; Soundararajan & Vivek, 2016; Umar, Ji, et al., 2021). GF is a fundamental activity to accomplish green growth. In a CE, the system replaces the end-of-life concept, stressing alternative/renewable energy sources and decreasing the usage of hazardous materials in industrial processes (Bag et al., 2021; Khan et al., 2021). CE alters production and consumption operations by recovering valuable elements from waste sources (Bag et al., 2021; Irfan & Ahmad, 2021). CE is founded on three key beliefs: sustainable financing, sustainable procurement, and revitalizing natural systems (Turner et al., 2019).

Globally, the supply of critical resources is steadily dwindling, while the degree of pollution is growing (Bag et al., 2020; Elavarasan et al., 2021; Razzaq et al., 2021; Shahzad et al., 2021). Companies are more hesitant to expand their efforts toward adopting CE principles through sustainable production (SP) to enhance circularity and extend resource lifespan due to the risk they face in the near future (Khan et al., 2021; Zhu et al., 2016). SP refers to creating industrial methods that benefit individuals and society while conserving the same resources for forthcoming generations (Bui et al., 2021). Countries including China, the European Union, Japan, and the United States have just recently begun to adopt SP techniques for CE principles in current pandemic conditions (Covid-19) (Gao et al., 2021; Mirza et al., 2020; Rizvi et al., 2020). While practising and promoting CE, a few essential factors such as innovative technology utilization, procurement complexities, planning and control, legislation, and public awareness must be considered (Bag & Pretorius, 2020; Yadav et al., 2020).

The current study is engrossed in the manufacturing sector, as; this sector is a key player in enhancing environmental deterioration through maximum natural resource utilization (Ahmad et al., 2021; Shahzad et al., 2020; Umar et al., 2020). For example, more than 60% of precious metals are utilized as input in the production of automobile parts, indicating a significant danger of material shortages by 2030 (Bag et al., 2021; Umar, Ji, et al., 2021). However, the manufacturing sector is shown to have a dual obligation (Yang et al., 2018). On the one hand, a significant return on investment is anticipated, while on the other, adverse environmental consequences must be handled (Elhabashy et al., 2019; Shahzad et al., 2021). SP may help promote long-term growth and development, particularly in the industrial sector (Geissdoerfer et al., 2017). At the same time, investment in resource conservation and logistics of green resources can play a magnificent role in SP. As GF facilitates a green economy in the current pandemic era. The WHO likewise regarded climate change as the most serious global health hazard of the twenty-first century (Klioutchnikov & Kliuchnikov, 2021). Pollutants in the air raise the risk of chronic respiratory illness, stroke, and other disorders (Iqbal et al., 2021). It also raises the chances of dying

from COVID-19 (Razzaq et al., 2020; Yarovaya et al., 2021). The worldwide pandemic will have long-term consequences on human attitudes toward the environment and funding in this area (Ciotti et al., 2020; Irfan, Akhtar, et al., 2021; Irfan, Shahid, et al., 2021; Mirza et al., 2022; Yu et al., 2021).

Few studies have recently looked at the hidden link between sustainable production and CE (Bag & Pretorius, 2020). Further, (Khan et al., 2021) identified that sensing, seizing, and reconfiguration of key organizational capabilities also affect CE positively. Furthermore, GF and GL may play a significant part in CE-based operations based on organizational capabilities because supplier selection, green certifications, strategic supplier relationships, and green processes performed by suppliers are all measures that enable suppliers to support the SDGs (Bag et al., 2020; Irfan, Razzaq, et al., 2021; Khan et al., 2021; Mirza et al., 2020). A researcher argues that stakeholders have become sensitive to the environment; hence they won't invest in a company where pollution rules are not respected (Shahzad et al., 2020). Due to the Chinese governmental environmentally friendly economic initiatives, Chinese green funds outperform other developing countries (Ji et al., 2021; Umar et al., 2020). Still, uncertainties and complexities surrounded these relationships. As a result, the viability of a company that practices SP through remanufacturing and recycling largely depends on how it handles its financial and logistical operations (Liu et al., 2019). These studies have also identified critical success factors, enablers, and barriers to implementing sustainable manufacturing to release CE (Nascimento et al., 2019; Rizvi et al., 2020). Because research on SP and CE is still in its early stages (Bag & Pretorius, 2020; Khan et al., 2021), the current study seeks to investigate the main finance and procurements necessary for SP in the context of CE. Hence,

- How do green financing and green logistics affect the circular economy implementation?
- How does sustainable production mediate the relationship among green financing, logistics and circular economy implementation?

The current study contributes to the existing literature in various ways by answering the aforementioned research topics. First, this work covers a research gap using structural equation modeling by examining the connection between GF, GL, SP, and CE implementation (SEM). SEM is a novel empirical technique and outperforms other traditional methodologies. It is quite evident that very little consideration has been given previously on how GF and GL push an organization towards implementing CE. Second, the outcome of this research authorizes the experts and provides helpful insights for an organizational decision regarding green financing and logistics for implementing CE through SP. Following a review of the literature and associated theories, the research methodology, results and analysis, discussion and implications, and future research prospects with conclusion are presented.

2. Theoretical background and hypotheses development

2.1. Theoretical footings and literature review

This study derives its philosophical foundations from resource-based perspective theory (RBV). The RBV considers the organization to be a collection of creative

resources (Barney, 1991). According to this theory, the firms' competitiveness is created by the firm's unique resources (intangible or tangible) (Peteraf, 1993). These productive resources refer to organizational assets, attributes, skills, and so on, enabling the organization to "conceive of and implement strategies that improve its efficiency and effectiveness" (Barney, 1991). According to (Barney, 1991), these physiognomic resources are VRIN; "(a) valuable, (b) rare, (c) inimitable, and (d) non-substitutable". The RBV is a complementary theory that may assist an organization in understanding how to employ the best resources and technologies to improve particular production/logistic efficiency (Savino & Shafiq, 2018). The RBV, on the other hand, is limited to reporting firm-level outcomes and ignores the influence of SP on CE (Andersén, 2021; Bag & Pretorius, 2020). By answering this, (Hart, 1995) recognized a natural resource-based view (NRBV).

The NRBV broadens the scope of RBV by emphasizing the relevance of the environment, and it may be viewed as "a theory of competitive advantage based upon the firm's relationship to the natural environment" (Hart, 1995). The NRBV intends to explore how green resources in organizations may result in both strategic advantages and positive environmental outcomes. Ecologists and environmentalists have argued that by adopting an NRBV viewpoint, a company may become more lucrative and thriving in the long run (Bag & Pretorius, 2020; Shahzad et al., 2020). It does, however, rely on necessary organizational green resources and competencies (Sarkis et al., 2010). Lower emissions and costs will arise from the capacity to continually improve and optimize industrial processes (Hart, 1995), and a "capability of strategic proactivity" will gain from first-mover advantages and more robust environmental protection (Andersén, 2021). Green financial resources and green logistics are essential for integrating SP (Bressanelli et al., 2018; Razzaq et al., 2021). In today's CE, green resource acquisition and sustainable manufacturing can boost CE implementation by utilizing natural system redesign and regeneration (Awan et al., 2021). An RBV contributes to the context in which an organization with a more substantial capacity for GF and procurement has a better chance of producing sustainably. Furthermore, the current study suggests that SP helps build green products with less impact on the environment and society through GF and logistics, thereby improving CE (Figure 1).

Apart from the above, the impact Covid-19 is imperative to integration in sustainable business performance. The Covid-19 epidemic has crippled global economies by causing demand and supply shocks, and several financial markets have fallen by much to 20% from their one-year highs (Khan et al., 2021; Rizvi et al., 2020). Most financial markets have had circuit breaker suspensions, and volatility is at an all-time high (Mirza et al., 2020). Credit markets are also volatile since borrowers are under pressure due to increased company risk (Mirza et al., 2020). (Mirza et al., 2022) identified that Islamic equities funds are more resilient to COVID-19 shock since they outperformed non-Islamic rivals throughout the pandemic's peak months. Even when the spread smoothes, the pattern remains. These findings support Islamic equities funds' safe haven qualities, which is beneficial for investors to hedge pandemic risks. Further, (Naqvi et al., 2021) highlighted that during Covid-19, the performance of green funds deteriorated, emphasizing the extra investment burden. We believe that rapid legislative, governance and regulatory measures are required to support a sustainable financial system.

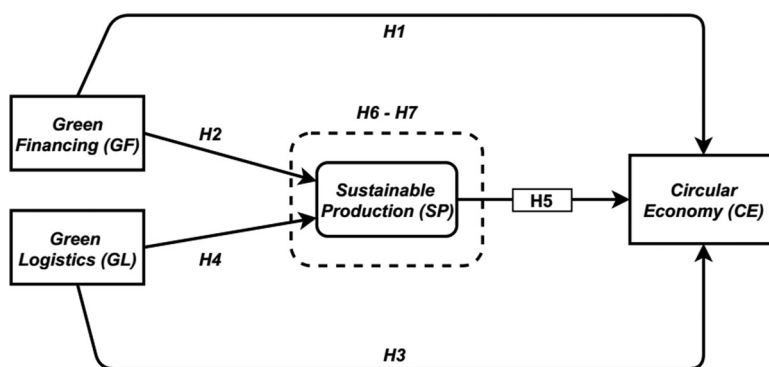


Figure 1. Conceptual framework.

Source: Authors' drawing.

Due to the Chinese governmental environmentally friendly economic initiatives, Chinese green funds outperform other countries (Ji et al., 2021). The flexibility of a carbon-neutral investment also improves the sustainable environment and circular economy. (Umar, Ji et al., 2021) emphasized that creating a green financial intermediation channel is critical to reach zero-carbon economies. Exploring these aspects is vital since banks are the most significant contributors to business finance, and their involvement is critical to supporting long-term growth. Transitioning to a sustainable business strategy impacts economic and financial performance (Yarovaya et al., 2021). Modes of funding and logistics can aid in overcoming the problems connected with environmental and ecological degradation. (Mirza et al., 2020) pointed out the necessity of enabling green financing and emphasized a substantial gap between fund demand and supply. They underlined the importance of developing new intermediation channels to assist carbon-neutral enterprises. It is critical to prioritize green finance since traditional approaches will likely raise carbon dioxide emissions (Umar, Ji et al., 2021; Wang et al., 2021).

2.2. Hypotheses development

2.2.1. Green financing

Numerous research on GF has been done since the concept's inception. Some investigations addressed the effect of GF on economic outcomes, whereas others utilized replacement factors. According to one of the researchers, investors have become more environmentally concerned, and as a result, they will not invest in a company that does not respect pollution rules (Zhang et al., 2019). The GF is a strategic tactic to include the financial industry in the transition to resource-efficient and low-carbon economies and climate change adaptation (Naqvi et al., 2021; Wang et al., 2019). It also contributes to the achievement of the green development strategy. The previous study has highlighted several benefits of GF, including the following: it encourages technological diffusion for eco-efficient infrastructure, aids in the creation of competitive advantage, provides corporate value, and improves economic prospects (Muganyi et al., 2021; Soundarrajan & Vivek, 2016; Wang et al., 2019; Zhang et al., 2019).

According to previous research, the goal of GF is to enhance the organizational capability to create sustainable commodities (Tanveer et al., 2021) in a way that reduces environmental pollution, utilizes green technology and knowledge, and extends energy and resources (Khan et al., 2021; Lingyan et al., 2021; Mumtaz & Smith, 2019; Saeed Meo & Karim, 2021; Yarovaya et al., 2021). The extent of literature recognized the benefits of GF for gaining green and SP and consumption, therefore improving CE (Tseng et al., 2020). GF policies and regulations are based on stringent environmental protection legislation, which frequently results in a win-win situation for both suppliers and manufacturers (Muganyi et al., 2021). (Jin & Han, 2018) discovered that GF had a favorable influence on SP as GF facilitates a green economy.

To create a sustainable product, raw resources should be obtained in a green and sustainable manner; GF assists in acquiring green raw materials, which are critical in attaining green growth and CE objectives. For example, heavy vehicle sector remanufacturing is the chosen choice for SP to reap the benefits of CE (Bag et al., 2020; Ling et al., 2021). Developments in disassembly time and cost reductions during remanufacturing will alter the practicality of prolonging product life and improving CE and economic sustainability. Such assistance is frequently provided in government policies that promote CE projects (Yadav et al., 2020). Furthermore, the effectiveness of GF initiatives is dependent on the degree of economic development in the majority of rising economies, including China. GF activities have a more significant impact on developed regions (Cui et al., 2020). Within the CE, GF is critical for sustainable and clean manufacturing. Governments may accomplish their sustainable development goals by enhancing the integrity of GF systems (Jin & Han, 2018; Naqvi et al., 2021). GF must coordinate among stakeholders to increase efficacy and ensure continuity, which is not always the case. According to the literature mentioned above, worldwide researchers focus on how GF might assist in achieving SP and CE. As a result, the following hypotheses were proposed:

H1. Green Financing has a positive and significant effect on Circular Economy implementation.

H2. Green Financing has a positive and significant effect on Sustainable Production.

2.2.2. Green logistics

Given the global development of manufacturing and cross-border product delivery, environmental issues have arisen as critical considerations for logistics businesses (Karaman et al., 2020). GL has evolved to encompass various green actions to reduce overall ecological effects and provide environmental protection and SP (Karaman et al., 2020; Rizvi et al., 2020). As scholars, governments, businesses, and stakeholders have become more interested in green and sustainable logistics over the last two decades, research on GL has grown significantly (Zhang et al., 2020). GL has a broad range of semantic meanings. It refers to a set of supply chain management strategies and efforts that emphasize material handling, waste management, green packaging, and green transportation to diminish product delivery's environmental and energy footprints (Seroka-Stolka & Ociepa-Kubicka, 2019). The closed-loop flow of "green

matter," which may be employed in the development of GL, is an essential component of the CE (Sun & Li, 2021). As a result, it will govern the efficiency of the economic cycle in CE.

According to the European Commission, CE is the economic worth of commodities, materials, and resources conserved for as long as possible while waste generation is kept to the lowest (Seroka-Stolka & Ociepa-Kubicka, 2019). SP and CE help promote environmental sustainability through green organizational operations, such as green financing, green design, and green logistics (Shahzad et al., 2020). The previous literature highlighted that GL leads to reverse logistics resource investment, directly connected to reverse logistics and remanufacturing performance (Bag & Pretorius, 2020). Prior empirical data suggest that a short customs clearance process is also a GL element. It contributes significantly to environmental quality because lessening wait time saves fuel and lowers emissions (Karaman et al., 2020; Umar et al., 2021). Furthermore, the development of effective trade and transportation structure aids firms in subsidizing SP (Gosling et al., 2017).

(Bressanelli et al., 2018) emphasized that green operational resources and GL activities were essential for integrating SP. Further, (Zhang et al., 2020) identified that energy conservation and emission reduction lead to higher SP. Furthermore, GL plays an imperative role in developing nations' environmental sustainability (Liu et al., 2019). Through green operations, the objective is to streamline logistic processes in the production systems of companies involved in product delivery, rationalize manufacturing logistics, and efficiently manage enterprises participating in the CE system (Seroka-Stolka & Ociepa-Kubicka, 2019). Further, CE is concerned with more than just utilizing renewable resources and waste as recyclable materials and recycling without harmful external impacts. Following the above discussion, the below hypotheses were proposed.

H3. Green Logistics has a positive and significant effect on Circular Economy implementation.

H4. Green Logistics has a positive and significant effect on Sustainable Production.

2.2.3. Sustainable production

The growing global population is putting a strain on natural resources. The need for water, food and energy is growing exponentially (Bag & Pretorius, 2020). Besides, unsustainable production and consumption are having a negative influence on the local society and atmosphere. The answer to reducing these adverse impacts is to transition from a linear economy to a CE by merging environmental analysis with the socioeconomic system via SP (Bag et al., 2021). Sustainability difficulties in a CE system may be solved by establishing a green financing and supply chain that may balance all (Khan et al., 2021). CE has currently acquired international traction as a result of its favorable link with sustainability. Industries are taking notice of CE-based business models because they may boost economic development, ensure resource sustainability, and preserve the environment (Bag et al., 2020; Khan et al., 2020, 2021). CE empowers implementing the 3R approach, which strives to reduce, reuse, and recycle resources to the greatest extent feasible (Turner et al., 2019).

SP refers to the manufacture of things using clean techniques that minimize environmental effects (Bag & Pretorius, 2020). SP considers employee safety and well-being, as well as societal and environmental considerations. SP is becoming increasingly essential in manufacturing science, environmental science, mechanical engineering, and energy science (Bui et al., 2021; Yadav et al., 2020). Depending on the nature of the business, SP strategies differ from one company to the next. Each company's function is critical to long-term viability (Soundarrajan & Vivek, 2016). Understanding the material and energy streams in the manufacturing system provides insight into costs, efficacy, and environmental impact.

However, manufacturers confront several problems when it comes to implementing CE. The primary contests are high preliminary setup costs, business-to-business non-cooperation, supply chain complexity, insufficient information for product design and production process, quality compromises, talent shortages, long lead times for disassembly, and high expenses associated with such operations (Liu et al., 2019; Zhang et al., 2019). Researchers highlighted that the solution to these problems is to acquire green resources through green financing and logistics (Bag & Pretorius, 2020; Karaman et al., 2020; Muganyi et al., 2021). Prior studies highlighted that SP plans are connected with company strategies that incorporate concepts of the CE (Khan et al., 2021). Furthermore, industrial strategies are being created to satisfy the aims of sustainable development (Shahzad et al., 2020). Extent literature acknowledged that, in the current scenario, SP might be a strategic instrument for using CE, which further contributes to the exhaustion of minerals and resources, which is causing worry for countries in general and the world in particular (Liu et al., 2018). SP and CE may evidence rewarding for manufacturing organization. Thus, the following hypotheses were proposed.

H5. Sustainable production has a positive and significant effect on Circular Economy implementation.

H6. Sustainable production mediates the relationship between Green Financing and Circular Economy implementation.

H7. Sustainable production mediates the relationship between Green Logistics and Circular Economy implementation.

3. Methodology

3.1. Sample and procedure

Due to the pandemic, a questionnaire was created for data collection and disseminated using a convenience sample approach among Chinese manufacturing SMEs. Chinese SMEs are classified as organizations with 999 workers and an annual turnover of 300 million/RMB (Waheed & Zhang, 2020). Since experts have proven the importance of SMEs in economic growth, the ultimate goal of SMEs is to enhance the economy of a specific country. SMEs play a key part in the gross domestic product (GDP), accounting for 30% of the country's GDP and serving as a major source of employment (Waheed & Zhang, 2020). Between March 2021 and July 2021, a total of 820 surveys were distributed via online methods and human visits. Following that,

278 questionnaires were received, with 240 of them finally being selected for data analysis. All of the replies were thoroughly reviewed, and any surveys that were incorrectly completed were discarded. Chinese colleagues and students were also asked to help with the data gathering. The majority of respondents, almost 70 percent, held a supervisory position, as they were in charge of implementing organizational processes and policies. Sixty-nine percent of those polled were men. The majority of responders were between the ages of 30 and 49. [Table 1](#) displays the complete demographic results. This study used the ten times rule for sample size, which is "10 times the largest number of structural paths directed at a particular latent construct in a structural model," as advised by (Hair et al., 2017). Besides, this study also confirmed sample adequacy by employing a series of power analyses through G*Power software as proposed by (Prajapati et al., 2010).

3.2. Measures and validation

The scholar separated the survey of this research into two sections. In the first section, data were collected for demographics variables. In the second section, four items were adapted for GF and GL, each from (Bag et al., 2021; Muganyi et al., 2021; Zhang et al., 2019). Further, eight items were adopted for sustainable production, and ten items were adopted for CE from the study of (Zeng et al., 2017). Items were evaluated using a seven-point Likert scale, with seven denoting strongly agree and one denoting strongly disagree. Following (Hinkin, 1998), we conducted pilot research to certify the reliability and validity of the accepted constructs within the study setting.

4. Results

We used the PLS-SEM approach to explore GF, GL, SP, and CE connections because this technique is most recommended and novel in exploratory investigations (Hair et al., 2017). It can handle both the structural and measurement models simultaneously and cater small sample sizes with more accurate estimations (Hair et al., 2017). The scholars used SmartPLS software version 3.2.8 for this research.

4.1. Common method variance bias

Common method bias is a potential problem that can affect the format's content and the response of the items causing measurement error (Podsakoff et al., 2012). We checked the common method variance problem using Harman's single-factor test and employed exploratory and un-rotated factor analysis techniques (Harman, 1976). The results indicated no single factor accumulated more than 35.60% of the variance; thus, a severe common method variance problem is not found in this research paper (Harman, 1976). The modernized approach proposed by (Kock, 2015) was also used in this investigation. To calculate the variance inflation factor (VIF), we performed a complete collinearity analysis. All of the VIF values were less than 3.3. As a result, we may infer that CMB is not an issue for this investigation.

Table 1. Demographic details.

Respondent Profile		(n = 240)	
Attributes	Distribution	Frequency	(%)
Gender	Male	166	0.69
	Female	74	0.31
Age (Years)	20 to 29	58	0.24
	30 to 39	73	0.30
	40 to 49	89	0.37
	More than 50	20	0.08
Education	Undergraduate	43	0.18
	Graduate	97	0.40
	Post Graduate	71	0.30
	Others	29	0.12
Managerial Level	Low Level	72	0.30
	Middle Level	90	0.38
	Top Level	78	0.33
Job Experience (Years)	Less than 5	52	0.22
	6 to 10	80	0.33
	11 to 15	67	0.28
	More than 15	41	0.17

Data source: Questionnaire survey.

Table 2. Construct reliability and validity.

	Cronbach's Alpha (CA)	rho_A	Composite Reliability (CR)	Average Variance Extracted (AVE)
CE	0.933	0.955	0.958	0.614
GF	0.915	0.927	0.937	0.634
GL	0.944	0.964	0.966	0.555
SP	0.889	0.901	0.921	0.634

Data source: Authors' calculations.

4.2. Analysis of the measurement model

The measurement model was estimated using the construct reliability (Cronbach alpha, rho_A, and composite reliability) and validity (convergent and discriminant validity) following the suggestions of (Hair et al., 2017). According to the results for construct reliability in Table 2, the score of "Cronbach alpha" is ranged from 0.889 to 0.944. In contrast, the values of rho_A are between 0.901 and 0.955, and the values of "composite reliability" comprise between 0.921 and 0.966. All values are above the threshold of 0.70; therefore, the construct reliability is confirmed (Cohen, 1988; Hair et al., 2017). Next, the factor loading and "average variance extracted" (AVE) were evaluated to measure the convergent validity. All factor loading values and AVE values are greater than the threshold value of 0.50, as (Hair et al., 2017) suggested. The resultant values were provided in Table 2, confirming the convergent validity of the constructs.

Furthermore, the discriminant validity is confirmed using one of the traditional highly recognized approaches (Fornell & Larcker, 1981) as well as a recent hetero-trait-monotrait ratio (HTMT) approach (Henseler et al., 2015). The Fornell-Larcker approach recommends that the AVE square root should be greater than the correlation between targeted constructs. The HTMT approach recommends a cut-off value of 0.85 for discriminant validity (Sarstedt et al., 2017). The results in Tables 3 and 4 confirm both criteria of discriminant validity. To summarize, the measurement model presents good reliability and validity, signifying that the instruments can be used to analyze the structural model.

Table 3. Discriminant validity (Fornell-Larcker).

	CE	GF	GL	SP
CE	0.777			
GF	0.459	0.790		
GL	0.517	0.601	0.738	
SP	0.456	0.539	0.601	0.790

Data source: Authors' calculations.

4.3. Analysis of the structural model

Upon validating the measurement model, the structural model was estimated to test the hypotheses. A bootstrapping method was used to assess the importance of hypotheses (5000 resample). The results of the model divulged a positive and significant influence of GF on CE (H1: β value = 0.310; $p < 0.000$), GF on SP (H2: β value = 0.225; $p < 0.003$), GL on CE (H3: β value = 0.198; $p < 0.029$), GL on SP (H4: β value = 0.139; $p < 0.046$), SP on CE (H5: β value = 0.243; $p < 0.000$), leading to the support of hypotheses H1 to H5 respectively. All the control variables were insignificant with β values (Age = 0.065, Experience = 0.047, Education = 0.064, Gender = -0.085, and Job position = -0.042). The overall results of hypotheses were provided in Table 5.

4.4. Mediation analysis

The present study also analyzes the mediating role of SP between GF, GL, and CE. Accordingly, the mediating effect of SP was inspected by the two-step procedure suggested by (Hair et al., 2017). At first, this study evaluated the indirect effects of GF to CE and GL to CE through SP. This study acknowledges the significant indirect effects of GF to CE $\beta = 0.091$ and GL to CE $\beta = 0.053$. In the second step, we assessed the direct effect of GF to CE and GL to CE and found the significant positive impacts with beta values $\beta = 0.222$ and $\beta = 0.198$, respectively. The results mentioned above lead to partial mediation. Further, this study detected the positive sign of direct and indirect effect ($p1^*p2^*p3$); it is concluded that the SP has "complementary partial mediation." Hence, H6-H7 is fully supported with "complementary partial mediation."

4.5. Goodness of fit (GOF) indexes

The model fit was confirmed by a broadly acceptable approach that is "standardized root mean square residual" (SRMR), where a value < 0.08 for SRMR is recommended (Sarstedt et al., 2017). The results show the value of SRMR is 0.066, signifying our model is relatively good. We further used the formula ($GOF = \sqrt{(AVE \times R^2)}$) to gauge model fit ($GOF = 0.552$) that demonstrates the large model fit (Wetzels et al., 2009). Further, the coefficient of determinants (R^2) and predictive accuracy (Q^2) were also analyzed. According to prior scholars, R^2 should be weighted as weak (0.25), moderate (0.50), and substantial (0.75) (Hair et al., 2017; Sarstedt et al., 2017). Our finding revealed that the overall model explained 51.5% variance CE, indicating a good model's predictive power. We also assessed the Q^2 values through blindfolding procedures to measure the model's predictive accuracy, which is 0.268. (Hair

Table 4. Discriminant validity (HTMT).

	CE	GF	GL	SP
CE				
GF	0.482			
GL	0.530	0.638		
SP	0.490	0.589	0.632	

Data source: Authors' calculations.

Table 5. Hypotheses results.

	β Values	T Statistics	P Values	Decision
GF -> CE	0.222	3.019	0.003	Significant
GF -> SP	0.320	3.696	0.000	Significant
GL -> CE	0.198	2.196	0.029	Significant
GL -> SP	0.139	2.001	0.046	Significant
SP -> CE	0.243	3.645	0.000	Significant
GF-> SP -> CE	0.137	3.566	0.000	Complementary
GL-> SP -> CE	0.091	2.601	0.009	Partial Mediation

Data source: Authors' calculations.

et al., 2017) stated if a Q2 is >0 , the model has predictive relevance. As per the results, our model has good predictive relevance.

4.6. Importance performance map analysis (IPMA)

The IPMA is an appreciated tool to evaluate the path coefficients practically and graphically. It has the potential to compare the importance and performance values of all exogenous constructs to predict the endogenous construct ((Hair et al., 2017). IPMA primary purpose is to recognize the precursor with better importance but the low performance and inversely ((Hair et al., 2017). The results are given below in Figure 2, which shows the relative importance and performance values of GF (0.309, 68.686), GL (0.201, 69.946), and SP (0.155, 71.225) respectively in predicting the CE. The graphical representation showed that the important values of GF are relatively higher (0.309) while performance values of SP are relatively higher (71.225) compared to all exogenous constructs.

5. Discussion and research implications

5.1. Discussion on key findings

This study combines RBV and NRBV to develop a conceptual framework for investigating unknown connections between GF, GL, SP, and CE. During Covid-19, we collected data from Chinese manufacturing sector employees to examine the assumptions. The empirical findings indicated that GF and GL encouraged green and sustainable manufacturing and drove organizations to use CE. To achieve better the objectives of this study, seven significant hypotheses were proposed. Findings unveiled that GF positively led to CE and SP ($\beta=0.222$ and $\beta=0.320$), supporting H1 and H2, respectively. Broadly, our results support the results of previous studies (Jin & Han, 2018; Muganyi et al., 2021; Yadav et al., 2020; Zhang et al., 2019). As the green source of financing significantly affects the green raw material procurement,

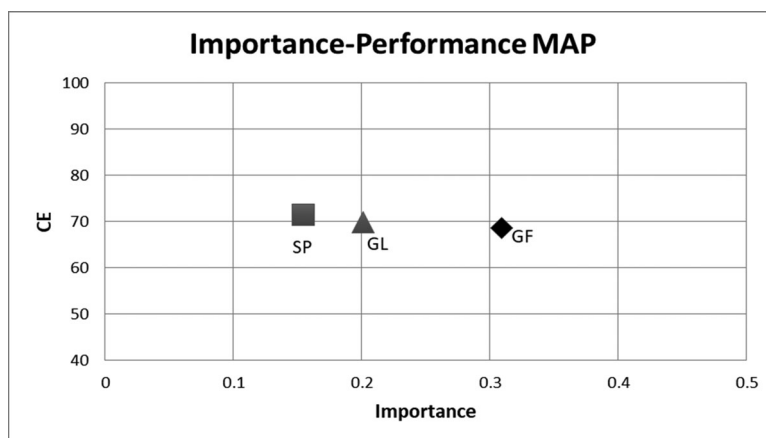


Figure 2. Importance-performance MAP.

Data source: Authors' calculations.

which enhances the significant effect of SP and CE (Ji et al., 2021). Further, GL positively led to CE and SP ($\beta = 0.198$ and $\beta = 0.139$), supporting H3 and H4, respectively. These results are aligned with the previous studies in Broadway (Bag & Pretorius, 2020; Bressanelli et al., 2018; Karaman et al., 2020; Umar, Ji et al., 2021). Green operational resources and logistics activities play a significant role in integrating SP and CE. Organization genuinely needs to adopt best green practices to provide environmentally friendly products without compromising the supply side interest, thus contributes to SP and CE.

Besides, SP positively led to CE ($\beta = 0.243$), supporting H5 (Bag & Pretorius, 2020) provide support to our results. Further, (Bag et al., 2021) also found similar results in their studies. Further, the results of mediating role of SP were significant, accepting our H6 and H7 with $\beta = 0.137$, $\beta = 0.091$, respectively. SP have complementary partial mediation among targeted construct. These findings highlighted the novel phenomena that SP, directly and indirectly, influences the implementation of CE. Lastly, IPMA identified that the GF has high importance and SP have higher performance values among these targeted constructs. The change in organizational green strategies regarding SP can significantly advance the adoption of CE. Competitive environmental strategies backed by GF and GL can reduce environmental issues and ensure increased satisfaction and positive word of mouth among various stakeholders (Chang, 2019; Mirza et al., 2020).

5.2. Theoretical implications

From a theoretical aspect, the current research boosts the prevailing literature on GF, GL, SP and CE in multiple ways. First, this study corroborates the conceptual model based on RBV, which enriches the limited literature, particularly in manufacturing organizations in the Chinese region. Concerning RBV and NRBV, this research has strategic implications for improving SP and achieving competitive advantage in a hyper-competitive world. Second, this study identified the multifaceted association between each component of this research model. Second, the mediation model directs

the association between GF, SP to CE and GL, SP to CE, which is a novel phenomenon and has earlier not been estimated. This study spreads the literature by identifying these essential factors in developing action plans for SP. Third, IPMA also emphasized the importance and performance value of each variable. Higher importance values of GF highlighted that organizations need to acquire raw material through green sources to achieve CE. The higher performance of SP shows that it is a strong predictor of CE in this context. These outcomes also shed light on the significance of the green box tactic. (Awan et al., 2017) adopting SP and environmental considerations into industrial sourcing procedures achieves better long-term objectives, improves market share, saves energy, and lowers pollutant emissions. These industries with a strong incentive drive may also use it to enhance the efficacy of SP, therefore boosting its adoption throughout their whole operations.

5.3. Practical implications

The findings of this study have substantial practical implications for administration, government/regulators, and policymakers. First, this research suggested that a company connect diverse green initiatives with on-the-ground operations while adhering to the established SP to increase competitiveness and attain CE. The CE is a cost-effective method many industries use to turn linear economics models into circular models for long-term sustainability. CE business models can assist in solving resource shortage issues while also adding value to the organization. Further, SP will benefit an organization's core competencies in achieving organization-wide sustainability. Henceforth, it is now suggested that stakeholders include green operational practices while establishing a sustainability action plan and tracking the results obtained via the consistency of their SP. Second, to attain a greater rate of CE adoption, this research gives critical insight into how green funding and green logistics drive SP to increase CE. Our IPMA findings also exposed the relative importance of GF and the relative performance of SP towards CE. It will become easier for an organization to manage its initiatives and outcomes on any future intervention towards green operations. If a strategic fit is not available among green operations and SP, such initiatives may not fully achieve realistic organizational performance.

Therefore, as (Kitsis & Chen, 2019) emphasized, top management and policymakers should carefully design and incorporate green organizational initiatives due to their critical importance for corporate survival and competitive advantage. Top leadership should take remedial actions to align green administrative operations with policymakers and regulators to develop a shared vision for the future. According to the findings of the mediations research, SP can have a beneficial influence on CE implementation. Traditional manufacturing and supply goods, lack of innovation, and negative environmental impacts are the potential reasons for the underperforming manufacturing industries globally. This must lead the regulators to prevent ecological degradation with stricter corrective measures and a vigilant approach towards its implementation across the board. The research will play a fundamental driver for change in the Asian region, as the manufacturing sector is a significant contributor to the economy of this region. Lastly, the findings of this research are essential and

supreme because it gives a better understanding for the practical implementations for SP to reap the full benefits of CE.

5.4. Limitation

Despite the substantial influences mentioned in previous sections, it is equally important to confess the limitations/constraints of this research that might help future studies as limitations give further study and research directions. The data was collected through the convenience sampling technique and only from the manufacturing industries of China during the pandemic. Future researchers may consider other sectors and regions to have more comprehensive results, enhancing this model generalization. Results might vary due to distinctive cultural, ethical, social, and environmental factors; the outcomes might differ in other areas. This study is based on a cross-sectional survey because of limited time constraints; the longitudinal research can be done in the future for more accurate and thorough results.

6. Conclusion

This study has achieved various outcomes that can be considered numerous offerings to the existing body of literature. This research aimed to investigate the impact of GF and GL on CE directly and through the mediation of SP following RBV in Chinese manufacturing industries. Based on the previous literature, we proposed this research framework and verified the hypotheses through SEM. Because the sample period corresponds with the Covid-19 epidemic, it gives a unique viewpoint on the performance of green financing as the current period is comparable to an economic crisis. The empirical results indicated that GF and GL impact CE both directly and indirectly. Furthermore, SP plays a vital role in mediating these interactions. IPMA also emphasized the significance and worth of all factors. CE implementation entails linking organizational vision to SP through the use of green resources. The current study has made a conclusive case for green financing for CE adoption as the performance SP and importance of GF is higher than all by IPMA results. Furthermore, it confers solid experimental support for arguing that the moral responsibility for sustainable and green management is absolute. Moreover, the outcomes of this research could be used as references for SP and CE in the future.

Disclosure statement

No potential conflict of interest was reported by the authors.

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