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REVIEW

Barriers and Drivers of Sustainable Business Model Innovation: Present and Future Research Perspectives

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ABSTRACT

Sustainable business model innovation (SBMI) introduced a unique frontier in current business operations and innovation management. Despite the numerous advantages of SBMI to contemporary business strategy, most established firms face challenges in its successful implementation. Through a systematic review process (SRP), the paper attempted to critically evaluate and analyze the previous outcome on the barriers and drivers to SBMI. The research explored 42 prior studies to identify the thematic study areas, highlight the research gaps, and outline future propositions and agendas. The research thoroughly evaluates the state-of-the-art regarding barriers and drivers to implement SBMI. The SRP approach utilized in the study sheds light on the intricacies of SBMI by highlighting six critical barriers: institutional, organizational, strategic, resource allocation, technological, and financial barriers that hinder the successful deployment of SBMI. In addition, the study's findings indicated that organizational learning, knowledge management, dynamic capabilities resource mobilization, innovative business activities, and human resource development could be a catalyst to the successful implementation of SBMI. Furthermore, the study highlighted some critical gaps and agendas for future research on SBMI. This study contributes to the literature on business model innovation and offers a practical outlook that can facilitate firms and policymakers in developing strategies to improve their business model.

Keywords: Business model; SBMI; Barriers; Systematic literature review; Business model innovation

1. Introduction

Sustainable business practices are the key to a firm's long-term existence in the twenty-first century. The sustainability of business model innovation (SBMI) has become paramount due to the recent

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global financial, economic, and pandemic crisis that has hit the world. This situation has raised an essential question about the impact of existing companies' business models (BM) on the economic system, environment, and society. In discussing such a relevant topic, the issue of sustainability comes to mind. Sustainability issues result from a systematic approach in the fundamental operation and design, causing a weakening of both ecological and society on which humans depend [1]. Addressing sustainability challenges presents an opportunity for businesses and entrepreneurs to be innovative. The severe threats of human-caused environmental changes, such as climate change, have prompted a push to promote more sustainable lifestyles. Ecological sustainability is considered at the heart of SDG declarations, as some of the 17 Sustainable Development Goals (SDGs) are focused explicitly on guaranteeing global environmental improvement [2]. For example, SDG 11 strives to make global cities and human settlements more inclusive, safe, resilient, and sustainable, focusing on decreasing cities' negative environmental impacts [3,4].

Moreover, sustainability is an effective tool to improve business sales, investment, financial support, innovation, employee diversity, productivity, visibility, and the goodwill of a company [5]. The concepts of sustainability and long-term viability are currently being discussed in academic literature and business studies. These ideas emphasize influencing human behavior, lowering production costs, and assisting people in making the best possible use of their limited resources. Sustainability emphasizes the importance of developing resilient systems regarding biodiversity, environment, and culture while being mindful of ecological potential and viability [6].

SBMI's success has increased in recent times and for an excellent purpose. Technological advances have made it easier to introduce various novel business models effectively. SBMI has recently been a hot topic among innovation management analysts [7]. As a result, SBMI is needed to balance opportunities and revenue frameworks to optimize long-term solutions [8]. SBMI is based on the business model concept and integrates it with the primary stakeholders' management philosophy [9]. Launching a new business is time-consuming and challenging [10]. Specifically, in the early stages, the focus is on creating a commercially viable product and establishing the company's organizational and financial structure [11,12]. Many SBMI fail, and entrepreneurs, businesses, and firms are no exception [13]. The reasons for these failures are relatively unexplored by researchers. The high failure rate of BMI concluded that these failures could be attributed to industrial challenges that remain relatively understudied in the literature, and practitioners have little guidance [14].

In addition, the lack of oversight and incentive programs, the lack of data and metrics to assess and communicate impacts, and the cost of a product or waste take-back, are the top challenges for entrepreneurs deploying circular BM [15]. Entrepreneurs also face challenges such as a lack of brand awareness, access to funding sources, mentoring programs, network services, and intricate product or packaging design in their quest to implement SBM. In support of the above reasons for the high failure rate of SBMI. Most businesses face challenges such as existing assets, leadership, and corporate identity [16]. The researchers also indicated that these barriers had not been explored in depth in the literature. Moreover, many firms like Dell, Apple, Roll-Royce, and Netflix have usefully capitalized on opportunities of BMI. Such successful BMI examples inspire enterprise leaders and managers to look for opportunities to innovate their business models [17]. Simultaneously, they are eager to identify the barriers to business model innovation. Therefore, this research aims to close these gaps in the literature by examining the obstacles of SBMI among businesses through a systematic review process. Hence the research questions to be addressed in this study include: **RQ1:** What is the current research perspective and profile of the present SBMI? **RQ2:** What are the barriers and drivers involved in successfully implementing SBMI? **RQ3**: What critical research gap in the SBMI requires further analysis? **RQ4:** What future research directions could fill the current research gaps?

The contribution of this study is as follows: First, this research is the first known article to systematically synthesize and analyze previous studies' outcomes of barriers and drivers to the implementation of SBMI. In addition, the research espoused prior literature gaps while highlighting research gaps and prospects. Second, the outcome of this research enhances discussion concerning the variable predictors that may serve as a barrier that businesses face when implementing sustainable business models to help them develop necessary measures to overcome them. Third, the study also underscores the dynamic nature of creating a sustainable business model and establishes a new foundation of knowledge on the various strategies that can better implement BM among businesses and entrepreneurs. Such knowledge and understanding could aid businesses, organizations, and entrepreneurs in adopting plans and policies to overcome the challenges of improving their SBMI. Lastly, the adoption of a systematic literature process (SRP) promotes the conceptual evaluation of SBMI implementation by providing a conceptual framework to assist businesses, scholars, and practitioners in investigating the nexus among the various variables (thus barriers and drivers). The rest of the study is structured as follows; Section 2 focuses on the conceptualization of SBMI, Section 3 details the review methodology, Section 4 focuses on the discussion, and Section 5 details the conclusion and implication of the study.

2. Conceptualization of SBMI

2.1 Business model

During the dot-com boom in 1990, the word "business model" became popular—one aspect of the business model concept has ignited a debate. Simply put, *"a business model is a medium or avenue in which a business generates, delivers, and captures value"* [18]. As a result, effective business models take a holistic approach, incorporating these elements into a well-organized and well-thought-out framework. BM creativity is simply a new way of bringing these pieces together to create a system that makes more value for customers and businesses. BM design is a vital consideration for everyone starting a new business. The BM framework allows organizations to attribute future consumer and value chain benefits to designing and implementing the BM components [19,20]. Business models incorporate critical innovations, business practices, and routines [10].

Moreover, BM is concerned with how a company determines its marketing plan based on the characteristics of services to its market segment [21]. The value proposition (i.e., the offering and the customer base classification), the value proposition and distribution mechanism, and the value capture tool are the features of BM [22]. BM comprises three interconnected aspects: value proposition, value formation, and value capture [23]. The recent business model focuses on value creation by seizing potential markets, emerging businesses, and new revenue streams [24]. Also, value capture is the avenue an organization can use to earn revenue from providing goods or services to its customers [24]. Value delivery and capture comprise activities in that companies offer products or information to generate income [25]. A value proposition would give the measurable social value connected to the firm's economic value. The researchers can deduct from the preceding to define "*BM as a concept that encompasses all activities a company engages in to provide value* (*goods, services, or knowledge to customers*) *and establish economic value for the organization*" [26]. **Figure 1** depicts various components of the business model.

2.2 Business model innovation (BMI)

BMI has recently been a hot topic among innovation management analysts [7]. Technology makes it possible to manage a wide range of innovative BM effectively. Simultaneously, increased creativity and global competition have made differentiation more relevant. As a result, BMI is needed to balance opportunities and revenue frameworks to optimize long-term solutions [8]. BMI activities involve "*planned, nontrivial changes to core components of an organization's BM and the structure that connects these components*," which is what BMI stands for [27]. Be-

yond product creativity, BMI allows businesses to implement new practices [28]. It has been identified as a firm's long-term competitive advantage generator [7]. BM is concerned with an enterprise value proposition, while BMI focuses on the novelty in consumer value creation and the logical structuring of the organization [19]. BMI is a philosophy that assists companies in comprehending and facilitating the study and preparation of a single BM [8]. BMI also comprises a specific way of generating and capturing the value of modifying one or more business model components [9].

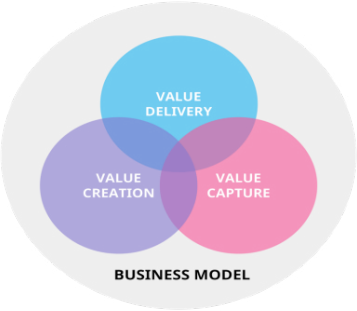

Figure 1. Components of the business model.

Moreover, BMI searches for unique business processes and novel approaches to generate and capture stakeholder value [29]. The value of a company's BM adjusting to evolving market realities, whether demand or supply, is emphasized in this definition. BMI is a tool for organizational change and transition [30]. From the preceding arguments and discussion, the researchers described "*BMI as the processes an organization goes through to successfully change from one business operation to another through effective implementation of BM."* BMI success has increased in recent decades and for an excellent purpose. The concepts of sustainability and long-term viability are currently discussed in academic literature and business studies. These concepts emphasize influencing human activities, reducing production costs, and assisting people in making the best use of the limited resources available to us.

2.3 Sustainable business model innovation (SBMI)

Sustainability-related issues have increased dramatically in the last ten years. SBMI can be defined as "*Identifying value that is not being captured by existing business models and then turning that new perception into value opportunities"* [31]. This process will lead to developing new BM with higher long-term value and the result of SBMs. Businesses may significantly promote sustainable customer behavior by improving manufacturing processes, meeting consumer desires differently, and developing new business models [32]. SBMI adopts a triple-bottom-line strategy, which considers many stakeholder interests, including the environment and society [33]. They play a critical role in generating and implementing corporate sustainability innovation; they can help incorporate business structure and objectives and serve as a competitive advantage driver [34]. SBMI outlines how new BMs are developed, and companies transform their existing BMs to achieve long-term sustainability. SBMI also considers anticipating societal changes and responding to sustainability concerns [35].

BM involves developing ways for companies to capture economic potential while also earning profit. SBMI can be viewed by creating three values (i.e., renewable energy and natural resources, practices of low carbon emission, protection, and prevention of air, water, and land pollution) [11]. The social value form includes; (diversity and equity, social well-being and development, labor standards, and organizational health and safety). The economic perspective of SBM involves; (profit return of financial investment, financial resilience, long-term business viability, and sustainability) [31,36]. Hence in this research, the authors attempt to evaluate what barriers and drivers affect the successful deployment of SBMI in an organization through a systematic review approach. Since few studies exist to provide more insight into this topic, the present research fills this gap in the literature by highlighting the research gaps that scholars can analyze in the future.

3. Research methodology

3.1 Systematic review process

The researchers conducted a systematic review process (SRP) to identify barriers and drivers to SBMI. The SRP is a methodology that allows for a

thorough evaluation of the state-of-the-art in any given area of research while also identifying gaps in the literature to encourage further study and knowledge expansion [37,38]. The SRP provides a platform that helps to analyze earlier research in a step-by-step approach; starting with identifying the publications; selecting relevant studies; information retrieval; evaluation of the information, and ultimately reporting the results [39,40]. To formulate a conceptual limit and boundaries for this study, two academic experts were consulted at the initial stage of the research. Their role was to help identify and select articles on this topic based on their expertise and advanced knowledge. Therefore, the phases for the retrieval and synthesizing of the study are discussed as follows:

Phase I: Planning the SRP by drawing up the research criteria to identify relevant studies.

Phase II: Assessing studies to evaluate their eligibility (inclusion and exclusion eligibility).

Phase III: Data extraction and final evaluation of pertinent articles.

3.2 Planning the SRP

This study's initial stage was establishing the protocols guiding the SRP. First, the study protocols started with the proposition of research questions that will guide the study's objectives, which have been discussed in the first section of this article. Hence, based on the proposed research questions, we identified the search strategy, located salient articles, created the inclusion and exclusion limits, and picked a particular synthesis approach. The study answers the research questions by identifying two up-to-date databases: *Scopus and Web of Science* (WoS) to search for related articles on this topic [40]. To begin with, the authors used the search term "business model" and "barriers" to search these databases. After that, the authors redefined a comprehensive keyword to be utilized as a search string within the study period from 2010 to 2022.

3.3 Research screening threshold

The study research was limited to review articles or original articles only. This is because peer-reviewed academic articles go through a more thorough review process before being published, resulting in the most valuable data for the study. Conference papers, textbooks, and other internet documents were eliminated during the exclusion stage. The exclusion and inclusion criteria have been summarized in **Table 1**.

3.4 Data extraction

The search was conducted using Scopus databases and Web of Science (WoS), with a time frame spanning 2010 to 2021. *Scopus and WoS* offer a broader range of study disciplines and the most up-to-date developments and trends, crucial in guiding future research directions. Scopus database and WoS are the most effective and reputable search engines for conducting a literature review [41-43]. The researcher used the following keywords in running the literature search on Scopus and WoS databases. The search inquiry was keyed as: (TITLE-ABS-KEY ("obstacles" OR "barrier" OR "challenges") AND TITLE-ABS-KEY ("business model" OR "business model innovation" AND "sustainable business model"). A total of articles, 184 (Scopus 76 and WoS 108) were retrieved. 61 papers were removed because of duplication during the article screening and selection.

Moreover, 56 papers were found to be unrelated to the subject of discussion in this study after the article's full-text analysis. As a result, the number of articles decreased to 38 publications included in the final synthesis after the inclusion and exclusion criteria presented in **Table 1** were applied. Furthermore, the researchers used the snowball method to locate relevant publications not caught during the article selection stage, resulting in 4 articles. This activity was carried out to supplement the findings of the initial two-stage search to gain complete coverage of the publication worth studying. The snowball exercise is sufficient since it allows for significant state-of-the-art works linked to the study [44]. Finally, 42 papers were included in the study portfolio for analysis and discussion. The steps of the systematic review are depicted in **Figure 2**.

Table 1. Exclusion and Inclusion threshold.

Exclusion (EXC)	Inclusion (INC)
EXC1: Non-peer-reviewed studies	INC1: Peer-reviewed studies
EXC2: Studies not written in the English language	INC2: Studies written in the English language
EXC3: Duplicate studies	INC3: Studies related to SBMI
EXC4: Books, thesis, essays, letters, and editorials	INC4: Literature reviews and original articles focusing on SBMI
EXC5: Project reports, conference articles, white papers, and working papers	INC5: Studies available in their full-text form
EXC6: Studies not related to barriers and drivers of SBMI	INC6: Articles published from 2010 to 2022

Figure 2. Overall research process.

4. Results and discussion

4.1 Annual trends of publications

We selected forty-two (42) articles for the review purpose of this paper. **Figure 3** indicates the bar graph of 42 articles published over the years. The analysis of the selected articles revealed that the discussion about SBMI challenges and drivers had been in contention in literature over the last decade. **Figure 3** indicates that the year 2010 had some studies on SBMI, and the discussion of this topic has been expanding over the years. For instance, as of 2010, some leading authors and journals include the *Long Range Planning and European Management Journal* [25,45-47]. Many studies are still investigating and looking at the pace; it is predicted to exceed the prior years. This depicts these issues indicating how important SBMI is to current business practices.

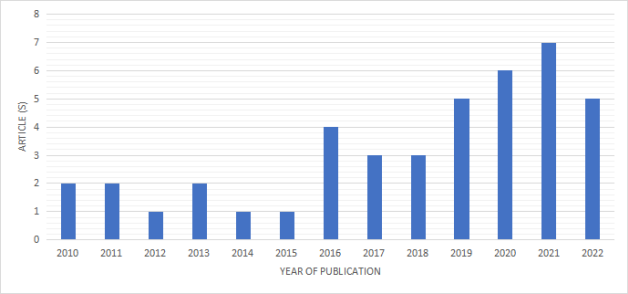

Figure 3. Distribution of the number of articles per year included in the study.

4.2 Current research perspective of SBMI

SBMI has become a significant debate among business and other research subject areas. Hence based on the SRP and categorization of the various articles retrieved, the authors classified the papers based on their current subject area. Thus, the authors categorized the articles based on how SBMI expands literature through contributions from multidisciplinary research work. Hence, we identified ten key areas, which are discussed as follows. The analysis indicates that most of the articles on SBMI stem from Business Management and Accounting, followed by Operations and Production Management. Moreover, other essential research includes; Environmental Management, Environmental Innovations, Industrial Innovations, Environmental Science, Econometrics, Finance and Economics Decision Science, and Energy and Social Science, as indicated in **Figure 4**. Moreover, as depicted in **Figure 4**, Business Management and Accounting hold the highest classification with a 12-point average, followed by the medium categories such as Social Science, Decision Science, Environmental Science, Industrial Innovation, Environmental Management, and Operation and Production Management. Energy, Econometrics, Finance, Economics, and Environmental Innovations were the minimum contributors to SBMI.

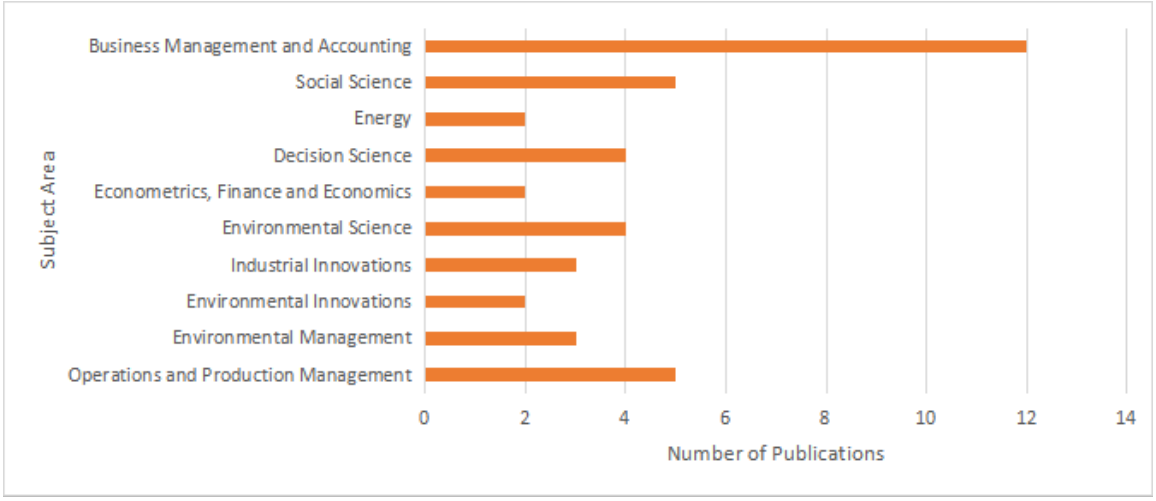

Figure 4. Research perspective of SBMI.

4.3 Applied research methodologies used in selected articles

To provide clarity and increase knowledge on this topic, the authors highlight information on the approaches used in the articles under consideration in this study. The analysis results underscored that most of the articles published utilized the structured review approach (38%), followed by a case study (29%), as indicated in **Figure 5**. It was also discovered that 19% of the study applied the mixed approach, and empirical studies accounted for 14%. This analysis has proved that different authors used various methodologies in their research based on the proposed objectives and the circumstances in which the studies were carried out.

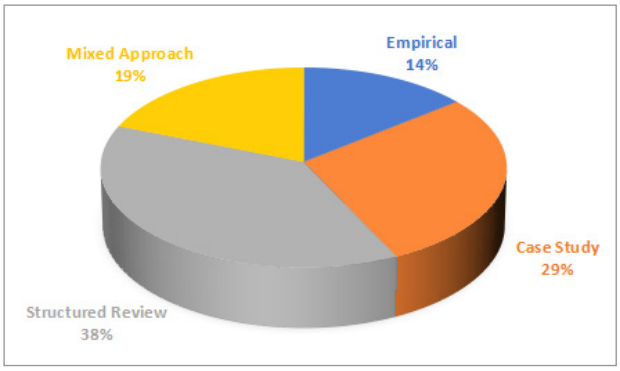

Figure 5. Research methods applied.

4.4 Geographical analysis of selected articles

The SRP analysis further revealed that research on SBMI is diverse, especially regarding geographical scope. The results from the articles extracted show that a larger number of the studies were carried out in the United States of America-USA (14 articles). The USA contributes to one-third of research in this area because it has positioned itself to take the lead in sustainability matters. Hence firms in the USA have started incorporating environmentally friendly practices into national legislation, generating employment in green companies, and informing the people about their role in making America more environmentally friendly. In addition, counties which include China (6 articles), the United Kingdom (5 articles), France (4 articles), Norway (3 articles), Spain (3 articles), Switzerland (3 articles), Netherlands (2 articles), Nigeria (1 article) and Brazil (1 article) in SBM articles as depicted in **Figure 6**.

4.5 Thematic areas

To methodically arrange a diverse variety of discoveries, the authors evaluated all 42 articles for recurrent themes, which aligns with erstwhile studies that applied SRP in their studies [48,49]. In the next phase, we employed a content analysis approach to

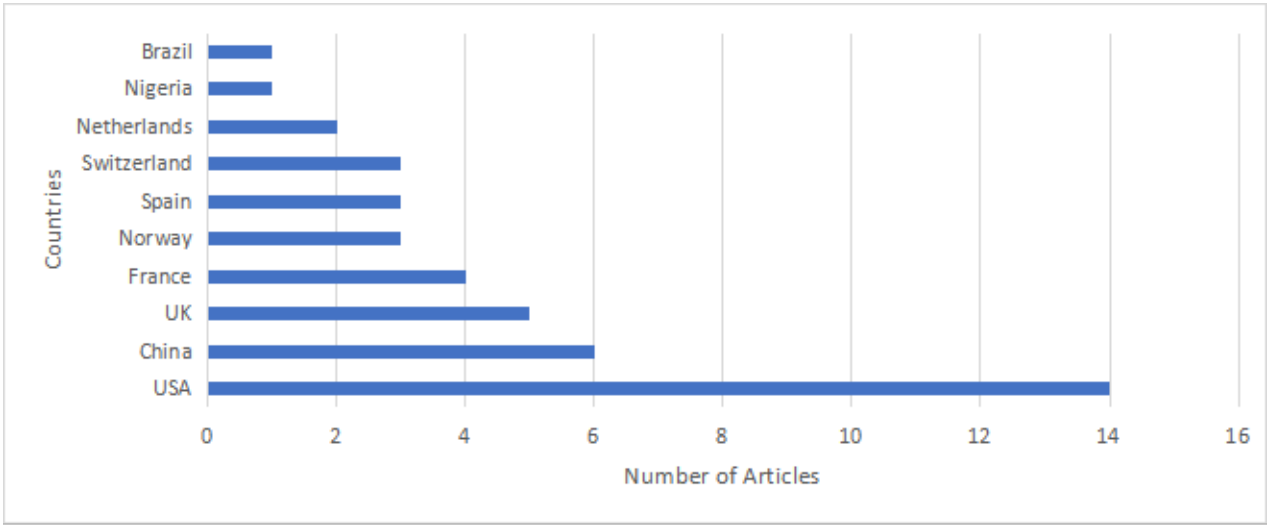

Figure 6. Geographical scope of selected articles.

aggregate the results of the existing studies. The content analysis approach has been argued by previous studies as a process that meticulously helps researchers to classify, code, and identify related textual material regarding a particular topic of interest [50]. The study applied a three-step approach that can lead to a fair and transparent literature presentation in various thematic areas [51]. Hence, the following steps were followed to categorize the different codes applied in this study: (1) the authors classify the leading authors and countries into axial codes and provide an assessment matrix to evaluate their contribution to this topic; (2) deductive and inductive techniques were applied to sort out the main variables that act as a barrier to SBMI and (3) lastly, we discussed these axial codes and grouped them into thematic themes. Hence two categorizations were highlighted (barriers and drivers of SBMI), which are presented in **Figure 7**.

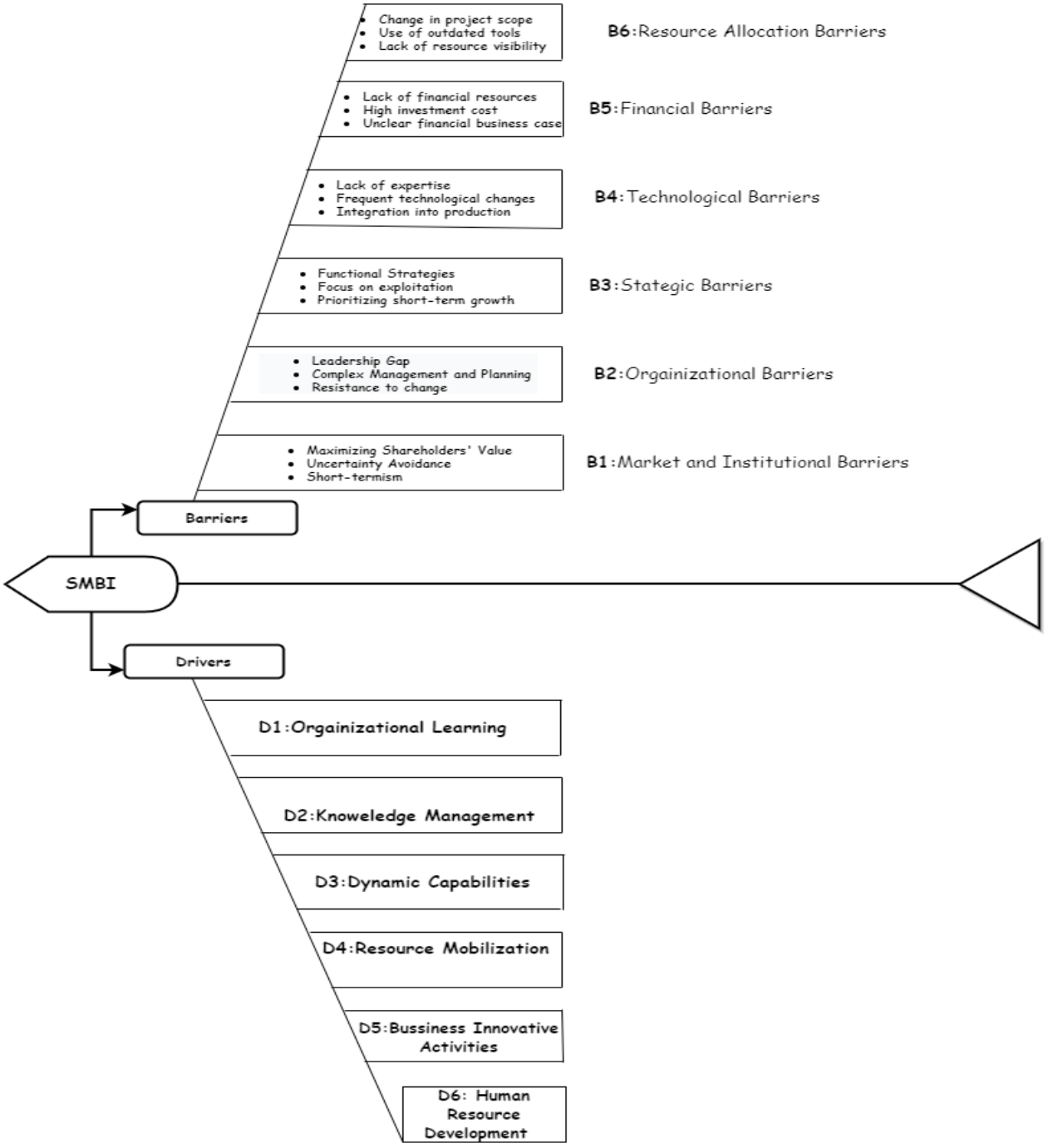

Figure 7. Thematic areas of the research.

4.6 Barriers

B1: Market and institutional barriers

Institutional entry challenges hinder enterprises from understanding or adapting to the laws, social standards, and value systems that contribute to the culture, sequence, and procedures. They exist at numerous levels in a market and govern the relationship between a company and its customers and its relationship with the community [52]. Institutions serve as the foundation for order and facilitate interactions between actors, describing the new institutionalism in economics [53]. Most SBMIs usually fail because they focus on *maximizing stakeholders' interests*. Thus, SBMI risks concentrating on profit maximization and financial performance indicators to fulfill shareholder value. SBMI is challenging to achieve in and of itself, but the need for SBMI to be profitable complicates matters even further [54]. Concerningly, an emphasis on boosting shareholder value leads to an avoidance of uncertainty in terms of attaining financial results in the short term. As a result, financial risk avoidance and poor tolerance for ambiguity influence investment decisions within organizations, leading to *uncertainty avoidance* [55]. Furthermore, *short-termism* affects SBMI, which generally occurs when firms prioritize immediate gains and profit in the short term rather than focusing on maintaining these outcomes in the long time [55].

B2: Organizational barriers

The *leadership gap* is a critical challenge to altering an existing BM; no single individual has the authority and power to innovate BM, especially when the changes are significant and radical. For instance, changing a complex BMI will involve numerous functional departments and require effective inclusion and integration. Such radical changes will call for the involvement of a collective effort from the leadership or management team. Some senior managers who disagree with the suggested amendments may tactfully reverse them [27]. Moreover, because managers keep changing in an organization, it can create a leadership gap where no one is available for the SBMI process [56]. Therefore firms must find a way to address this leadership gap to guarantee that business model experimentation is effectively governed and that the outcomes of their trials lead to action inside the organization [45]. *Organizational resistance to change* has also been identified as a critical barrier to implementing SBMI. In general, modifying the business model, even if drastic, puts existing positions of power and influence, entitlements, and presumed endowments at stake. Responsibilities, mechanisms, and workflows may need to be modified, leading to *more complex management and planning processes*. All of this can lead to significant employee dissatisfaction and even power struggles, extending or, in the worst-case scenario, impeding SBMI [57].

B3: Strategic barrier

Another critical factor that influences the successful implementation of SBMI is a strategic barrier. This study identifies three areas as the strategic deterrent of SBMI [55]. First is the *functional strategy*; this occurs when companies fail to achieve the purpose of SBMI because there are no precise functions and roles assigned to each division or unit in implementing the process. The second point to mention is the *focus on exploitation*; a strategic focus on utilizing existing potentials came at the cost of launching innovative SBMI capacity [58]. Third, the *institutional focus is on short-term growth,* with resources primarily budgeted for large-scale project investments. Furthermore, respondents from their study noted that focusing on short-term expansion resulted in strategy formulation reconsidering steadily maturing initiatives [54]. Again, administrative issues like advanced processes, unequal responsibility distribution, skewed reward systems, and a lack of oversight will hinder the integration of innovation into the business model [59].

B4: Technological barrier

Technology innovation is seen as an external catalyst and an obstacle to firms' ability to innovate their BM. Profitability from a new technology

would justify a company's need to change its BM. New technology or innovation may cause tension in a company's operations because the current BM is configured to work with older technologies [60]. The innovativeness of companies and the technological business level could aid BMI [61]. BMI is related to capability challenges, including recognizing change drivers, such as technological and regulatory change, and the capacity to develop new BM concepts [28]. Thus, another stance is *the rate of frequent technological changes* that occurs in modern business. One business model can change overnight due to a technology change which may affect the operation of the current business model used in an organization.

In most cases, a *lack of technology or technical know-how* is not regarded as a stand-alone barrier because it is closely related to SMEs' lack of resources and time to acquire skill training [62]. Technology was identified as one of the most significant factors affecting a company's long-term innovative thinking, and its integration into the business production process might raise employee concerns [63]. All technologies adopted by the management are evaluated regarding the amount of energy, water, and raw materials used. These technologies are designed to reduce consumption while generating financial returns for the company. This capability significantly impacted innovations in the company's sustainable products and processes, particularly economics [64].

B5: Financial barriers

Many organizations, particularly small and medium enterprises, have limited budgets, knowledge, and staff and thus cannot undertake BMI if their resources exceed their capabilities. Furthermore, decision-makers in businesses always prioritize what is more profitable. As a result, they will devote more resources to the firm's current BM, significantly if sharing resources between two models could jeopardize its recent BM's returns. This is a problem because, typically, *the gross margins of proposed BM are lower than those of existing ones at the outset.* The power of the financial markets creates a destructive cycle in which top executives are rewarded based on quarterly achievement, incentivizing directors to demonstrate their capacity to thrive in the business only within the restriction of the current model [56]. Many SBMI fail because of *financial difficulties* that most entrepreneurs and organizations face in today's competitive market. Another impediment of BM is a *lack of funding and colossal investment cost.* Banks are hesitant to help start-ups and small businesses develop and implement a BM [65]. The vague market demand for BMs, a significant concern for the case companies, is most likely to blame for the lack of funding opportunities. Financial barriers to SBMI are primarily due to difficulties in making the business model economically viable [66].

B6: Resource allocation barriers

Resources are the most crucial investment for business operations and strategies. As a result, firms try to use them efficiently for profit-making and sustainability purposes. The *improper allocation of a firm's resources* can lead to delays in the high cost of projects delivery of projects and derail business projects in their tracks [67]. A company's resource availability severely hampers business model innovation initiatives. Thus, organizations with sufficient resources may face cognitive barriers, resulting in insufficient resource allocation for business model innovation [45]. The importance of skilled labour, investment, and resources as the main constraints of SBMI among businesses [59]. Their study viewpoint offers one possible explanation for why, in general, these businesses do not devote significant resources to continuous innovation within the business model. A company's production methods are established while available resources are considered in *resource integration.* However, such resource integration is driven by economic considerations [63]. When the same resources are used for multiple products, the likelihood of raw materials, equipment, and other resources becoming outmoded, as does the value of modern infrastructure. **Table 2** and **Figure 8** outline the key obstacles and sub-barriers of SBMI. This section also discusses some of these barriers with previous literary works.

Table 2. Key barriers impeding the implementation of SBMI.

Code	Barriers	Sub-barriers	Reference
B1	Market and Institutional Barriers	Focus on maximizing shareholder value Uncertainty avoidance Short-termism	[53, 54, 68, 69]
B2	Organization Barriers	Leadership gap Lack of managerial know-how Organizational resistance to change More complex management and planning processes	[27, 59, 62, 68, 70-72]
B3	Strategic barriers	Functional strategy Focus on exploitation Prioritizing short-term growth	[54, 73, 74]
B4	Technological Barriers	Lack of technical know-how and expertise Rate of frequent Technological changes Integration into production processes	[28, 60, 62, 75-77]
B5	Financial Barriers	Lack of financial resources High investment cost Unclear financial business case	[62, 66, 68, 71, 72, 78]
B6	Resource Allocation Barrier	Change in project scope Lack of resources visibility within a matrix firm Use of outdated legacy tools Mismatch in the skillset between capacity and demand	[59, 63, 67, 70, 72]

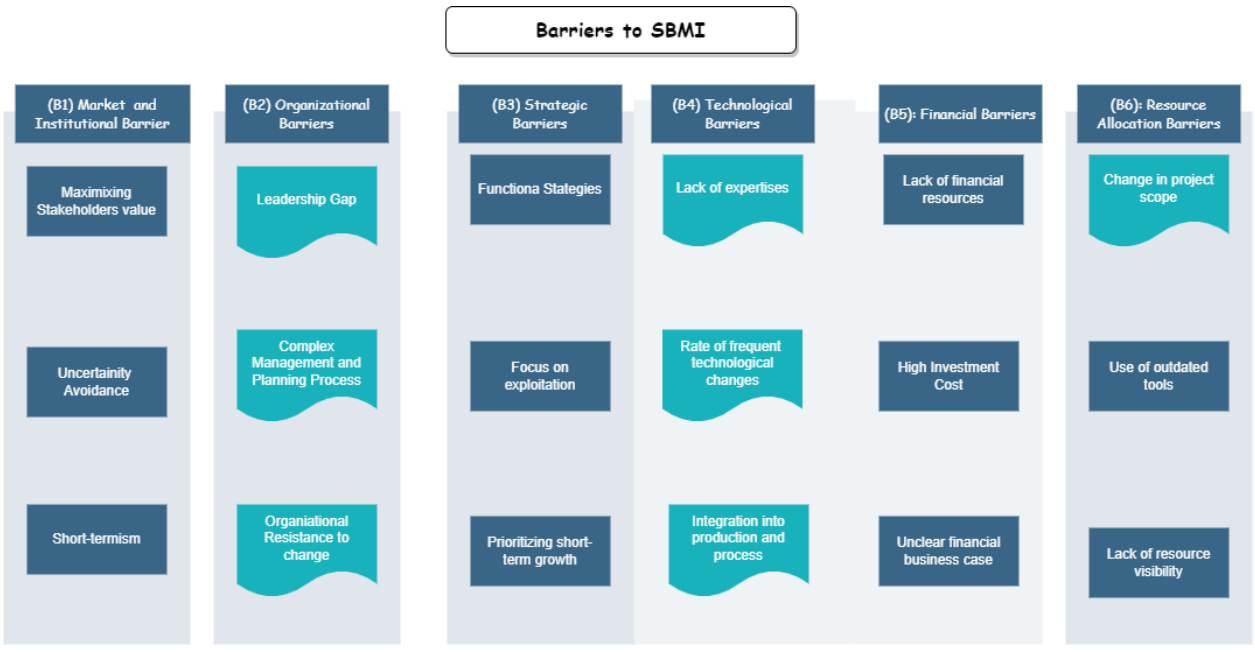

Figure 8. Barriers to SBMI.

4.7 Drivers

Drivers in this study are the strategies that can help firms transition to the effective deployment of SBMI and overcome the challenges discussed above. The term "transition" can be described as a period of systematic change in an institution's culture, organizational structure, and structure [58]. Therefore, sustainability transition is a complicated and long-term process involving a network of diverse actors functioning at different system levels. Sustainability measures are not typically included in accounting methods, decision-making, or general company models. Therefore, the successful sustainable business model appears to be more comprehensive [79]. Critical variables that estimate the performance and consequences of BM decisions transparently and concisely can be used to evaluate sustainability. In this section, the researchers discuss ways entrepreneurs and businesses can emulate to implement SBMI, as shown in **Figure 9**, successfully.

D1: Organizational learning

Organizational learning (OL) is a critical and fundamental process for processing information and knowledge and changing an organization's traits, behaviors, capacities, and performance. *Information acquisition, knowledge sharing, and utilization* are a few subprocesses that make up organizational learning [80]. OL is a critical component in defining better performance and long-term competitive advantage for businesses and a key element in explaining success [81]. Organizational learning has been identified as a general approach that can help overcome the barriers to successfully implementing SBMI [16]. A strong relationship exists between OL and SBMI [82]. Organizations must develop *new knowledge and skills* to cope with the highly competitive marketplace.

Furthermore, effective organizational learning strategies and behaviors enable an organization to establish its strategic competency, maintain its competitiveness, and improve performance [82]. Manage-

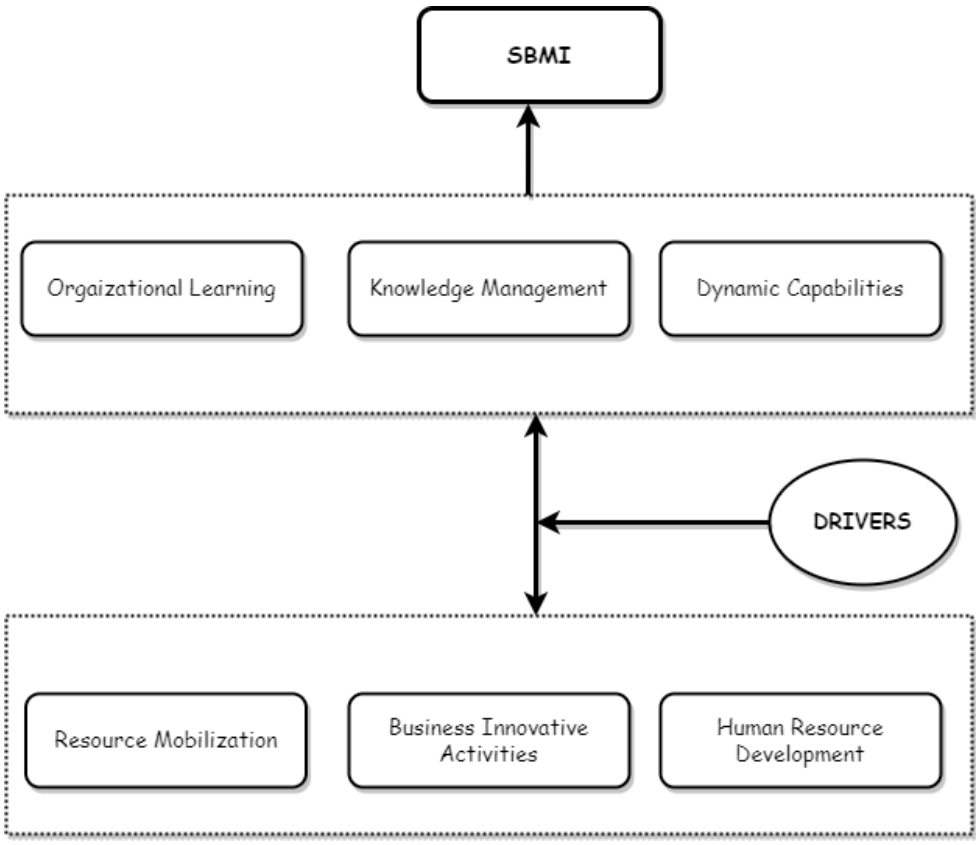

Figure 9. Drivers of SBMI.

ment often focuses on increasing performance or revamping tactics when managing sustainability efforts. They frequently overlook the significance and function of learning in implementing improvements. OL is critical for firms to implement sustainability, yet research in this area is limited. As businesses grow more committed to sustainable business practices, understanding how to learn about sustainability constantly—and how to distribute that knowledge throughout the organization—becomes increasingly important [83]. Effective organization learning can help in better implementation of SBMI and help overcome challenges such as organizational barriers and strategic barriers.

D2: Knowledge management

Knowledge evolves through a human evolution process. Knowledge management (KM) is "*a combination of procedures, systems, technical, and managerial tools to develop, share, and exploit information and knowledge within and around an organization"* [84]. Despite its intangibility, KM is regarded as an asset that provides a competitive advantage to the company. *Continuous improvement, process innovation, and product innovation* are all ways to gain a competitive edge. KM for BMI is expected to be the guiding principle for entities and relatively traditional brick-and-mortar organizations confronted with the issue of incorporating their business models into and beyond brick-and-mortar companies [85]. KM is a critical function for improving the understanding of SBMI. Entrepreneurs and organizations need to comprehend the exact effect of regulative mechanisms on business activities. Thus, firms need to appreciate the meaning of SBMI and how it can lead to enhanced competitive advantage. *Knowledge management can help firms transition to SBMI by understanding the significant association between environmental and financial performance*. Integrating KM and SBMI can increase a firm's sustainable competitive edge and help overcome market, institution, and technological barriers.

D3: Dynamic capabilities

An organization can maintain long-term wealth creation and value propositions; it must be prepared to embrace and continuously revitalize its BMs and modify its firms to innovative and attractive propositions [86]. SBMI necessitates the development of capabilities that can assist firms in reshaping their BM component to accommodate the different waves of the dynamic business environment and build and strengthen their internal business operations. The strategic interest of BMI is the same as pursuing innovative behavior: to incorporate the firm into an innovation engine [87]. The concept of dynamic capabilities (DCs) *can be classified as a company's efforts to effectively develop its BM while maintaining a high level of performance*. Firms with significant DCs can incorporate external resources and establish a new service system and methods while implementing SBMI. Organizations must overcome institutional barriers to develop cooperative connections with many stakeholders and persuade customers to join BM's value network [88].

Moreover, DCs of firms help organizations respond to changing business environments swiftly and seize marketing opportunities. Organizations modify business model components by establishing resources and competencies connected to service innovation [88]. As industries and markets become more challenging deploying SBMI, the DCs may contribute to establishing sustainability initiatives and technological upgrading, regardless of the industry in which they conduct business [63]. DCs can help firms deploy their BM successfully and overcome any technical challenges.

D4: Resource mobilization

Resource mobilizations are the fundamental basis for SBMI [89]. Business needs resources to accomplish their objectives; firms must provide a combination of resources to support the successful implementation of SBMI [90]. As a result, firms must build *a resource mechanization channel* that is key to BMI's success. BMI can improve the capabilities of a firm's value proposition and development, but the possibility of

BM design can only be achieved by *establishing equivalent financial and material resources* [89]. When firms possess the needed resources to transition to SBMI, it can help them enhance their sustainability [90]. Furthermore, resource mobilization is critical to generating and retaining long-term value for a company. Firms must change their matching resource base when performing BMI. Business strategy can help start-ups interactively adjust available resources and prowess and realize help and innovation matching [91,92]. Most entrepreneurs and organizations fail in their SBMI because they cannot find the needed resource to match. Therefore, for firms to successfully implement their SBMI, they need to establish a sound strategic plan to help them raise the necessary funds for successful implementation. To overcome the resource allocation financial barrier to SBMI, firms must initiate plans to get the economic prowess to make their SBMI work.

D5: Business innovative activities

A business model's key activities represent what the company must do to make the business model work. These activities may involve the creation of a product, the provision of a service, or a combination of the two. Key activities are any activities that firms engage in with the primary goal of profit. Business activities include operations, marketing, production, problem-solving, and administration. To succeed, a corporation must convey specific initiatives its business model primarily dictates [92]. In planning for their SBMI, businesses should consider current social and environmental developments and how they may change with time. Furthermore, companies must imagine radically new, more extreme versions of the future (rather than linearly forecasting trends) to vary their SBMI thinking. Firms must also consider how environmental and societal challenges might evolve in light of these scenarios [93].

D6: Human resource development

Employees are resources that must be built and empowered regularly. Providing adequate environments for employees' personal growth and career progress, such as company support or motivation, will increase productivity. Employee empowerment is a long-term investment to improve economic performance and image among customers and employees [94]. The personnel policy, part of the firm's overall policy, includes important employee principles and governs the relationship between workers and the company [95]. For a business to overcome organizational barriers (i.e., leadership gap and resistance to change), it must focus on training its employees to adapt to change. This can be achieved by organizing training programs for leaders and employees to educate them on implementing the new BM in the organization. Such a training program can help them understand the concept of a radical change that might happen in adopting the new SBMI. Human resource management generally exemplifies how its sustainability performance aligns with leading global frameworks and supports overall business sustainability strategy through these processes [96].

5. Research gap and guture agenda

The in-depth evaluation of previous studies provides a thorough understanding and knowledge of the drivers and barriers to the application and implementation of SBMI. As espoused in this research, the authors have identified numerous research gaps which may serve as a potential avenue for future research directions. These penitential avenues and research direction will entice scholars to go deeper into this topic and discuss the consequences of their discoveries for pertinent stakeholders and organizations to make a prudent decision regarding the implementation of SBMI. The current research gaps based on the themes and proposed methodologies identified through the SRP are presented in **Table 3**.

Table 3. Highlights of the research gap and future agenda.

Themes	Sub-themes	Research Gap	Future Agenda
Barriers	Market and Institution	(1) Extant studies have not yet examined how the issue of short-termism affects SBMI	**RQ1**: How does short-termism influence the implementation of SBMI?
		(2) The views and assumptions of stakeholders are critical to the implementation of SBMI. The essence is to evaluate how stakeholders' values can be maximized in implementing firms' SBMI. However, there is scanty research on this topic.	**RQ2**: What is the effect of stakeholders' values on the implementation of SBMI?
	Organizational Barrier	(1) Previous studies highlighting the extent to which organizational barrier such as leadership gap influences the adoption and implementation of SBMI is nascent	**RQ1:** How does the leadership gap affect the effective implementation of SBMI?
		(2) Complex management planning and process were highlighted as an organizational barrier to SBMI; nevertheless, few studies have examined these concepts.	**RQ2:** To what extent do complex management planning and process affect the successful implementation of SBMI?
		(3) Employees of firms are sometimes resistant to changes. However, extant studies have not yet captured the initiatives and strategies needed to respond to the inherent resistance among employees to overcome this menace.	**RQ3:** What initiatives and strategies can a firm use to promote collaboration among employees to implement SBMI successfully?
	Strategic Barriers	(1) Prior literature has yet to analyze how and why various organizational and functional units fail to achieve their assigned roles in implementing SBMI.	**RQ1:** How can firms strategize to help various units to function properly to promote the implementation of SBMI
		(2) Existing studies have not explored how firms can exploit employees' potential in achieving the objectives of firms' SBMI.	**RQ2:** How can enterprises overcome the barrier of "exploitation" in their quest to introduce a planned SBMI?
		(3) Extant studies have not discussed how the short-term growth of a firm affects its implementation of SBMI	**RQ3:** To what extent does the short-term growth of a firm influence its quest to implement SBMI
	Technological Barriers	(1) Previous literature is nascent on how employees' expertise level influences the implementation of SBMI.	**RQ1:** To what extent does employees' level of expertise influence firms' decision to engage in SBMI?
		(2) The current dynamic rate at which technology has changed is quite alarming. This situation can disrupt the implementation of SBMI. However, the previous study has not delved into this argument.	**RQ2:** How should firms adjust to technological changes when planning their SBMI?
		(3) The effective integration of SBMI into firms' production and the process is critical for a successful SBMI program. Yet, prior studies have not captured how these integration activities can be adequately implemented.	**RQ3:** What initiatives and mechanisms can firms utilize to effectively integrate their SBMI into their business production and process?
	Financial Barriers	(1) Existing studies have identified that financial barriers such as lack of financial resources, high investment costs, and unclear financial business cases affect SBMI. However, the literature has not yet evaluated how these factors affect the implementation of SBMI.	**RQ1:** How does high investment cost affect the implementation of SBMI? **RQ2:** To what extent does an unclear financial business case influence SBMI projects?

Table 3 continued

Themes	Sub-themes	Research Gap	Future Agenda
	Resource Allocation	(1) The literature is yet to examine a change in project scope, the use of outdated tools, lack of resources visibility within a matrix firm and mismatch in the skillset between capacity and demand affects the implementation of SBMI.	**RQ1:** How can enterprises address the issue of resource allocation within their firm matrix to improve the viability of SBMI?
Drivers	Organizational Learning	(1) Researchers must conduct an in-depth analysis of the influential role of organizational learning in enhancing SBMI.	**RQ1:** What role does organizational learning play in enhancing SBMI?
	Knowledge Management	(1) Previous studies are characterized by few empirical studies on how knowledge management can affect SBMI.	**RQ1:** Can knowledge management facilitate the effective implementation of SBMI?
	Dynamic Capabilities	(1) Extant studies lack clarity on how dynamic capabilities influence SBMI.	**RQ1:** What is the impact of dynamic capabilities on SBMI?
	Resource Mobilization	(1) Empirical studies regarding resource mobilization's effect on SBMI are still debatable.	**RQ1:** How can extant studies empirically evaluate the nexus between resource mobilization and SBMI?
	Business Innovative Activities	(1) Businesses can use various innovative activities to improve their SBMI.	**RQ2:** What core business innovative activities can the firms use to improve their SBMI?
	Human Resource Development	(1) Employees are a vital part of the implementation of SBMI. Hence the human resource department of a firm should organize training for employees in their quest to implement SBMI.	**RQ3:** How can human resource development motivate employees to implement SBMI?
Methodological Approach	Qualitative Approach	(1) Prior studies used qualitative and case study approaches to analyze SBMI.	**RQ1:** How can the researcher empirically explore the association between drivers, barriers, and implementation of SBMI?
	Case Study	(2) Majority of the extant studies employed used a single enterprise as a case study; this methodology limits the generalizability of the research outcome.	**RQ2:** How can scholars use data from different enterprises to improve the generalizability of the previous outcomes?
	Longitudinal Approach	(3) Erstwhile research primarily applies only a few numbers of longitudinal analyses.	**RQ3:** How can scholars utilize a longitudinal approach to evaluate the effect of SBMI on firm performance?

6. Framework development

SBMI is viewed as a technique of BM discovery, advancement creation, acceptance, modification, revamping, and refinement in which BMI elements are combined with sustainability considerations [11]. SBMI explains how new BMs are developed and how existing business models are transformed to achieve long-term viability [97,98]. SBMI is a conceptual approach to incorporating social and ecological concerns into an organization's priorities and operations [98]. Research on the convergence of SBMI, corporate development, and strategic design has shown the importance of following particular practices when implementing SBMs [99]. The SBMI sector is currently undergoing consolidation, with new reviews specifying the nature and limit. Simultaneously, several resources have been developed to help firms implement SBMI. Hence it is essential to provide a workable framework that can help improve the viability of SBMI in a firm. The proposed framework is a straightforward and systematic representation of SBMI deployment. We applied the actor-network theory to develop a theoretical framework that helps broadens the understanding of barriers and drivers that influence the various components of SBMI (i.e.,

value creation, values, value capturing, and value delivering). The actor-network theory helps understand the interconnections, components, and implications among a proposed framework [72]. As indicated in **Figure 10**, the framework proposed provides an understanding of how firms can overcome various challenges of SBMI and how it can also contribute to achieving value creation, capture, and delivery. This paradigm and proposed framework give prospective researchers a clear research direction to evaluate this subject area further.

7. Conclusions and implications

7.1 Conclusions

The present SRP sought to evaluate the barriers and drivers connected with implementing SBMI. The study applied rigorous research protocols highlighting prior studies from prominent databases, including *WoS* and *Scopus*. Accordingly, this research addresses the study **RQ1** by providing a descriptive profile of previous studies on barriers and drivers of SBMI through an SRP approach. The study profile includes annual trends of publications, current research in SBMI, geographical contributions, and methodological approach. The study answered **RQ2** and utilized the content analysis approach through the thematic themes of existing studies. **RQ3** was evaluated by synthesizing previous studies to highlight research gaps and future research propositions. Lastly, the research provides a study framework that analyzes the requirements for proper implementation of SBMI to answer research question **RQ4**. By evaluating thematic themes that incorporate the barriers and drivers of SBMI. Further, we proposed a framework for implementing SBMI based on actor-network theory. The research thus provides substantial recommendations for stakeholders and researchers who are interested in implementing SBMI in their enterprises.

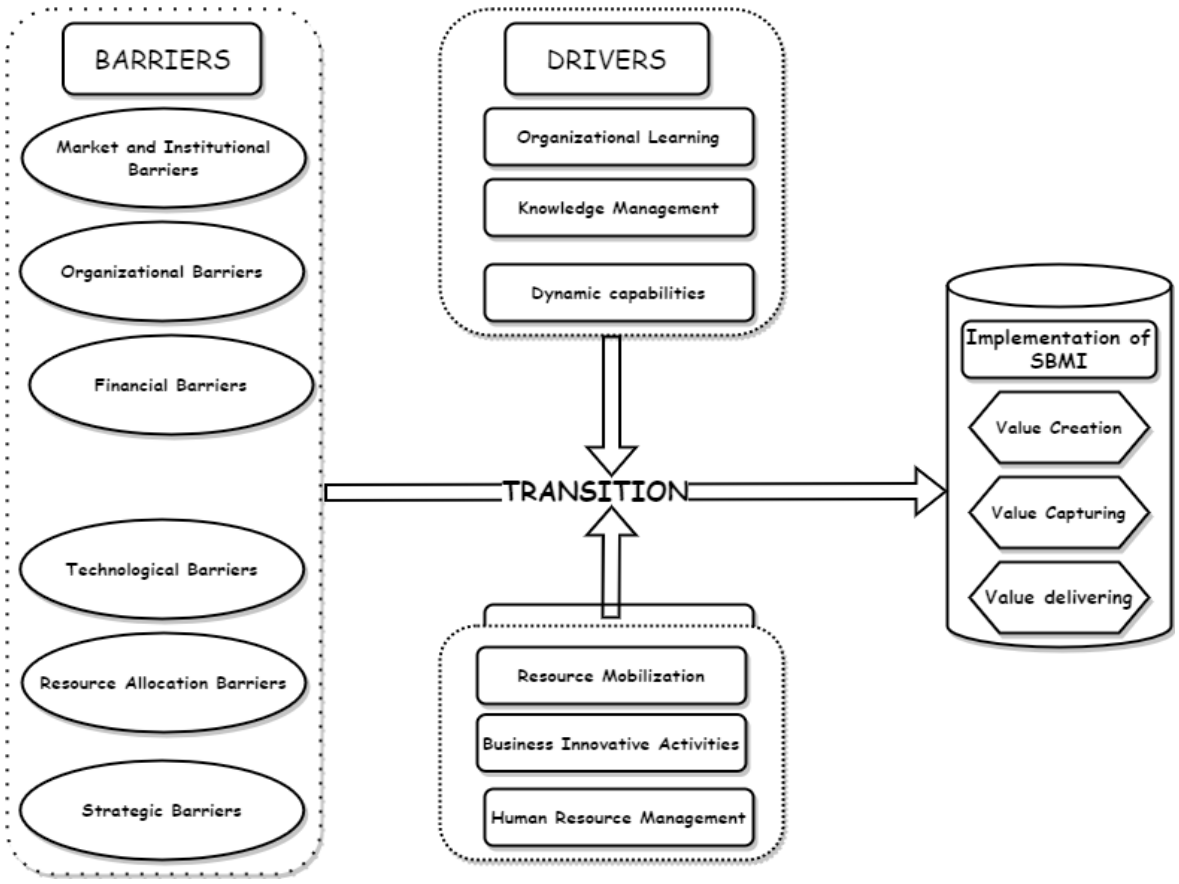

Figure 10. Proposed framework for the implementation of SBMI.

7.2 Theoretical implication

SBMI research is rapidly emerging in contemporary business activities, but little initiative has been expended in examining the barriers to successful integration. SBMI depicts a new frontier of business innovation beyond only the invention of goods and services. This study attempts to fill this gap by analyzing key barriers to SBMI deployment. It contributes to the literature and theory on business models in entrepreneurship. This review aims to contribute to scholars' understanding of institutional, organizational, strategic, technological, financial, and resource allocation barriers that hinder the deployment of successful SBMI. The present research proposes drivers enabling entrepreneurs to transition toward the successful implementation of SBMI. A successful SBMI requires firms to adopt the following strategies: organizational learning, knowledge management, dynamic capabilities, resource mobilization, sustainable mindset, and human resource development. Comprehensive identification and understanding of SBMI barriers and drivers add to the body of knowledge in the literature and help explain the idea of the business model in terms of entrepreneurs. The research also theoretically contributes to studies on SBMI and the actor-network theory by providing a framework that encompasses the drivers and barriers of SBMI.

7.3 Implications for business strategy

In this research, we recommend that firms and entrepreneurs set clear objectives for their business models. Thus, they should understand and explain the concept of their BM models to their employees. This can be done by developing their human resources through training, symposium, conferences, etc. The study's business implications strategy is that firms must know the challenges and barriers to adopting SBMI and find strategies to overcome them in their quest to implement their BM. Such studies can allow entrepreneurs and firms to plan before implementing any BM. Also, the researchers recommend that the business strategy emphasizes the degree and complex nature of SBMI and the need to enhance modern BM through experimentation. The best capabilities value of SBMI is realized when the new enterprise model is brought to scale: Thus, involving workers in the organization, all over the distribution chain, and in its ecosystems to increase impact and competitive edge. SBMI should not be implemented haphazardly; instead, it is a complex business activity that needs to be addressed with much focus. As a result, these initiatives will help increase the interest of entrepreneurs seeking to meet the urgent need for stable growth and the transition to more viable industrial operations to address escalating economic, environmental, and social issues. This review also allows policymakers to implement better policies to help businesses overcome such challenges. Companies will also understand SBMI and its challenges to help them plan to overcome such challenges. The current study's findings have important implications because they clarify entrepreneurs' challenges in successfully implementing their SBMI. Finally, firms need to invest in organizational learning, human resource development, knowledge management, dynamic capabilities, resource mobilization, and innovative business activities to overcome challenges in deploying their SBMI.

7.4 Limitations and future direction

The limitation of this present study lies first in the methodology used in identifying papers related to SBMI. This method might exclude relevant information from other document types or languages. Secondly, the researchers could not empirically test how these discussed barriers and drivers affect SBMI. Future research will focus on collecting data from enterprises to analyze and understand how these challenges affect their sustainable business model innovation in today's business. Moreover, future studies could address the incentives provided by public policies aimed at more sustainable businesses and achieving SDG 11 (Department of Economic and Social Affairs) [100]. Lastly, future studies will provide an in-depth evaluation of the association between research and the institutional distribution of

researchers in this field.

Author Contribution

Agyemang Kwasi Sampene: conceptualization, methodology, formal analysis, and investigation. Fredrick Oteng Agyeman: methodology, formal analysis and investigation; Fazeelat Aziz: visualization and formal analysis.

Conflicts of Interest

The authors declare no conflict of interests.

Data Availability Statement

The data sets used during the current study are available from the corresponding author upon reasonable request.

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ARTICLE

Pursuing the Distilled Good Practices to Improve the Quality of Environmental Impact Assessment Reports and Hence Enhance the EIA Effectiveness and Help Address the Concerns of Project Proponents: An Indian Context

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ABSTRACT

Despite a wealth of literature on the different facets of the EIA, and copious theoretical knowledge and practical experience, the general agreement is eluding definitions of EIA effectiveness, quality, and good practices. There are apprehensions about EIA meeting its basic objectives while project proponents continue to treat EIA as an impediment to development. Governments tend to adopt a "practical" approach, sacrificing pillars of EIA and overlooking the prime objective of environmental protection. Based on an extensive literature study and the author's long EIA-related experience, some key workable practices for the EIA process are elaborated. Meticulous scoping using different sets of lenses, spotlighting significant impacts to determine the breadth and depth of EIA reports for focussed EIAs, robust EIA review and decision-making, commitment from the regulators for environmental protection, and use of strategic planning, strategic environmental assessment, and tiering practices are expected to address scholars' apprehensions and project proponents' concerns.

Keywords: EIA reforms; EIA regulation; EIA review; Good quality EIA report; Good practice EIA

1. Introduction

Environmental Impact Assessment (EIA), internationally considered a science and art [1], has grown in popularity as well as a strength [2] as one of the world's most widely used environmental policy

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instruments [3]. This is evident from its adoption in 187 countries as of 2017 [4]. As the key instrument, the *ex-ante* evaluation of the environmental aspects helps ensure that economic growth is environmentally sustainable [5-7], and it can be viewed as both, an "institutionalized practice" and a "factor of institutionalization" [8]. As an instrument, EIA is a process to evaluate and analyze the potential impacts of human activities on the environment using the precautionary principle and find actions required to prevent environmental degradation and loss of natural resources [7,9] and facilitate decision-making for project approval. However, from the perspective of the affected community, EIA may be about living endlessly with impacts [10]. On the other hand, EIA professionals, expected to be knowledgeable about risks to physicochemical, ecological, and social environments are obligated to the project proponents. Despite ample theoretical and practical experience, apprehensions are expressed about the EIA meeting its objectives [11]. Moreover, in practice, EIA has grown into a complex, technocratic, and interdependent system and a time-consuming process that can frustrate project proponents, communities, and regulators alike [10,11]. A continuous evolution [12] including improvements, simplification, and refinements of the EIA process is witnessed through global experience sharing and efforts aimed at boosting the effectiveness, efficiency, and participatory nature of the EIA process and its potential role in realizing sustainable development [8,13]. The EIA regimes have undergone multiple changes and "reforms" over the last five decades or so, primarily aiming to improve environmental outcomes through changes in the EIA regulation, framework, and procedures and broadening the purposes of EIA [14] that are adequately documented. Additional changes have also resulted from simplifications and streamlining attempts [15,16], and sometimes evading the issues [17]. The EIA scholars are, however, apprehensive of such changes and so-called "refinements" or "reforms" that affect accomplishing goals and benefits of the EIA [3,15,18].

EIA is primarily meant to improve project design further and support informed decisions [19] and is neither intended to stop development or growth nor limit opportunities for communities. However, project proponents consider the EIA process to be an impediment to development because of the time and expenses involved in conducting the EIA study. There is no doubt that the EIA process involves costs for the government to administer the EIA process and for the project proponent to prepare the EIA report and manage compliances [14]. Further, potential delays and uncertainties [14,20] in obtaining the environmental approvals may result in time and cost overruns for the proposed projects and hence loss of business opportunities, given that time is the essence of the business. The concerns of the project proponents may be genuine and should be addressed but without overlooking or disregarding the concerns for environmental protection and ecological and sociocultural aspects of society. Good practice principles for EIA are evolved although these are subjective and their implementation is contextual to the wider institutional structure within which the EIA system operates as reviewed and discussed by several researchers [11,14,19].

2. Scope and methodology

It is observed that despite a wealth of literature available on EIA good/best practices, the quality of EIA reports/environmental impact statements, and the effectiveness of EIA remain a concern for the researchers. Moreover, project proponents continue to treat the EIA as a barrier to their investment plans for development projects because it is time-consuming as well as expensive. Given the above, the present work attempts to explore the ways and means to improve the quality of the EIA reports and EIA effectiveness and simultaneously reduce the time involved in the EIA process in India by adopting workable good practice EIA and rationalizing the EIA process. The approach adopted for this study is similar to that followed in the literature [10], i.e. based on an extensive literature search and experience of the author from his long association with academics, EIA review, and accreditation process for the EIA consultants, and his research and publications to ex-

amine the shortcomings and suggest a set of key effective EIA practices. The suggested practices would guide the implementation of an effective environmental assessment to support environmental protection and environmental management. The proposed practices, distilled from the good practices available in the literature, are not intended to be comprehensive but it is expected that these would help fulfill the objectives of the EIA, meet stakeholders' expectations, and could be operationalized readily in India and also in the countries having similar political and socioeconomic settings.

The terminology of "good practices" [11] is used in this work rather than "best practices", given the philosophy underlined in the quality management system that there is always a scope for further improvements. Good practices in EIA are expected to improve the effectiveness of the EIA, with a simple understanding that "effectiveness" [21] is achieving the predefined objectives of EIA, viz. the extent to which EIA addresses environmental objectives, and incorporates environmental concerns into the development and environmental approval/clearance of projects even though there is no general agreement in the vast literature on the definition of the term "effectiveness" of EIA [22-24]. The evaluation of EIA quality and EIA effectiveness is beyond the scope of this study. A simple understanding of EIA effectiveness, focusing on the objectives of the different stages of the EIA process [25,26] could aid the analysis of the determinants affecting EIA effectiveness [21]. However, the extent to which good practices lead to improving EIA effectiveness- procedural as well as EIA assessment methods, and quality of EIA reports requires further empirical studies and research under different contexts.

3. EIA challenges, practices, and reforms

The literature review on EIA reports' quality, EIA effectiveness, and EIA good practices is briefly recapitulated below, given that the detailed overviews for these facets are very well documented and readily available.

3.1 EIA reports' quality

There appear no standard requirements for an EIA report to be qualified as a good quality report although there is a good amount of literature related to different aspects of the quality of EIA reports [12,27-31]. The EIA consultants influence guiding quality performance, partly due to their vital knowledge of the subject and by their perceptions about their responsibility requiring a balance between maintaining good business relationships with those hiring them for the environmental impact assessment through "good enough" quality to get them environmental clearance (EC) and maintaining a good professional reputation of adopting "best" practice as recognized by them [32]. However, the bottom line for a good quality EIA report is that it fulfills the objectives of the EIA [33]. Further, good quality EIA reports are also expected to contribute to enhancing the overall effectiveness of EIAs, more so, when the institutional framework is not robust, public participation is not effective, and there is limited expertise on the part of the designated authority deciding on the grant of EC to the proposed projects. The factors that could be attributed to project proponents/EIA consultants, designated authorities, and others for the quality of EIA reports are highlighted [34]. The salient features of a good quality report [31,34], evaluation of the EIA quality mark certification scheme [35], and "Enhancement Quality Testing Framework" structured around performance indicators to evaluate enhancement measures detailed within EIA reports [36] are presented in the literature.

3.2 EIA effectiveness

EIA effectiveness encompasses how specific aspects of EIA get managed for a project, the efficiency of the EIA process as a whole, and the benefits of the EIA [19,37]. The legal requirement appears to be the main explanatory factor for EIA effectiveness in several countries [21], given that the main parameters explaining the *ex-ante* effectiveness are hastening the EIA process for decision-making and *ex-post* effectiveness is the mandatory requirement to con-

duct EIA. As a result, EIA is primarily viewed from the legal and procedural angles [38], rather than how the instrument is used through all the stages with a focus on outcomes [39] to optimize the environmental performance of the project [40]. It is reported that procedural effectiveness with a focus on the regulatory framework, quality of EIA reports, and EIA good practices [41,42] and the EIA process, in general, have received more attention [43] than the effectiveness of impact assessment methods and methodologies employed [24,44,45]. Given that compliance with the regulation tends to be generally high [45], legislative support is necessary for the use and implementation of methods and methodologies for impact assessment, besides guidelines to implement the EIA process and framework of the EIA report to further the EIA effectiveness. The EIA's effectiveness could be evaluated based on the objectives of the process, management of the environmental policy, and interests as well as expectations of stakeholders [46].

3.3 EIA good practices

The five main guiding principles for EIA [47] are further developed by several researchers into a range of additional principles and characteristics for effective EIA [11,48,49], best practice principles [33,50], and resilience assessment [51]. Overviews of the EIA best practices are well documented in EIA books and reports, IAIA best practice guidelines, and publications in several journals [11,14,30,52-58]. Good practices are developed continuously to improve the quality and effectiveness of the EIA in the backdrop of key challenges to the EIA process, viz. weak regulatory regime, limited capacity of EIA consultants, lack of or weak public participation, weak institutional mechanism for EIA follow-up [19], etc. especially in developing countries. Good practices are evolved for both [19], the a) institutional and managerial aspects like systems and processes employed to frame the EIA regulation and its implementation to conduct EIA, review, decision-making, and follow-up, and b) techniques and tools for EIA like scientific, predictive and analytical tools for establishing baseline conditions, impact prediction and evaluation, risk assessment, assigning the significance of environmental impacts and risks, selecting mitigation actions, monitoring, and evaluation of outcomes. 74 good practices for EIA are proposed [11], grouped under 22 themes. International best practice principles for EIA follow-up, a vital element of EIA, are reviewed, and the revised EIA follow-up best practice principles are proposed [59].

3.4 EIA challenges and EIA reforms

Several researchers [10,30,60,61] have analyzed the challenges of the EIA process. These could be broadly summarized as a weak regulatory regime, priority for economic benefits over environmental impacts, the limited scope of impact assessment, non-prescription of methods and methodologies for impact assessment and risk assessment, emphasis on faster EC rather than thorough EIA review, ineffective public consultations, and lack of proper EIA follow-up besides disregarding cumulative impact assessment, sustainability, and climate change-related issues.

The stakeholders and divergent interest groups involved in the EIA process have different agendas and some of them have a limited appreciation of the intricacies involved in the EIA. Project proponents consider the EIA process time-consuming, expensive, and an impediment to investing in developmental projects and expect a straightforward EIA process with the shortest possible duration [62]. Understandably, a project proponent would like to be exempted from going through the EC system or have the least requirements to conduct EIA and prepare the EIA report and receive the EC soon after submitting the EIA report. On the other hand, the public including NGOs would like to have sufficient time to understand the project and its consequences on them and to actively participate in the process. The public at large in developing countries expects employment, basic amenities, and improved physical, as well as social infrastructure in their region from the project proponent, given that public consultation is mandatory for certain projects and public endorsement is needed for these projects. The regulator is invariably hard-pressed for the specified timelines to complete

specific activities. EIA academics and scholars desire an ideal scenario in which good quality EIA reports are prepared to adhere to good practices using the required expertise and adequate time to appraise such reports. Given the above, democratic governments attempt to adopt a "simplified" or "practical" approach to the EIA process and respond to lobbying by the project proponents and political pressure [63]. As a result, there are instances when even after enacting robust EIA regulations, these are diluted in the garb of the so-called "reforms" or "simplification" [3,17,64], overlooking that the prime objective of "protection, maintenance, and enhancement of the environment" may get compromised [7] by government actions.

4. Discussion on pursuing the distilled good practices

4.1 Addressing the concerns of the project proponents

Understandably, a project proponent would not like to go through the rigor of EC or would rather have the least requirements for the EIA and get EC soon after submitting the EIA report, given that time is the essence of the business. A basic question arises as to whether under the pretext of "rationalization" or "simplification" of the EIA process to facilitate investments in development projects and employment creation, should the EIA process be simplified and quickened by reducing it to prescribing standard terms of reference, impact "predictions" and generic mitigation measures, *ad hoc* EIA review and grant of EC with generic terms and conditions with the objective to reduce the time and cost for the project proponent? This is a big challenge for the EIA process, more so, in democratic countries even though at least one arm of the government is expected to have its obligation of ensuring the suitability of projects [63] from the environmental viewpoint before approving them.

The issue of the EIA process being time-consuming, a major concern of the project proponents and development agencies of the government, could be addressed in India by adopting and adhering to EIA good practices across the EIA process stages. For this, at the initial stage itself, it is necessary to differentiate between greenfield and brownfield projects, understand the project and environmental settings of the proposed location and its surroundings, primary data requirements to prepare the EIA report, availability of the secondary data, whether the technology proposed to be employed is commercially proven and similar projects are in operation in the country, uncertainties involved, etc. Applying these parameters, briefly elaborated below, transparently and consistently to every project proposal would help determine how rigorously the EIA process should be made applicable.

Project: Greenfield or brownfield project, the resource requirement- per unit of product as well as, say on an annual basis, infrastructural requirement, characteristics and inventory of emissions and discharges, inventory and hazardousness of materials used or to be produced, confidence level about the effectiveness of control technologies proposed for pollution abatement, supply chain involved, etc.

Technology: Authentic information about impacts, mitigation measures, and environmental outcomes if the technology proposed is already being commercially employed within the country. Otherwise, given unknowns and uncertainties, the worst-case scenario needs to be considered.

Environmental settings: Proximity to and effect on the designated protected areas, biodiversity, unique species or habitats in the study area, agriculture, water resources, coastal and marine ecosystem, pristine areas, uniqueness of the landscape, religious, cultural, and heritage sites, tribal areas, and population.

Rigorous EIAs would necessitate a longer time to generate primary data, acquire secondary data, or both, conduct detailed environmental impact as well as risk assessment, and prepare an elaborate environmental management program (EMPg). The time involved in preparing and reviewing an EIA report and the associated costs correlate with how rigorously the EIA is to be carried out. It is likely that a large number of proposals may not require

rigorous EIA and such projects could go through the orange channel for environmental clearance, leaving a small number of projects for the red channel. For the brown-field projects, environmental monitoring data available readily from the operating projects could be used as primary data after due validation to save time as well as expenses involved in generating primary data. The funds required to conduct EIAs generally form a minuscule fraction of the project cost, setting at rest the concerns that the EIA process is expensive. Further, the expenses involved in the EIA follow-up need to be internalized by the project proponents.

4.2 Why EIA good practices?

Adopting EIA good practices earnestly can help conduct thorough EIAs consistently, assure good quality EIA reports, address various challenges to the EIA process, and improve EIA effectiveness. A key question, however, arises as to whether a "good quality EIA report" is required at all and by whom. Like any product, good quality EIAs could be driven either by stakeholders' demand for good quality or by the initiatives of EIA consultants to create a niche market for good quality EIA reports and get appreciation and rewards from regulators and project proponents. In either case, stakeholders, as well as EIA consultants, must develop a full understanding of good practices through every stage of the EIA process, viz. a) (pre-EIA) action including screening—whether EIA is required, scoping—coverage of the EIA report in case the screening necessitates EIA, and consideration of alternatives; b) preparation of EIA report; c) review of the EIA report and decision-making on environmental approval; and d) EIA follow-up for compliance monitoring and performance audit in each lifecycle phase of the project. A good quality EIA report may appear to be relatively expensive but it would be beneficial to project proponents in the long term given that it comprehensively brings out the potential issues upfront and adds value to the project design. Being a focused report also saves time in the EIA report preparation and EIA review.

4.3 Distilled good practices in the operating principles of the EIA process

Pre-EIA action

A good practice screening considers the potential impacts of the project proposed at a particular location in the case of greenfield projects and the incremental impacts of brownfield projects. In the Indian context, the EIA regulation [65] specifies a positive list of the projects that require mandatory EIA irrespective of the location. It is necessary to develop clarity about what is expected from the project proponent and what is to be incorporated in the EIA report to determine the breadth and depth of the EIA report. Among others, supported by a suitable regulatory framework, good practice scoping takes into consideration limitations of data availability as well as its accuracy from the pre-feasibility or techno-economic feasibility report stage of the project life-cycle to conduct, e.g. detailed material balance and energy balance for emissions and discharges, and water balance calculations besides the propriety and confidentiality of the data and prescribes a) project and site-specific TOR for the preparation of the EIA report rather than no TOR; b) tailor-made TOR rather than detailed generic standard TOR [63]; c) distinct TOR for green-field, brown-field, and expansion project [66]; d) effective methods and methodologies with thorough structures and implementation [67] to be employed for accurate impact assessment that would facilitate suggesting appropriate mitigation actions using the hierarchy of avoidance, minimization, and control of impacts within the acceptable levels and compensation and effective EMPg; e) type of alternatives [68] to be considered, viz. with respect to the project, project size, site-location, design for the selected project, construction and operation for a given design, timing for project construction and operation, and no project or no action alternative; and f) TOR to carry out cumulative impact assessment and any other special studies. The review of the TOR after detailed site-specific investigations are carried out [30] may also be necessary in some cases. Under the need "to do something about climate change",

gate-to-gate lifecycle assessment of greenhouse gas emissions is being asked for in the EIA report, a positive move initiated recently in India. However, this requirement needs to be applied to projects that have a high potential for greenhouse gas emissions as documented by the IPCC rather than across the board. Such a good practice scoping will help guide well-focused EIAs and hence save resources for the project proponents in preparing the EIA reports.

Material balance is essential to ascertain the pollution load/release inventory of emissions and discharges from the production and allied processes. However, by sharing this information, the project proponent may not only violate the contractual obligations with the technology licensor but also invite the risk of jeopardizing its commercial interests. The insistence on such information in the EIA report forces the project proponents to follow the path of least resistance, i.e. give cooked-up information with a clear understanding that the regulator does not have time or expertise to verify it. Given the confidentiality of such information for the project proponents of, e.g. specialty chemicals and performance chemicals projects, good practices may focus on environmental outcomes, adequacy of the mitigation actions, and mechanisms for monitoring and auditing based on due diligence of the project details and the available information on the efficiency of the resource utilization, and waste generation and impact assessment based on worst-case scenarios. Once the project is operational, the information on emissions and discharges would get revealed from the monitoring and audit besides the effectiveness of the mitigation actions. Likewise, security, national defense, and strategic projects need to be viewed through different lenses and approved with proper environmental safeguards.

EIA report preparation

Workable distilled good practices in the preparation of the EIA report are summarized in **Box 1**. Good quality EIA reports should be prepared by following the spirit of the TOR [34]. Citing references rather than describing theory in the EIA report can reduce its bulk. Good practice EIA entails that the EIA report is written in such a manner that different chapters are linked with each other and properly documented [31] to facilitate EIA review, derive terms and conditions for EC [69], and aid EIA follow-up [59,70,71].

Given that several stakeholders are not likely to read the main EIA report, and the public at large may not understand the technical jargon, good practice executive summary of the EIA report is written in simple non-technical language highlighting the key issues, and the findings from the detailed EIA study in a crisp manner and is complete [72]. It also becomes handy for the decision-makers who are generally under the pressure of time due to timelines prescribed for the different stages of the EIA process and the large number of project proposals received in developing countries.

EIA report appraisal/review and decision-making

a. Public consultation

Given that public consultation with the general public and public hearings for the stakeholders is an important pillar of the EIA process [63], the project proponent needs to appreciate that the stakeholders should get full opportunity to know about the project including its resource requirements, and its impacts for them- adverse as well as beneficial and that a genuine positive relationship with the local population helps build mutual trust that is always beneficial to the project in the long-term. Good practice public hearing recognizes its important role, more so, in developing countries, given that the local resources of the economically weaker sections of the society get shared by the proposed projects, resulting in adverse impacts with which the local population may have to live both, individually and collectively as they perpetually get paper promises [10] from the project proponent for the benefits that hardly accrue to them. Good practices advocate that the public hearings are held earnestly, not stage-managed, and are bona fide in which the authorities facilitating the public hearings display soft corners for the local population, without getting influenced by project proponents. A good practice of mandatory videography of the

Box 1. Distilled good practices for EIA report preparation.

1. Consider all the activities involved in the proposed project in its lifecycle. For example, an industry project needs to encompass battery limits plant, offsites, utilities, warehouse, transport and unloading of feedstocks, storage tanks, loading and transport of products, by-products, and side-products, infrastructural facilities required, etc.
2. Consider the activities in all the phases of the project in its entire lifecycle, viz. preconstruction, construction, operation, maintenance, suspended operation, project closure, and decommissioning
3. Exercise sense of proportion while describing anything in any chapter, i.e. the description should be relevant and have correspondence with the EIA study.
4. Bring out the project details that would help identify potential impacts from different activities involved and the corresponding technical details
5. Bring out the environmental sensitivity of the project site and its surroundings (core and buffer zones) and describe the environmental components/attributes that have a potential threat of getting affected by any of the project activities- normal or abnormal
6. Describe distinct components of the environmental impact assessment, viz. impact identification, prediction, and evaluation/ assessment based on the methodologies specified in the TOR or well-known/widely practiced methodologies. These pertain to both, spatial and temporal impacts for the different typologies, viz. temporary, permanent, occasional, ongoing, short-term, long-term, reversible, irreversible, and spatial spread
7. Use appropriate software/model for predictions, with a full understanding of its applicability and limitations for quantitative prediction of the impacts
8. Describe the impacts on different receptors in the predicted impact zone, with a serious and objective discussion on, e.g. impact on the different attributes of the physical environment; LU/LC, soil, and landscape changes and impacts thereof; impacts on species- terrestrial, aquatic, marine and avian, habitats, grasslands, etc; social and cultural impacts; risk assessment; and cumulative impacts
9. Establish the significance of the impacts described above, using prescribed or specific and contextual criteria
10. Suggest mitigation actions corresponding to each of the established significant impacts, not generic under normal, abnormal, and suspended/abandoned operational scenarios, using the mitigation hierarchy of prevention, minimization, and control of impacts and compensation
11. Integrate risk mitigation actions into the EMPg
12. Propose remedial measures for the properly assessed residual impacts
13. Propose a specific, not generic EMPg with details of the proposed actions and corresponding estimated budget, facilitating its implementation by the project proponent and designing EMS to internalize the environmental concerns
14. Suggest an administrative framework to operationalize the EMPg, aligned with the overall organizational setup
15. Assimilate mechanisms for monitoring, audit, and management review into the EMPg
16. Imbibe mechanism to update the EMPg, considering the terms and conditions of the environmental approval, periodic audit and review, and changing regulatory requirements

Source: Compiled [11,31].

proceedings of public hearings by the designated authority is in place in India.

b. EIA review

When all the projects go through the same set of lenses due to a lack of a test for the significance of the environmental impacts, the time taken to review EIAs is long even for the projects having no serious impacts. Good practice EIA report appraisal entails that the EIA reviewers are clear about the objectives of the EIA review, viz. to determine whether the EIA report is complete [19,27,73], and contains correct and comprehensive environmental information related to the project that would facilitate well-informed decision-making. The desired information includes a) how physical, ecological, social, and other impacts are identified, predicted, assessed, and addressed; b) how actionable, adequate, and effective are the suggested action measures; and c) the suitability of the mechanism proposed for periodic monitoring, audit, management review and updating the EMPg. The low scores for the quality of the EIA report due to several shortcomings are reported [30]. Experts also echoed these views [38]: "The overall quality of the EIA reports is below par. One can observe the poor quality in almost all the material chapters of the report." "At times, EIA reports are approved without proper scrutiny due to shortage of time, lack of understanding, or any other factors, and quality of the EIA reports is the first victim." Good practice EIA report appraisal recognizes a strong correlation between a robust EIA appraisal system and the quality of EIA reports. Thus, the appropriateness and quality of EIA reports are considered to be important in EIA reviews, not the volume of information to help visu-

alize a much bigger picture, far beyond the procedural issues. Given that the project proponent and EIA consultant have a vested interest in preparing the EIA report, good practice EIA review essentially serves as a quality control exercise for the EIA reports and hence the EIA effectiveness [28]. It encompasses: a) a robust and comprehensive EIA appraisal/review mechanism imbibed into a well-formulated EIA regulation; b) appraisal procedure with appraisal criteria specified in the regulation; c) meticulous, transparent, and effective implementation of the regulation; d) a more structured, independent, transparent [11,49], participative, interdisciplinary, objective, uniform, detailed, grounded, and consistent appraisal system with no room for *ad hoc* and weak appraisal based on the presentation given by the project proponent on the EIA report over half-an-hour or so [38]; e) in-depth and thorough appraisal of the EIA report done by each member, followed by the overall judgment of the appraisal committee; f) accountability of project proponents for the quality of impact assessment, mitigation actions, and EMPg; and g) transparency in the process to constitute appraisal committees, not just the eligibility criteria for members notified in the regulation. Thus, a good practice EIA appraisal mechanism helps motivate or impel the project proponents/EIA consultants to prepare good quality EIA reports, a major indicator of the overall effectiveness of the EIA process. A two-tier structured, transparent, and criteria-based EIA review mechanism [31] reflects good practice EIA review.

c. Decision-making and communication

The decision for the EC of the project is communicated by the designated authority to the project proponent invariably with a set of terms and conditions. Good practice decision-making recognizes that the objective of the terms and conditions [74] is primarily to establish basic rules for the project proponent, rectify minor deficiencies in the EIA report, monitor impacts- physical, ecological as well as social to ascertain that these are within the permissible/acceptable levels, and verify that the project proponent fulfills commitments made in the EMPg. Good practices require that a) a long list of irrelevant, ineffective, inadequate, and unenforceable EC conditions give an impression of greenwash and are not suited for good practice EIA; b) EC conditions are directed at measuring the environmental performance of the project to catalyze achieving sustainability targets, a prime objective of the EIA; c) EC conditions are key to the effective implementation of the EIA follow-up that has a much broader scope; d) appropriateness of the EC conditions reflect competence, commitment, and autonomy of the appraisal and decision-making system; e) effectiveness of the EIA follow-up including compliance with the EC conditions by project proponents reflect on the institutional framework; and f) EC conditions imply conducting a thorough EIA appraisal. A good practice comprehensive and well-formulated EIA regulation specifies a mechanism that helps prioritize the well-specified EC conditions, resource allocation for EIA follow-up, and stakeholder engagement. To ensure that the rules are followed for effective actions, good practices help exhibit commitment from i) the regulator in terms of, e.g. prescribing consistent, comprehensive, unambiguous, relevant, implementable, enforceable, measurable, monitorable, and auditable conditions to facilitate a robust EIA follow-up adhering to good practice principles including rigorous examination of the periodic compliance reports received from project proponents, not just adopting the tick-box approach, and ii) the project proponent in terms of self-regulation, e.g. compliance with the regulatory requirements and the prescribed terms and conditions, internalizing the prescribed actions in the form of the environmental management system, and responding to public pressure [74].

EIA follow-up

Good practice EIA follow-up recognizes the importance of the EIA follow-up, given that ultimately the actual impacts are relevant to protect the environment, not the predicted impacts, and that the follow-up alone can provide concrete evidence of the environmental outcomes [59] through monitoring and auditing. EIA follow-up consists of five elements: monitoring, evaluation, management, participation, and governance [75], and a mechanism to improve

environmental outcomes by learning from the earlier management actions [14,76]. It needs to ascertain and incorporate: a) regulations and institutional arrangements; b) approaches and techniques in the follow-up practice; c) resources and capacity to undertake follow-up; d) types of activities to be followed up; and e) role for major stakeholders, viz. project proponent, regulator, and public. The design and implementation of the revised EIA follow-up best practice principles [59] help to strengthen the overall EIA system further. Implementing the good practices discussed above, aligned to the global practices being evolved, with a commitment to environmental protection from the regulator, as well as the project proponent, can assure good EIA quality, and also address challenges for EIA [10,60] including those related to climate change [7].

4.4 Strategic environmental assessment

In addition to good practice project-level EIAs discussed above, the use of formal strategic environmental assessment (SEA) and strategic planning with greater public participation, among others, also help streamline and strengthen the project-level EIAs and environmental clearance processes [14] by shaping alternatives, anticipating project-level issues and mitigation and hence improve scoping for the EIAs for focused EIAs [77] and subsequent actions. A strategic or regional impact assessment framework also strengthens cumulative impact assessment [19,78,79]. The SEA for industrial clusters facilitates decision-making about the type, number, and siting of industries that are water-intensive, high wastewater generating, air emissions-intensive, or involve hazards and have high-risk potential, especially those planned in the proximity of the population and ecologically sensitive areas. Tiering, i.e. the organized transfer of information between SEA and EIA processes helps in delegating certain features to the appropriate assessment levels, improves the unification of environmental considerations across tiers, and hence avoids duplication of assessments [64,77,80]. This assists in improving the consistency of information to aid decision-making, complement sustainability across planning hierarchies [81,82] through strategic considerations such as climate change, and advance sustainable development goals using sustainability criteria during planning [39,83]. The overall scheme is expected to save resources including time [84,85] for project-level EIAs and help overcome its limitations.

5. Conclusions

Once good EIA practices are in place, there are better chances of getting good-quality EIA reports from the project proponents. This hypothesis is validated by the quality of the EIA reports prepared by the Indian EIA consultants for multilateral-funded projects [69]. Although the implementation of EIA principles is contextual to the system within which it operates, its practice should be consistent across the country. The screening process should be well defined in the EIA regulation through positive/negative lists and the projects classified into different categories. In the Indian context, the projects categorized as "A" and "B" need to be revisited to harmonize the environmental settings of proposed projects with size thresholds and potential environmental risks. "A" category projects should be given terms of reference on a case-by-case basis considering the environmental settings of the proposed location, the potential significant impacts, and environmental risks, and "B" category projects could be permitted to prepare the EIA reports based on standard TOR, given that such EIA reports need not be as extensive as those for "A" category projects. Further, good practice scoping should distinguish the projects based on their potentially significant biophysical, socioeconomic, cultural, cumulative, and sustainability impacts [31,86-88]. The scoping and expanse of the EIA reports of greenfield and brownfield projects and the projects proposed in industrial parks/estates having well-developed industrial and environmental infrastructure are also different. The case-by-case scoping, focussing on the critical concerns and the key issues that have the potential to cause environmental degradation [89] helps prepare a well-targeted and comprehensive EIA report and hence saves time and resources associated with the EIA process, the very objective with which

standard TOR was possibly introduced [90].

"Simplification" to compress the time for the EIA process should not be at the cost of affecting/sacrificing the pillars of the EIA [63], viz. scoping for the projects having significant potential impacts, determining the significance of environmental impacts, and public participation (open or limited). Any "reforms" in the EIA process should be done cautiously, addressing the concerns of researchers [2,15-17,91] and ensuring that the sanctity of the EIA is not negotiated and no room is given for apprehensions about retrograde steps [64]. The "reforms" in the EIA process need to be aimed at moving from the current practice of emphasis on procedural design to outcome-based [39], risk-based environmental assessment [92], and sustainability assessment [51]. There is no doubt that good practice scoping will require expertise and time but many projects having minor and manageable impacts will be spared from undergoing extensive EIA.

The authentic and updated information on the availability and inventory of resources, environmental monitoring, and meteorological data in the public domain could help minimize the time generally spent in generating the field data and hence minimize the overall time for the EIA and its cost too. Good practice EIA, focusing on the key issues, improves EIA effectiveness and simultaneously addresses the major concern of many project proponents that the EIA process is time-consuming. The saving of resources involved in completing the EIA process [11,19] thus addresses the concerns of a sizeable number of project proponents as well as the government while ensuring environmental protection. The wide range of good practices indicates the complexity of EIA and implies that the overall success of environmental assessment is dependent on addressing several factors. Flaws in any one dimension may impair the rest of the EIA process [11]. Good quality EIA reports focussing on significant environmental impacts, rigorous EIA review, and appropriate terms and conditions for environmental clearance and EIA follow-ups would be the key outputs of the good practice EIA. The rationalized and refined EIA procedures ensure objective and high-quality EIA studies [93] based on high-quality data, analyses to predict the impact [94], application of appropriate methodologies for assessment, and advancing beyond the current EIA practices [7]. Further empirical studies and research under different contexts are required to better understand the extent to which good practices could improve EIA effectiveness.

6. Way forward

The policy-makers need to recognize that rational reforms in the EIA process along with good EIA practices result in a win-win situation for all the stakeholders involved in the EIA process including the mute environment. Good practices should, thus, be followed for effective EIA, right from framing the EIA regulatory regime through EIA follow-up, given that weak scoping will not lead to accurate impact assessment, and inaccurate impact assessment will render the environmental management program inadequate in controlling and containing impacts and hence the environmental protection would be ineffective in the long term [67] in bolstering sustainable development. In the absence of a robust EIA review, there is no quality control check on the EIA reports, and decision-making cannot be well-informed [74]. Improper environmental clearance terms and conditions weaken the EIA follow-up; hence the EIA outcome is inappropriate, making the EIA process a mere formality. Thus, a holistic understanding and consistent approach for good practices in the EIA process should be developed for the overall accomplishment, given that shortcomings in one facet or a weak link may undermine the entire process [11] and its effectiveness. The assessment of alternatives from environmental and social perspectives in addition to technical and economic viewpoints in a thorough, transparent, and unbiased manner right from the "upstream" stages of the development planning through the stages of project identification, site selection, project design, and implementation should be imbibed into the regulation so that EIA could contribute further to improved decision-making [68] for sustainable development. Further, the core of the EIA needs to be strengthened with good practice robust EIA

regulation, and its strong implementation for meticulous scoping, EIA review, and EIA follow-up with an in-built system of periodic review and incorporation of feedback from the implementation experience [30,61,95,96] so that the regulation does not operate linearly as at present [97].

Appreciating the limitations of the project-level EIA systems, at least large and integrated projects should be subjected to SEA-sectoral or regional environmental assessment duly backed up with suitable regulatory provisions. Thus, effective SEA [14,19,85,98] as integral to the planning process for economic development, and other forms like sectoral assessment and regional environmental assessment, with a wider public consultation, should be adopted to boost the overall efficiency and effectiveness of the EIA process. The practice of tiering also needs to be adopted to further streamline and strengthen the EIA process, improve the consistency of information to aid decision-making [77], and save time in the preparation of project-level EIAs.

Given that imbibing good practices into the EIA regulation and adopting good practices by the regulator in any country through the entire EIA process are the prerequisites for the fructification of good EIA practices, the designated authority making regulations and granting environmental approval, and EIA reports appraisal committees recommending the environmental clearance should roll out the ball to adopt and promote good practice EIAs. Simultaneously, to start, the project proponents of large projects and the leading EIA consultants may be motivated to take lead to prepare EIA reports following good practices through incentives like priority scoping and EIA report review, fast track decision-making, and support to self-regulate the EIA follow-up. Given that the taste of the pudding is in its eating, the test of EIA effectiveness is in the project's environmental performance for which its design, proclamation, and implementation of EIA good practices are prime requisites.

Conflict of Interest

There is no conflict of interest.

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ARTICLE

Automated Clearing System on Deposit Money Banks' Performance: Experience from the Nigerian Banks

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ABSTRACT

This study majorly examined the effect of automated cheque clearing system on banks. Specifically, this study examined the effect of automated cheque clearing system on total deposits of deposit money banks in Nigeria. Data were extracted from the CBN Statistical Bulletin (2020). Using the ordinary least square method of analysis via E-views 10, the findings of the study revealed that deposit money banks' total deposits increased significantly owing to the decline in the value of cheques cleared, since the adoption of the automated cheque clearing system in Nigeria. Guided by the findings of this study, the researcher recommended that the regulatory authorities and banks should continue to liaise with each other on how to improve the efficiency of automated services so as to improve customer satisfaction and patronage.

Keywords: Automated cheque clearing system; Total deposit; Nigerian banks

1. Introduction

The banking sector, which plays an important role in a country's economic development, is no exception to the innovation orchestrated by this phenomenon in the twenty-first century. Prior to 1989, when technological innovations like Automated Teller Machines were introduced, banking practices in Nigeria were so primitive that customers could spend an entire day in the banking hall just to make a deposit or withdrawal, and in some cases had to return to the same bank the next day due to a long queue. Customers were unable to conduct transactions in another branch of the bank because banking operations were so based on "armchair brick and mortal" approaches at the time. Banking services in Nigeria

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were subpar during the conventional banking era because they were performed manually due to a lack of technological innovation [1].

However, the advent of technology and its application since 1989 has undeniably refurbished the system, albeit with some hiccups. New technologies have transformed organizations by providing innovative ways of adding value to both existing and new markets, thereby creating opportunities that can extend firms' scope beyond organizational boundaries [2].

Following the introduction of the Nigerian Automated Clearing System (NACS) in 2002, which automated the process of cheque clearing, was one significant application of technological innovation in the banking sector. The Bankers Committee initiated the Nigeria Automated Clearing System (NACS) in October 2002 as a mechanism for sorting cheques using the Magnetic Ink Character Recognition (MICR) format [3]. Even after the introduction of the automated cheque clearing system, another cheque clearing system, In 2012, the Cheque Truncation System (CTS) was implemented, which is the process by which physical cheques presented for payment in a bank are converted into an electronic form through scanning and the image is electronically transmitted to the clearing house for processing [3].

It is evident in the literature that technological innovation has created enormous opportunities for banks not only in advanced countries but also in developing nations like Nigeria. However, the challenges this development has caused in the banking sector cannot be swept under the carpet because they are useful for policy and decision-making. The major problem observed in this study is that recently, a lot of policy changes have been made to the system of handling and clearing cheques and with the recent surges in other electronic means of payment such as ATMs and electronic funds transfers, the volume of cheque transactions seem to be on the decline. There is therefore need to justify the effort and financial outlays that have been committed towards the smooth running of the Nigeria Automated Clearing System on total deposits of deposit money banks in Nigeria.

2. Conceptual review

2.1 Cheque clearing

Cheque clearing, is the process of returning a cheque to the bank where the drawer has an account for verification and collection of the value. In general, every cheque goes through the clearing process, which involves confirming the validity of the instrument before the paying banker assigns value to the cheques [3].

One key concept associated with cheque clearing is the cheque truncation system. Cheque truncation is a simplified banking model in which actual cheques are not sent to the paying bank, but instead are held in the receiving bank, which notifies the paying bank with digitized details of cheques received. Truncating a cheque is a process that involves stopping the physical movement of the cheque and replacing it with a scanned image of the cheque and the data contained in the Magnetic Ink Character Recognition Line [4].

2.2 Theoretical framework

Bank-focused theory

This theory was popularized by Kapoor in 2010 and anchors on the premise that banks use non-traditional but conventional low-cost delivery channels to offer services to its customers. Such channels include automated teller machines (ATMs), mobile phone banking, Point of Sale (POS) among others. In using these platforms, the bank offers a large variety of services to its customers notwithstanding area and branch attachments. Enter the needed information into the system and the transaction is done.

This theory favours this study since the emphasis here is on electronic platforms as means of delivering services. The theory preferred banks in using non-traditional channels in offering banking services to their customers.

Empirical review

Used annual accounts in investigating the impact of the e-banking payment system on the performance of commercial banks in Nigeria [5]. E-cheque, ATM,

and POS were proxies for E-banking payments, whereas commercial bank performance was proxied by Return on Equity (ROE). The ex-post-facto research design is used, and the study spans the years 2009-2018. Diagnostic tests were performed, and an Auto Regressive Distributed Lag (ARDL) analysis was estimated using the Ordinary Least Square (OLS) method. The analysis tool is an e-view 10 statistical package. The analysis results show that current ATM, E-cheque, and POS values are statistically significant at less than 0.05. E-beta cheque's coefficient value was discovered to be positive. This means that E-cheque had a positive impact on bank performance. Examined the effectiveness of Automated Clearing System on the Nigerian Payment System [6]. The study covers cheque clearing processes (through the application of NBCS Cheque Truncation Model) which has facilitated efficient transfer of funds and enhanced the cashless policy of the Central Bank of Nigeria. Data were elicited using a stratified random sampling technique from current account holders and staff of three major banks in Nigeria. Interviews were also conducted with various funds transfer staff of the selected banks. Chi-square analysis was used to probe the association between the bank staff and account holders' responses. The study revealed that there is a significant agreement from the reports of the clearing staff and the customers of the banks. The study further lends support that there is a significant reduction in the length of time to complete a clearing cycle from T+3 to T+1 while the time of cheque return was reduced from T+1 to T. The study examined the data set for electronic payment performance in the Nigerian banking system [7]. The data used in the study included automated cheque clearing, electronic funds transfer, ATMs, POS and web pay. The data were analyzed using descriptive statistics such as means, frequencies and percentages. The findings of the study revealed that among the channels of e-payment systems, automated cheques have the lowest growth rate. The study investigated the significant effect of cheque truncation system (CTS) in the delivery of efficient financial services in Nigeria [3]. The study used desk research methodology, reviewing extensive available relevant literature to provide direction to the topic under consideration. The study's findings revealed that the cheque truncation system reduced the time required for clearing cheques, improving the efficiency of Nigerian banks. Examined the nature of Electronic Cheque Clearing System (ECCS) in Ghana and explored banks' acceptance factors among Ghanaian Banks [8]. The purpose of this research was to understand the process of clearing cheques electronically in Ghana and to analyze and extend knowledge regarding influential factors that affect banks' accept ECCS. The research examines 25 commercial banks and 5 savings and loans companies which have different ways of adopting the technology. Data was collected through interviews, observations and direct participation while a survey instrument was used to gather data and Structural Equation Modelling (SEM) using Partial Least Squares (PLS) was used as the statistical model to analyze the data gathered. The findings revealed that whilst some banks centralize the process to reduce cost, other banks decentralize the process to enhance service delivery to customers. The study looked into the impact of an automated clearing system on the Nigerian banking system [9]. Secondary data were mostly obtained from publications published by the Central Bank of Nigeria and analyzed using t-test statistics to determine whether there was a significant difference between the pre and post automated clearing system. According to the findings, the automated clearing system has a significant positive impact on the overall payment system.

3. Methodology

3.1 Research design

An *Ex-Post Facto* research design is utilized as design owing to the time series nature of the data used in this study. The ex-post facto research design adopts statistical analysis of already established and factual data. As the name implies "after the fact", the *Ex-Post Facto* research design draws a conclusion about a subject by analyzing facts that have already happened. This study is preferred for its lack of bias

or data manipulation as well as its suitability to the data used in this study.

3.2 Sources of data

The time series data on total assets and total deposits which were used in this study were sourced from the CBN Statistical Bulletin (2020). Other information and literary works were sourced from articles, blogs and webpages retrieved from the Internet.

3.3 Model of the study

This study adopted a similar model which modelled return on investments (ROE) as a function of Electronic Funds Transfer (EFT), Namibia Interbank Settlement System (NISS) and Cheque issued (Cheque) as shown in Equation (1) [10].

$$ROE = f(EFT, NISS, Cheque) \quad (1)$$

However, this study expresses Total Deposits (TDEP) as functions of Value of Cheque Cleared (VCC) as shown in Equations (2) and (3).

$$TDEP = f(VCC) \quad (2)$$

The functional models are modified to include parameters for data analysis. The modified models are shown in Equation (3).

$$TDEP = \alpha_0 + \alpha_1 VCC \quad (3)$$

where, a_0 is the constant term which accounts for the values of the bank performance variables which are not explained by automated cheque clearing system. α_1 is the coefficient of the regression.

3.4 Description of the variables

The variables used in this study include the dependent and independent variables. The independent variable is the variable that is expected to affect the dependent variable in a way. An Automated cheque clearing system is the independent variable. On the other hand, the dependent variable is the variable of interest whose behaviour or trends the researcher seeks to predict as a function of the dependent variable. The dependent variables are deposit money banks' performance which is measured by the following:

Total Deposits: Total deposits refer to the aggregation of deposits accumulated by the deposit money banks in Nigeria including demand, savings and timed deposits. It measures customer patronage of deposit money banks in Nigeria. This variable is expressed in billions of Naira.

3.5 Method of data presentation and analysis

The data used in this study are presented in tabular form. The data were examined using the Ordinary Least Square regression method. The OLS method has been used in a wide range of economic relationships with a satisfactory result. The OLS method provides the relevant statistics used to explain the relationship among variables. More so, the liability of this method lies in the desirability properties which are efficiency, consistency and unbiased. This implies that its error term has a minimum and equal variance.

4. Data analysis and result

4.1 Data analysis

The data used in this study are presented in **Table 1**. **Table 1** contains the post-NACS period bank performance indicators and the value of cheque cleared.

Table 1. Descriptive statistics.

	TDEP	VCC
Mean	11939.67	11787.55
Median	11452.76	7674.857
Maximum	31456.96	29436.02
Minimum	1157.112	4129.220
Std. Dev.	8586.415	7801.544
Skewness	0.452814	0.877166
Kurtosis	2.489772	2.477403
Jarque-Bera	0.855390	2.652709
Probability	0.652010	0.265443
Sum	226853.7	223963.4
Sum Sq. Dev.	1.33×10^9	1.10×10^9
Observations	19	19

Source: SPSS 22.0 descriptive statistics output, 2022.

As shown in **Table 1**, indicates that an average of 11,787.55 trillion naira in electronic cheque transac-

tions has been recorded annually over the reviewed period. This includes its highest figure of 29.436 trillion naira and its lowest figure of 4.129 trillion naira. Similarly, the descriptive statistics show that liquidity ratio, loan-to-deposit ratio, total assets and total deposits have averaged annual figures of 49.8%, 66.22%, 20.617 trillion naira and 11.94 trillion naira respectively. The Jarque-Bera statistic reveals that all the variables are normally distributed as their p-values are all above 0.05. The skewness shows a positive designating a greater number of smaller values and this is considered exceptional. In Kurtosis on the other hand, the distribution is too emaciated showing that the distribution is more peaked than normal.

In **Table 2**, the correlation analysis supports ascertaining the degree of relationship between two or more variables. Pearson correlation coefficient was employed to evaluate the strength of trend of the relationship between the variables. The Pearson correlation analysis reveals that TDEP (–0.470), correlates negatively with VCC, showing that the degree of relationship between VCC and TDEP is 47%, and this is considered fair.

Table 2. Correlation matrix.

	VCC	TDEP
VCC	1	–0.469935
TDEP	–0.469935	1

4.2 Test of hypothesis

The hypothesis of the study is tested using the probability values (p-value) of the t-statistic. The decision rule states that if the p-value is less than the chosen level of significance, 5% (0.05), then the null hypothesis is rejected in favor of the alternate hypothesis. Otherwise, the null hypothesis is accepted while the alternate hypothesis is rejected.

Hypothesis One

H_0: Automated clearing system has not had a significant effect on the total deposits of deposit money banks in Nigeria.

H_1: Automated clearing system has had a significant effect on the total deposits of deposit money banks in Nigeria.

The results shown in **Table 3** show that the value of cheques cleared has a negative effect on the total deposit of deposit money banks in Nigeria. The regression coefficient of –0.517213 reveals that every billion naira increase in the value of cheques cleared would lead to a decline of 517.21 million naira in the total deposit of deposit money banks in Nigeria. The R-squared value of 0.220839 revealed that about 22% of the trends in the total deposit of deposit money banks are explained by the value of electronic cheques cleared.

Table 3. OLS result for VCC and TDEP.

Dependent Variable: TDEP
Method: Least Squares
Date: 02/10/22 Time: 03:12
Sample: 2002 2020
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VCC	–0.517213	0.235624	–2.195072	0.0423
C	18036.34	3303.847	5.459194	0.0000
R-squared	0.220839	Mean dependent var		11939.67
Adjusted R-squared	0.175006	S.D. dependent var		8586.415
S.E. of regression	7798.970	Akaike info criterion		20.86067
Sum squared resid	1.03×10^9	Schwarz criterion		20.96009
Log likelihood	–196.1764	Hannan-Quinn criter.		20.87750
F-statistic	4.818343	Durbin-Watson stat		0.216137
Prob(F-statistic)	0.042333			

Source: E-views 10 OLS regression output, 2022.

Table 2 shows that with a p-value of 0.0423 which is less than 0.05, indicating a rejection of the null hypothesis in favor of the alternate hypothesis. Therefore, automated clearing system has had a significant effect on the total deposits of deposit money banks in Nigeria.

5. Conclusions and recommendation

Automated cheque clearing implies that banks no longer need to physically receive the cheque slip in order to clear such transactions. Automated cheque clearing system has therefore reduced the time taken to confirm checking transactions. How this affected banks was what was examined majorly in this study. Using the ordinary least square method of analysis, the study found that deposit money banks' total deposits increased significantly owing to the decline in the value of cheques cleared, since the adoption of the automated cheque clearing system in Nigeria.

The probability value of the t-statistic however revealed that the effect was insignificant. This finding is in line with the prior expectation of the study. Also noted is that some manifestations of financial innovation such as electronic cheques have made some banking tasks more efficient and cheaper [10]. By so doing, banks are able to secure more customer patronage. Therefore, the decline in the value of automated cheques cleared since the automation of the cheque clearing process has caused an increase in the value of deposits amassed by deposit money banks.

Guided by the findings of this study, the researcher makes the following recommendations. The regulatory authorities and banks should continue to liaise with each other on how to improve the efficiency of automated services so as to improve customer satisfaction and patronage.

Conflict of Interest

There is no conflict of interest.

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ARTICLE

Stamp Duty Tax and Growth of Economy: Evidence from Nigeria

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ABSTRACT

This study looked at the impact of the Nigerian stamp duty tax on the growth of the economy. Time series data were employed spanning the years 1999-2020. For various years, related data were extracted from the Central Bank of Nigeria Statistical Bulletin, the Bureau of National Statistics, and Federal Inland Revenue Service reports. E-view 9.0 was used to test the hypothesis using the ordinary least square. The study outcome revealed that stamp duty has an insignificant and positive impact on Nigeria's economic growth. It was recommended that the government improve public entities and provide strong government investment as a source of domestic revenue generated from various business activities.

Keywords: Taxation; Stamp duty tax; Growth of economy

1. Introduction

In the media, institutions, and public society encouragement, the tax policy debate continues to dominate [1]. This thought curtails the fact that taxes are not only the most important source of income for governments, states, or metropolises; they are also instruments for ratifying financial programs and prompting positive performance variation [2]. A country's tax system has essential control over other displays of macroeconomic [3]. In both industrialized and emerging economies, there is an oath between tax composition and the growth of the economy [4]. Certainly, it has been contended that a country's tax base heavily influences its level of economic growth, and tax rule fluctuates depending on the phase of development [5].

Furthermore, it may cause dissatisfaction among both domestic and foreign investors, resulting in a situation in which international investors quickly rebalance their international investments and flee to

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countries with tax systems that encourage industrial growth and high investment returns. As admirable as this is, it has obscured the need for a tax system that can be used to establish and develop industries in Nigeria. As a result, the importance of focusing Nigerian tax architecture on the goals of industrial development, economic growth, and job creation cannot be overstated. As a result, as has been well established in the literature, the goal of a tax system is not simply to raise a definite amount of income, raised from those segments of individuals and units who can best bear the burden of the tax [6]. In short, the goal is to ensure a fair distribution of the tax burden, which cannot be accomplished unless an effort is made to trace the incidence of each tax.

There have been a lot of studies on taxation's effect on economic growth with varying outcomes in Nigeria. Some studies show that tax revenue has a statistically significant relationship with gross fixed capital formation [7,8]. Similarly, it was found that taxation has a positive impact on economic growth [9-11]. However, on the flip side, some studies documented a negative association between taxation and economic growth [12,13]. Prior related scholarly works illustrate that taxation has no major association with the growth of the economy [14,15]. Several experimental scholars have been carried out as a result of the doubt about how taxes affect the growth of the economy, which this study anticipates to underwrite.

Stamp duty is one type of tax that has recently gained recognition in Nigeria. The federal government of Nigeria regards stamp duty as a viable source of revenue [16]. The accumulated stamp duty revenue is used in meeting recurrent expenditures. Because taxes are such an important part of government policies, they occupy a unique position. The Stamp Duties Act requires the stamping of all written instruments, including those in which property or an interest in a property is or is to be transferred or leased to any person. In Nigeria, stamp duties are typically charged at a rate of 7.5%. Any unstamped written document is not admissible in any judicial proceeding in Nigeria until the stamp duty and the resulting penalty for non-payment of the stamp duty are paid. As a result, this study explores the influence of the stamp duty tax on the growth of the economy in Nigeria.

2. Review of related literature

2.1 Taxation and its composition

Taxation pays for government activities like civil amenities like roads and education, as well as packages like communal safety and hospital. Julia Kagan broadened her definition to include the purpose of taxation, which is to fund government activities. Tax is an obligatory charge enforced by the government administration on people and organizations. It is a payment for which the government makes no direct or indirect contribution [17]. The principles of tax include: Compulsoriness of the levy as is installed in phase 24 of the 1999 constitution of the Federal Republic of Nigeria which vests all citizens of Nigeria with the responsibility to "claim his earnings really, to appropriate and lawful companies and pay his tax promptly".

The federal government has recently given stamp duty more recognition as a revenue-generating tool. According to NAN, the Federal Government expects to earn $66.1 billion in 2017 from stamp duty alone, according to the medium term expenditure framework and fiscal strategy paper for 2016, 2017, and 2018. It also forecasts an increase in revenue from 71.8 billion in 2017 to 78.5 billion in 2018. Furthermore, it has been stated that Nigeria's tax regime will be overhauled in order to significantly increase income without harming the poor, so that loopholes in the previous system will be closed. The policy is outlined in the Stamp Duty Act of 2004 and the 2009 financial regulations of the Federal Government of Nigeria. The federal high courts have authority over corporate income tax, petroleum profit tax, customs and exercise duties, stamp duties, corporate capital gains tax, and education tax. The federal government levies personal income tax (PIT), capital gains tax, and stamp duties, but state governments collect them [18].

Stamp duties are essentially taxes paid to the

federal or state government on documents such as conveyances on sale, bills of exchange, promissory notes, agreements contracts, or even documents such as letters and certificates of admission, instruments of apprenticeship, insurance policies, and so on. The Stamp Duties Act 1939 (as amended by numerous acts and various resolutions and contained in vol 22 cap 411 LFN 1990) provides a list of documents in its schedule as well as the duty payable on each of them.

The Stamp Duties Act was endorsed in 1939 to offer a legal source for the imposition of obligations on a dutiable device that had been executed, but its application to dutiable tools in Nigeria was largely retrained or even overlooked by both duty payers and agencies [19]. The Stamp Duties Act, CAP S8, LFN 2004 (as amended), governs stamp duty collection, which can be done by the (FIRS), the Federal Capital Territory (FCT), as well as the respective state Internal Revenue Service (IRS) [20].

Stamp duties were previously one of the Nigerian government's underutilized revenue sources. The SDA's comprehensive list of dutiable instruments, which includes arrangements, contracts, bank deposits, bills of sale, bonds, certificates, deeds, legal mortgages, and so on, combined with the enormous volume of transactions requiring the execution of such dutiable instruments, would have made stamp duties one of the government's primary sources of revenue [21]. However, because the SDA had not been reviewed or updated in several decades, it had become nearly obsolete and out of touch with current realities. This could have contributed to the tax authorities' disinterest in enforcing collection and overall noncompliance with the SDA's provisions.

2.2 Economic growth

Growth of the economy is an upturn in the worth of an economy's goods and services, which produces extra income for trades and implies an increase in National Income and Per-Capita Income [22]. As a result, stock prices rise, providing companies with capital to invest and hire more workers. The growth of the economy is typically represented by growth in a nation's gross domestic product (GDP), which is the sum of the monetary worth of the nation's goods and services created over a given time period. As a result, economic growth can be defined as the process by which a country's real national and per capita income increases over time. When it comes to measuring economic growth, the upturn in per capita income is the healthier measure because it reflects an improvement in the living standards of the masses, which should also be reflected in terms of increased output of goods and services [22].

2.3 Empirical review

This research work looked into the outcome of tax funds on Nigeria's growing economy. The data emanated from the annual account of statistics published by the National Bureau of Statistics (NBS). For the regression analysis, E-view 9.0 was used at a 5% level of significance, and the study revealed that income from tax has no momentous on inflation and interest rates in the nation [15]. From 2000 to 2019, the research explores the influence of tax funds on per capita income of Nigeria. Descriptive statistics were used to describe the study variables, and the hypothesis was analyzed with regression analysis. It was found that tax fund has a substantial positive influence on per capita income Nation [7]. The research investigated the relationship between tax revenue and Nigerian economic growth. They analyzed their data using Stata software. Their research discovered that the Petroleum Profit Tax (oil tax revenue) has a positive but non-significant relationship with Nigerian economic growth, whereas the Value Added Tax and Companies Income Tax (non-oil tax revenue) do not [23]. Using annual time series data from 1980 to 2018, the study investigated the impact of taxation on economic growth in Nigeria. They analyzed their data using the autoregressive distributed lag (ARDL) model. Their findings revealed that in Nigeria, long-run taxes on economic growth are more pronounced than short-run taxes [24]. From 2003 to 2017, the study investigated the impact of taxation on Nigerian economic development [25]. They employed the Vector Error Correction Model (VECM), the

Augmented Dickey-Fuller (ADF) unit root test, the Autoregressive Distributed Lag (ARDL) bounds test, the Jarque-Bera Normality Test, and the Eigenvalue Stability Condition Test. Their findings revealed that petroleum profit tax, corporate income tax, and value added tax have long-run effects on Nigerian development of economy, respectively. From 1990 to 2015, it was investigated the influence of taxation on the growth of Nigerian economy, data originated from the Central Bank of Nigeria (CBN) Statistical Bulletin. They estimated linear versions of Company Income Tax (CIT), Value Added Tax (VAT), and economic growth (GDP) using the ordinary least square (OLS) technique. Their findings confirmed the presence of the hypothesized link between Value Added Tax, Company Profit Tax, and financial growth in the Nigerian context [26]. From 1993 to 2013, the study investigated the impact of indirect tax revenue on Nigerian economic growth [27]. The study used convenient sampling techniques with value added tax revenue and customs and excise revenue for the empirical analysis. The data were analyzed using descriptive statistics, correlation, unit root test, co-integration test, and error correction model regression. According to the findings, value added tax had a negative and significant impact on real GDP. Customs and excise duties had a similar negative and marginally significant impact on real GDP. Studying the impact of tax revenue on the Nigerian economy from 1998 to 2014, the data were extracted using the desk survey method from the Central Bank Statistical Bulletin. The ordinary least squares of multiple regression models were used to establish the relationship between dependent and independent variables. The findings revealed a strong link between the petroleum profit tax and Nigerian economic growth. It demonstrated that non-oil revenue has a significant relationship with Nigerian economic growth [23]. From 1970 to 2010, a study investigated the impact of the Petroleum Profit Tax (PPT) on the Nigerian economy [28]. To analyze data involving variables such as GDP, Petroleum Profit Tax, Inflation, and Exchange Rates, multiple regressions were used. With an adjusted R2 of 86.3%, the study's findings revealed that all variables were statistically significant to Nigeria's economic growth.

3. Methodology

This study employed a longitudinal research design. The design was chosen with the intention of discovering trends and patterns of change in mind. This was critical in determining the long-term economic impact of tax composition revenue. Data used in this study were compiled from the Central Bank of Nigeria Statistical Bulletin (CBN) and Federal Inland Revenue Service (FIRS) for twenty two years. The data include Gross Domestic Product (GDP) and Stamp Duty Tax (SDT).

3.1 Model specification

The study modified the model [29].

$$GDP = \beta o + \beta_1 SDT_t + \mu t \quad (1)$$

where, GDP = Gross Domestic Product; SDT = Stamp Duty Tax; μ_t = Error Term; t = Time; β_0-β_1 = Parameter Coefficients.

The independent variable is stamp duty while Gross Domestic Product represents the dependent variable. Ordinary least square analysis was used to test the hypothesis via E-View 9.0.

3.2 Decision rule

If the P value is greater than 0.05, accept the null hypothesis; otherwise, reject the alternate hypothesis.

4. Analysis and results

4.1 Data analysis

In this section, we tested for stationarity (Unit Root Test) before applying auto regressive distributive lag regression as shown in **Table 1** below:

4.2 Unit root test

As shown in **Table 1** above, the means and variances of the variables under consideration are

Table 1. Unit root test result.

Null Hypothesis: GDP has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag = 4)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			–2.182337	0.2178
Test critical values:	1% level		–3.788030	
	5% level		–3.012363	
	10% level		–2.646119	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 03/14/23 Time: 21:15				
Sample (adjusted): 2000 2020				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	–0.229502	0.105164	–2.182337	0.0418
C	3390261.	1461394.	2.319882	0.0316
R-squared	0.200424	Mean dependent var		226281.4
Adjusted R-squared	0.158341	S.D. dependent var		917167.2
S.E. of regression	841427.3	Akaike info criterion		30.21398
Sum squared resid	1.35×10^{13}	Schwarz criterion		30.31346
Log likelihood	–315.2468	Hannan-Quinn criter.		30.23557
F-statistic	4.762593	Durbin-Watson stat		2.215474
Prob(F-statistic)	0.041843			

expected to be persistent over time in this pre-regression analysis. Non-stationary variables, also known as unit root variables, have means and variances that change over time. As a result, using Ordinary Least Squares regression to estimate regression equations with non-stationary or unit root variables produces misleading results. Instead, if the variables are non-stationary, use the cointegration method to estimate their long-run relationship.

4.3 Hypothesis testing

Table 2 indicates that the stamp duty tax does not discernibly impact Nigeria's economic growth. The above-mentioned model yields the following results for the variable of stamp duty (SDT): (Coef. = 195, t = 1.27, and P-value = 0.218). It was revealed that stamp duty is a positive and statistically insignificant effect on economic growth in Nigeria at the 5% level. As a result, the stamp duty tax has an insignificant positive impact on Nigeria's economic growth.

5. Conclusions and recommendations

This research work presents the viewpoint that lower taxes (in terms of excise duty tax) can affect economic growth, which is stable with models of endogenous growth. Accordingly, an advanced tax rate discourages saving which leads to stagnated development. As a result of this study, it can be concluded that stamp duty tax revenue surprisingly stall economic growth in Nigeria during the period under investigation.

Furthermore, the results of the stamp duty variable show a significant negative effect on the economic growth of Nigeria. The result is confirmation

Table 2. Regression result.

Dependent Variable: GDP				
Method: Least Squares				
Date: 03/14/23 Time: 19:51				
Sample: 1999 2020				
Included observations: 22				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13620767	408566.4	33.33795	0.0000
SDT	19496.10	15338.48	1.271058	0.2183
R-squared	0.074742	Mean dependent var		13839336
Adjusted R-squared	0.028479	S.D. dependent var		1763642.
S.E. of regression	1738347.	Akaike info criterion		31.66128
Sum squared resid	6.04×10^{13}	Schwarz criterion		31.76046
Log likelihood	–346.2740	Hannan-Quinn criter.		31.68464
F-statistic	1.615588	Durbin-Watson stat		0.415885
Prob(F-statistic)	0.218293			

that taxation is still a powerful socio-political and economic tool for economic growth and national prosperity [25]. Tax evasion is a global concern, but it appears to be common when compared to the prevalence of corrupt practices. Since tax is the main spring of government revenue, if people can avoid paying it through lawful or unlawful means, the speculative equity of the tax is lost. As a result, tax evasion and avoidance reduce the government's effectiveness in promoting economic growth. The findings are consistent with [30]. This study recommended that the government improve public entities and provide strong government investment as a source of domestic revenue generated from various business activities.

Conflict of Interest

There is no conflict of interest.

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ARTICLE

The Causes of Hiking Ethiopian Consumer Prices

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ABSTRACT

A growing consumer price is creating instability in the macroeconomic environment and hinders the consumption level of especially the poor society. This paper then explored the major causes of such increasing consumer prices using Ethiopian cases. Using data from the National Bank of Ethiopia from 1982/1983 to 2019/2020, it condensed the information of monetary sector, external sector and fiscal sector variables to a small set to estimate the causes of Ethiopian consumer price hiking using the ARDL model. The factors determining consumer price differ from food to non-food. The most important factors determining food price are price expectation and fiscal factors. On the other hand, the main determinant of non-food consumer prices is the fiscal factor. The author also found evidence of fiscal factors and price expectation effects on general consumer prices. Therefore, to contain the rise in consumer prices, it needs to exercise conservative fiscal stances, which require minimizing deficit financing, reducing the import tax rate and reducing domestic indirect tax rates such as excise tax and value added tax on basic consumer goods and services. Moreover, sound government policies are essential to address inflation anticipations (providing information for society about the future of inflation) to change public opinion.

Keywords: Price inertia; External factor; Grain price; Fertilizer price; Principal component analysis

1. Introduction

There has been a growing interest in the determinants of consumer price hiking. A growing consumer price creates instability in the macroeconomic environment and hinders the consumption level of especially the poor society [1]. For instance, the increase in food prices increases the proportion of consumers'

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total expenditures, which further exacerbates poverty [2].

It is also revealed that the rate of inflation in the services sector for everything from housing rents to personal services seems to be increasing from already high levels, and it is unlikely that it will decline soon. Rapid nominal wage increases might make these pressures worse. In nations with robust labor markets, nominal salaries may begin to rise quickly, more quickly than what businesses could realistically absorb, with the ensuing increase in unit labor costs being passed on to consumers as higher prices. Such "second-round effects" would result in higher inflation expectations and more sustained inflation. Finally, a prolonged period of high inflation may result from a further escalation of geopolitical tensions that sparks a new increase in energy costs or exacerbates current problems [3]. Because of this reason, the root causes of consumer price hiking should be clearly understood to minimize its daunting effect on the lives of the poor and instability in the macro economy [4].

Many studies have sought to uncover the fundamental causes of price increases, often ranging from supply to demand shocks such as money supply, government expenditures, depreciation of the exchange rate, household confidence, exports, costs of production (i.e. real wages, prices of raw materials, oil and corporate taxes imposed by governments) over the time horizon [5-9]. Nevertheless, we are less aware of how these factors impact price components in various emerging nations [10]. One of Sub-Saharan Africa (SSA), Ethiopia, has mostly been affected by price inflation, and mainly food prices contributed more to inflation than non-food prices. It is reported that headline inflation has risen to 19.3%, with food price inflation being even higher (23.2%); the headline inflation rate was in the range of 11% in January 2019 [11].

There is no consensus as to why prices rose so dramatically in Ethiopia. A hike in inflation had been typically associated with unfavorable harvest due to drought or conflict, exchange rates depreciation, monetary growth, price expectation, rise in fuel and fertilizer prices, imports and nominal interest rates in Ethiopia [12]. Other factors such as lack of smooth distribution, political uncertainty, volatility in output, fiscal balance, etc were also the reasons for increases in Ethiopian consumer prices [13].

Different studies identified different factors for consumer price hiking in Ethiopia and have not yet reached on conclusion. The choice of the study variables and the technique of analysis may have contributed to the variation in the literature. This paper's goal is to close this gap by re-assessing the factors that influence the rise in consumer prices in Ethiopia. Unlike other studies, this paper rigorously analysed the determinants of Ethiopian price hiking by condensing the information of monetary sector, external sector and fiscal sector variables to estimate the causes of Ethiopian consumer price hiking through PCA (Principal Component Analysis) and a distributed autoregression model (ARDL). It also includes the components of CPI in the analysis.

The remainder of the article is structured as follows: The literature is reviewed and a brief account of the price evolution in Ethiopia is provided in Section 2. The data and empirical model are described in Section 3. In Section 4, the models are discussed and analysed. Section 5 brings the paper to a close and finally Section 6 recommends policy implication.

2. Review of literature

The changes in both supply and demand have been believed to be the drivers of consumer prices. Of the utmost importance is to specifically identify the factors that are significantly determining the hike in consumer prices. The goal of this review is to determine whether there is strong evidence showing how various factors affect increases in consumer prices.

2.1 Theoretical literature

An overview of the growth of the literature on the causes of inflation is given in this section. Inflation has emerged as an important concern in the macroeconomic stability of developing countries. Conventionally, monetary policy has been observed as a

major cause of price changes [14,15]. However, there is growing evidence that changes in overall price are the outcome of the complex dynamic interaction of monetary, demand-pull, cost-push, structural change and price itself [16,17].

The proponents of monetary factors, the importance of money were underlined by monetarists. "Inflation is always and everywhere a monetary phenomenon that results from a more rapid expansion in the supply of money than in total output", according to the modern quantity theory led by Milton Friedman. As opposed to that, Keynesians focused on demand-pull side inflation and believed that when aggregate demand is greater than aggregate supply at full employment, the inflationary gap results. In accordance with Keynes' demand-pull inflation theory, policies that lower the total demand are effective at lowering pressure inflation. Tax increases, government spending cuts, and limiting the amount of money available individually or collectively can also be used to reduce demand and control inflation [18].

Another theory, the Cost-Push theory asserted that Inflation is the increase in money wages that is greater than the increase in labor productivity; an increase in the price of domestic and imported raw materials; or an additional irritation caused by an increase in salaries to reflect an increase in the cost of living. Besides, this theory also emphasized that profit-push, i.e. when Oligopolistic and Monopolistic businesses increase the price of their goods to cover rising labor and manufacturing costs and boost profits leading to higher inflation [19].

Structuralism theorists also viewed that the service sectors accelerated growth, which is linked to immigration and population increase, may put pressure on inflation. They highlighted that given the rapid economic growth and increased social movement, the competition will be heightened. With the use of inflation, new social groups are given access to political and economic activities, and efforts are made to increase power and alter the distribution of income. According to this perspective, inflation is a manifestation of how the economy and society are changing as a result of the quick, dynamic growth of the economy [20,21].

In sum, although monetary policy is conventionally believed to be the major cause of inflation, researchers have cast considerable doubt on the role played by demand-pull, cost-push, structure and inflation itself. Having discussed the theoretical background of inflation, we will now discuss current empirical discussions surrounding inflation's causes.

2.2 Empirical literature

Numerous studies prefer to concentrate on the consequences of inflation, with the objective of testing whether inflation burdens the living standards of the poor [22-24]. Yet, there hasn't been a lot of empirical research analysing the causes of inflation. Studies from different countries on the causes of inflation will provide an important understanding of this section. A common finding is that the change in monetary policy, aggregate supply, aggregate demand, external factors, and domestic factors were the drivers of consumer price hiking; however, the magnitudes and significance of the effects differ across countries.

For instance, utilizing annual data from 1970 to 2011, researchers analysed variables affecting inflation in two sets of nations (high inflation group and low inflation group). The short- and long-term effects of each variable on inflation have been explained using an error correction model based on autoregressive distributed lag (ARDL). They discovered that in low inflation countries, GDP growth and imports of goods and services had a major long-term impact on inflation. They stated that the long-term determinants of inflation in high inflation countries are the money supply, national spending, and GDP growth [25].

In the same way, using time series data from 1974-1975 to 2014-2015 and a vector error correction approach, researchers looked into the factors that affect Ethiopia's experience with inflation. Their results showed that over the long run, the money supply, real gross domestic product, and overall budget deficit all had a positive and statistically significant impact on the consumer price index, which is a measure of inflation [26]. Additionally, they discovered evidence to support the idea that market par-

ticipants factor a predictable fraction of the inflation rate into the nominal interest rate and that a 1-month Euro currency rate contains information about the future course of the inflation rate [27].

On the other hand, money supply, interest rates, and inflation expectations are the long-term drivers of non-food inflation. The short-term model identifies the main sources of inflation as wages, foreign prices, exchange rates, and restrictions on the supply of food [28]. It is discovered that monetary trends continue to be a crucial and major component in explaining Ethiopia's high food inflation. The general level of prices, the world grain price index, the lagged world DAP price index, the domestic benzene price index, the non-food price index, shocks in the money and goods markets, the ongoing depreciation of the Birr against the dollar, and the degree of inflation inertia are additional significant factors that contribute to Ethiopia's soaring food inflation.

Similarly, a monetary union's and the European Central Bank's long-run factors influence inflation differentials analysed. They demonstrated that the main driver of price and inflation differences in the non-traded sector was relative productivity variations. External factors were also found to be a positive and significant factor in raising inflation [29]. Some studies employed Johansen's cointegration test and the Vector Error Correction Model (VECM), respectively, to uncover the long- and short-term foreign and internal drivers driving Ethiopia's food inflation using monthly data from 1997 to 2010 [30]. Based on annual data, researchers estimated determinants of inflation in Pakistan using the data from 1971-722 to 2005-2006. They showed that inflation in Pakistan is influenced by the depreciation of the exchange rate and increases in the value of imports [31].

Research done in Nigeria analysed the dominant factors influencing inflation using ECM depending on conditions of the money market's equilibrium. The findings confirmed that a substantial part of Nigeria's inflationary process can be explained by monetary expansion, which is mostly caused by expansionary fiscal policy [32]. Again, inflation was found to be significantly influenced by monetary and fiscal policies. Similar studies examined the long-term bivariate link between the US and nine European countries' inflation rates and short-term interest rates in Eurocurrencies. They used co-integration techniques and discovered that there was typically a one-to-one relationship between euro currency rates and inflation that was logically anticipated. Similarly, the study assessed the Republic of Tajikistan's inflationary factors using the ARDLmodel on monthly data. He discovered that whereas real wages, the GDP gap, and remittance inflows greatly influence price level from the demand side, exchange rate, global wheat prices, and world oil prices significantly influence price level from the supply side. The effect of remittance inflow is also supported well [33].

There is a study on the forces behind the current inflationary experience that has employed the vector autoregressive (VAR) in Ethiopia from 1995 to 2008. It discovered that a fast increase in food demand brought on by a worrisome growth in money supply and credit expansion, inflation expectations, and an increase in international food prices are the main factors contributing to food inflation over the long term. By creating single-equation error correction models for the Consumer Price Index in each nation; it was possible to determine the primary causes of inflation in Ethiopia and Kenya [34]. It discovered that the same variables affect inflation rates in both Ethiopia and Kenya; long-term effects are caused by global food prices and currency rates, while short- to medium-term effects are caused by money growth and shocks to the supply of agricultural commodities. Additionally, both countries showed strong inflation inertia. The main finding was that neither country had a clear and effective monetary or exchange rate policy, which would have served as a nominal anchor for inflation.

Again, using 32 years of data from 1985 to 2016 and ARDL to evaluate the supply and demand side factors affecting inflation in Ethiopia; studies found that in contrast to real gross domestic product, which has a large negative impact on the price level, they discovered evidence of a long-term positive relationship between the money supply, global oil price,

budget deficit, and real effective exchange rate on inflation in Ethiopia. Real effective exchange rates, money supply, budget deficits, and global oil prices are the primary short-term drivers of Ethiopian inflation [35].

Moreover, the factors affecting inflation in two groups of countries (high inflation group and low inflation group) using annual data from 1970 to 2011 were examined. An Error Correction Model based on the Auto-Regressive Distributed Lag (ARDL) modelling has been used to explain the short-run and long-run impacts of each variable on inflation. They found that GDP growth and imports of goods and services have a significant long-run impact on inflation in low-inflation countries. They indicated that money supply, national expenditure and GDP growth are the long-run determinants of inflation in high-inflation countries. In the short run likewise, none of the variables is found to be significant determinants in high-inflation countries. However money supply, imports of goods and services and GDP growth have significantly impacted inflation in low-inflation countries [36].

Others assessed the main drivers of inflation in Ethiopia and Kenya by developing single-equation error correction models for the Consumer Price Index in each country. They found that inflation rates in both Ethiopia and Kenya are driven by similar factors; world food prices and exchange rates have a long-run impact, while money growth and agricultural supply shocks have short-to-medium run effects. There was also evidence of substantial inflation inertia in both countries. The key conclusion made was that there was no nominal anchor for inflation in either country in the form of a clear and well-functioning monetary or exchange rate policy [37]. Likewise, the sources of inflation in India, both in the long run and in the short run were examined by using the co-integration method and found that in the long-run money supply (MS), depreciation of the rupee and supply bottlenecks causes inflation to rise in the country. It's revealed that in the long-run domestic factors such as monetary growth and supply bottlenecks dominate the external factors for a rise in the domestic prices in the economy [38].

Generally speaking, it appears appropriate to hold the perspective that has been a significant effect of various factors on consumer price inflation. In reality, the works that have been discussed thus far represent some of the most in-depth research on this topic and significantly add to the body of literature in this field. However, each work mentioned above was not rigorous and again inconclusive. This is because, the factors determining consumer prices were dependent on the indicators chosen by each researcher. Some of them include some variables ignoring the variability in the others which may lead to omitted variable bias. Although it is challenging to distinctly control all of the issues misleading the results, by attempting, this work will contribute to the literature to include at least the variation in many variables expected to affect the change in consumer prices by developing different indices using Principal Component Analysis (PCA) and estimating the effects using level ARDL model.

3. Data and methods

3.1 Data source

This study has made use of time series datasets obtained from the National Bank of Ethiopia (NBE). These datasets include statistics on pricing, money and finances, external variables, and other topics for the years 1983 to 2020. Due to their extensive temporal ordering, these datasets key advantage is their capacity for generalization.

3.2 Study variables

This study analysed a variety of variables to determine what was causing Ethiopian consumer prices to rise. Different literature has forwarded the importance of variables from different perspectives. These are mainly from monetary policy perspectives, fiscal policy perspectives, international economic policy perspectives and structural economic perspectives in determining the price hiking in different countries. This paper selected variables on the basis of such perspective from existing scholarship and compre-

hensively analysed the causes of price hiking using Ethiopian cases. The response variables are General CPI (GCPI), Food CPI (CPIF) and Non-Food CPI (CPINF); whereas the explanatory variables are monetary factors (Mp), fiscal factors (Fp), external factors (Ep), Dummy for regime change (DRC) and dummy for financial crises (DFC). The explanatory variables such as Mp, Fp and Ep were computed using PCA. The Mp variable is created by the linear combination of money supply (M2) and nominal lending interest rate (i) using PCA. Similarly, the Fp variable is created by the linear combination of total government expenditure, import tax revenue, and domestic indirect tax revenue using PCA. Finally, the Ep variable is created by the linear combination of the nominal effective exchange rate, the value of fuel import, the value of fertilizer imports, imports of raw material, and remittance inflow.

3.3 Principal component analysis (PCA)

In order to reduce the dimensionality of huge data sets, a technique known as PCA, is frequently utilized. PCA works by condensing a large collection of variables into a smaller set that still retains the majority of the data in the larger set. It reduces the number of variables of a dataset, while preserving as much information as possible [39]. In order to preserve as much of the information in the original variables as feasible, the PCA derives a few linear combinations, or principle components (PCs), of a set of variables.

It was been used in aggregating microeconomic, macroeconomic and international indicators into a single measure in the Bank of Jamaica [40], to re-evaluate the relationship between various central bank independence characteristics and inflation performance; to study the relationship between financial conditions and economic activity and etc. [41]. This statistical method is utilized in this investigation to accumulate the variables in the monetary, fiscal and external factors [42]. There are three methods that are frequently used to select the right number of principal components: (1) select a small number of components to obtain between 70 and 90% of the variation, so that only a small amount of information is lost; (2) keep the components whose corresponding eigenvalues are larger than average; or (3) look at a scree plot. They all essentially produced the same choices and were used in this investigation.

3.4 The model and its estimation strategy

The purpose of this study is to look at what influences Ethiopian consumer prices. This paper focused on three outcomes, namely GCPI, CPIF and CPINF. A logical place to start would be to estimate a model using traditional ordinary least squares after controlling for other variables and presuming that the outcome of interest depends on predicted components. One of the main issues with interpreting such estimates without taking into account the fact that the data are time series is that most economic variables have non-stationary data, which makes it possible for observations to become correlated with time. It's possible that the order of integration will differ as well. Such issues may result in serial correlation, which can produce erroneous or inconsistent estimates [43]. The statistical characteristics of time series data should be studied first in order to account for these impacts, and then the right model should be applied. We investigated potential indicators or possible indications of Stationarity using Augmented Dickey-Fuller (ADF) test.

The other major issue is that it takes some time for factors like monetary and fiscal policy to have an impact on prices. Their impact is delayed and dispersed over several years [26]. It is advised to use a dynamic single model, such as the ARDL model, to address this issue [34]. Finally, the inclusion of many variables will increase the degree of freedom, which may reduce the total observation used to estimate the parameters. Including all many explanatory variables to the model will lead to misspecification and again, ignoring some of them will bias the estimates. Therefore, the appropriate way is to reduce the dimension without losing the information. This was done by using PCA. Taking into account all the above information and following the previous work done, this study adopts the position that price changes caused by other costs or by price adjustments in

markets with surplus supply or demand account for the majority of inflation and has specified the following ARDL (P, Q) models in the literature.

$$\varphi(L)CPI_t = \alpha + \theta(L)X_t + \mu_t \quad (1)$$

where:

- CPI_t is the Consumer Price Index (general, food and non-food);
- X_t - observable exogenous variables expected to affect prices: Monetary factor (Mp or M2), fiscal factor (Fp or FD), external factor (Ep or NEERI), a dummy for regime change (DRC), a dummy for financial crises (DFC) (Indgap), and lag of consumer price index (general, food and non-food).
- $\varphi(L) = 1 - \varphi_1(L) - - - \varphi_p L^P$ and $\theta(L) = 1 - \theta_1(L) - - - \theta_q L^q$,
- μ- is the residual term.

This model will be assessed using the maximum likelihood function and the variables such as DRC and DFC are expected to positive effect on the Ethiopian consumer price index.

4. Results and discussion

4.1 Results

The findings and discussions were provided in this part. Data were first examined using ADF test statistics, followed by model estimation using ARDL, and a discussion of the derived coefficients.

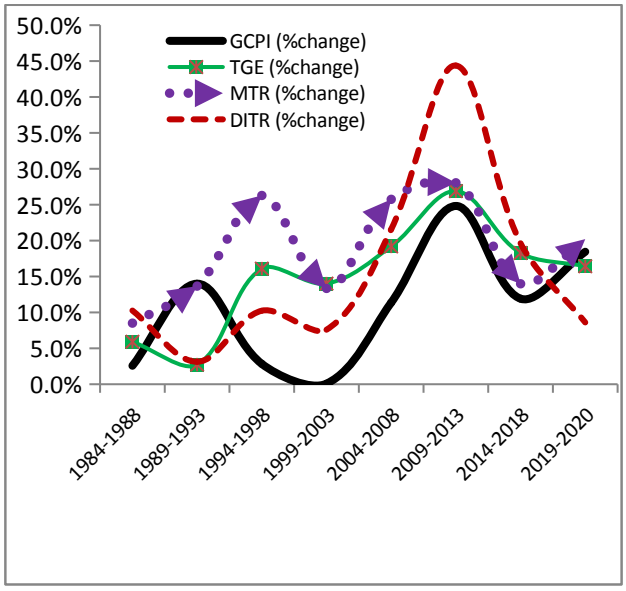
Trends of consumer prices and other variables in Ethiopia

The consumer price is growing in Ethiopia on average. The consumer price growth is faster since 2002 which was accompanied by improvements in the economy. Although the trends somehow decreased between 2013 to 2018, it has started to increase since 2018. The growth in food consumer prices is contributing more than non-food consumer prices to the general consumer price in Ethiopia (**Figure 1b**). Similar cases were observed in the money supply. The money supply is also increased since 2002. Although, in many cases, the growth in money supply follows a similar path to growth in prices, the average annual growth rates of money supply started to decrease in 2013 annually (**Figure 1c**). The other variables such as government expenditure, import tax revenue and domestic indirect tax revenue (such as VAT, and excise tax) also followed the same growth trends, on average, with the average growth trends of general consumer prices. Especially the growth trends of import tax revenue seem growing proportional to consumer prices (**Figure 1a**). The values of raw material imports and remittance inflow are also growing since 2013. The depreciation of currency (NEERI) also seems to have an increasing effect on the growth of general prices (**Figure 1d**). The trends in remittance inflow seem to move together with the average growth in general consumer prices since 2003 (**Figure 1d**). In general much has been observed from the trends in **Figure 1**, food consumer price is contributing more to inflation and again there is an indication of proportional trends with GCPI from other factors including the money supply and import tax revenue, total government expenditure and remittance inflow.

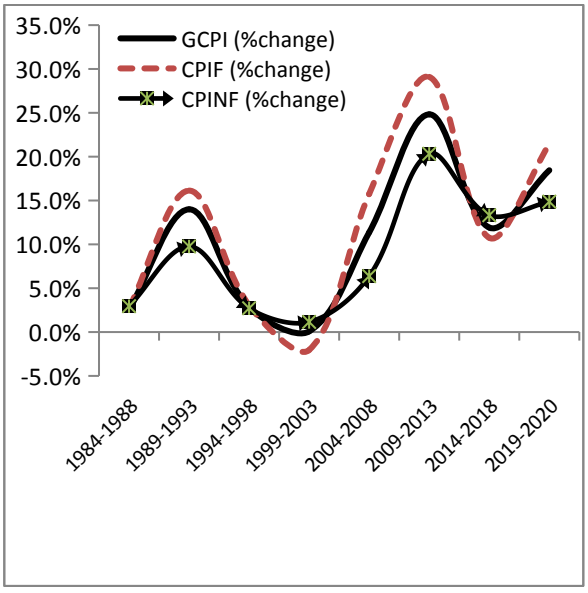
On the other hand the variables such as Mp, Fp and Ep were generated based on the three methods mentioned under methodology which are frequently used to select the right number of principal components. We have selected a small number of components to obtain between 88% of the variation, kept the components whose corresponding eigenvalues are larger than average and scree plot (See **Figure 2**).

Result for unit roots and co-integration test

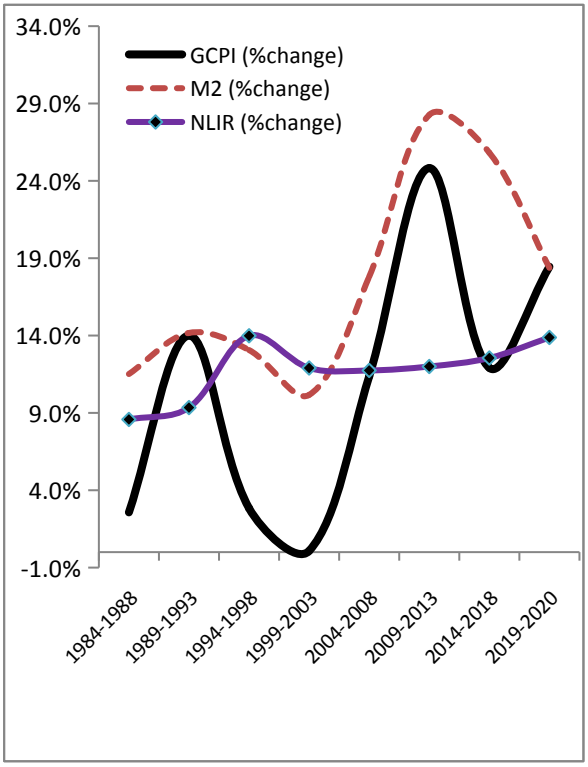
Table 1 investigates whether the means are constant and variances are only reliant on the time lag, as well as the initial steps to identify and define the underlying properties of data throughout time. To demonstrate if such principles apply, we employed the ADF test at the level with intercept and again with different variables with intercept. The test demonstrates that none of the variables were level stationary. Nonetheless, found stationary after applying the first difference with the intercept. Therefore they are I(1) (see **Table 1**). All variables were determined to be non-stationary when the stationarity of the variables was checked, as previously stated. Each model underwent the limits test to see whether none stationary series had long-run shared trends (see **Table 2**).



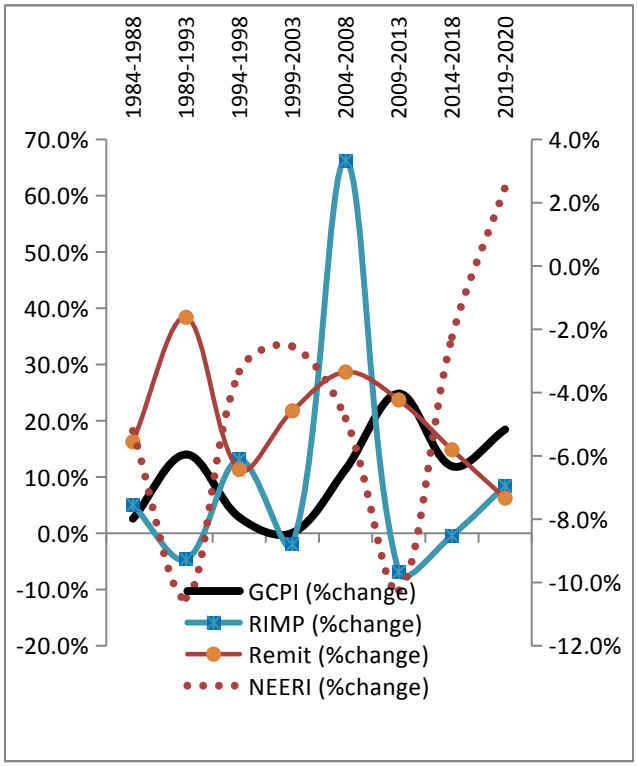
a) Change in GCPI and Fiscal Factors (in percent)



b) Change in GCPI and its components (in %)

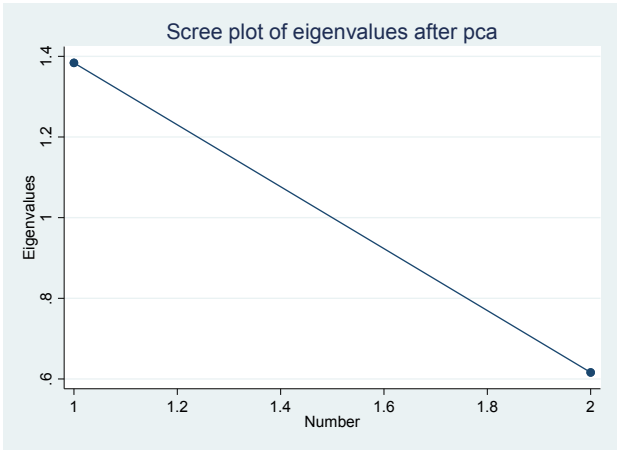


c) Change in GCPI, M2 and NLIR (in percent)

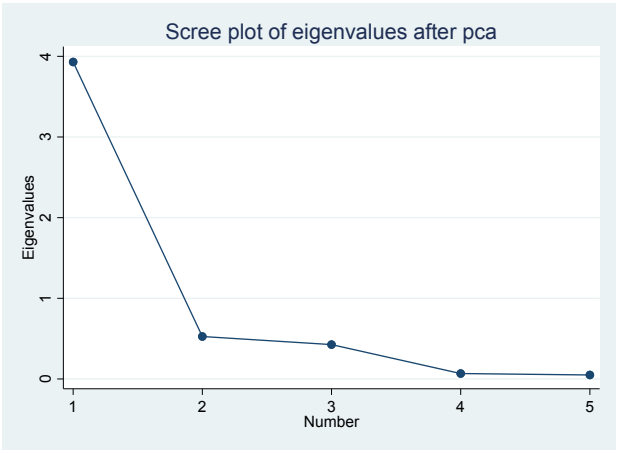


d) Change in GCPI and External factors (in percent)

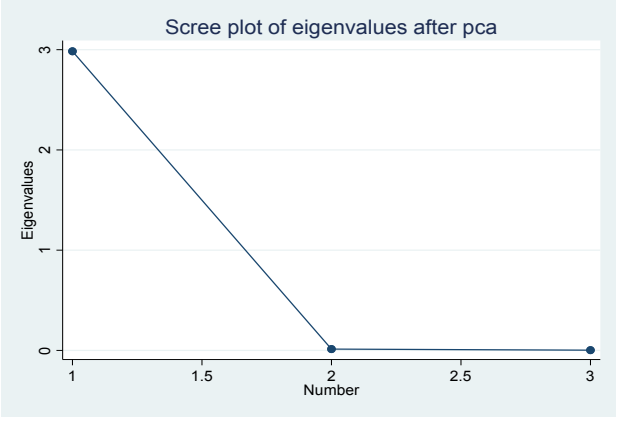
Figure 1. Trends of recent developments in a) Consumer Price Index compared to fiscal, b) GCPI components, c) monetary factors and d) external economic variables.



a) Scree plot for monetary factors



b) Scree plot for External factors



c) Scree plot for Fiscal factors

Figure 2. Scree plot for principal component analysis for a) monetary, b) external economy and c) fiscal factors.

Table 1. Augmented Dickey-Fuller tests for unit roots.

Variables[1]	**t-ADF**	**Lags**	**Variable**	**t-ADF**	**Lags**
GCPI	10.7	1	ΔGCPI	–6.513***	1
CPIF	8.2	1	ΔCPIF	–7.870***	1
CPINF	12.9	1	ΔCPINF	–4.847***	1
Mp	0.39	1	ΔMp	–5.610***	1
Fp	18.0	1	ΔFp	–2.165***	1
Ep	0.27	1	ΔEp	–6.023***	1
NEERI	–1.95	1	ΔNEERI	–4.219***	1
M2	21.8	1	ΔM2	–4.453***	1
FD	1.86	1	ΔFD	–3.654***	1

[1] Note: *** Indicates significance at 0.1 percent significance level.

Table 2. Diagnosis tests including Co integration test.

Tests	[1] **Dep't Var.**					
	(1)	(2)	(3)	(4)	(5)	(6)
	GCPI	CPIF	CPINF	GCPI	CPIF	CPINF
DW	1.54	1.63	1.50	2.07	2.08	1.90
LM test	1.75(0.19)	1.5(0.22)	1.8(0.18)	0.09(0.77)	0.09(0.77))	0.05(0.82))
IM test	31.5(0.09)	33.8(0.052)	32.9(0.06)	29.6(0.13)	29.6(0.13)	32.6(0.07)
sbcusum	0.27(0.95)	0.26(0.95)	0.26(0.95)	0.17(0.95)	0.16(0.85)	0.14(0.85)
BoundTest	21.1(0.00)	21.1(0.00)	21.1(0.00)	21.1(0.00)	21.1(0.00)	21.1(0.00)

[1] LM test indicates the Breusch-Godfrey LM test for autocorrelation. Its test static is chi square. The value in parenthesis is p-value.

[2] IM test indicates the Cameron and Trivedi's decomposition of IM-test. Its test static is similarlychi square for Ho: homoscedasticity. The value in parenthesis is again a p-value.

[3] Sbcusum indicates the Cumulative sum test for parameter stability. Its test static is chi squarefor Ho: No structural break. The value in parenthesis is the critical value.

[4] Bound Test indicates the Pesaran, Shin, and Smith (2001) bounds test. Its test static is F test for Ho: no level relationship. The value in parenthesis is the p value.

[5] Models 1 and 2 are estimated using ARDL (1, 0, 0, 0, 0, 0) respectively and ARDL (1,0,0,0,0,0 is used to estimate Model (3). ARDL (1,0,0, 0,0,0) is used to estimate Model (4). (1,0,0,0,0,0), Models (5) and (6) are calculated using ARDL (1,0,0,0,0,0) respectively.

Result for ARDL model estimation

The empirical findings for the ARDL model estimate are shown in **Table 3**. The response variables were GCPI and two of its components CPIF and CPINF. Totally six ARDL models were estimated to implement the plan described under the procedures. The first three models were estimated based on the indicators generated by PCA (Mp, Ep and Fp) along with other variables such as a dummy for regime change (DRC), a dummy for financial crises (DFC), and price expectation (lag of consumer prices). The second three models were estimated based on conventional indicators such as money supply (M2) instead of monetary factor (Mp), a nominal effective exchange rate (NEERI) instead of an external factor (Ep) and deficit financing (FD) instead of fiscal factors (Fp).

The importance of reporting both findings was to compare what kind of effects would have happened if we have used conventional indicators for monetary, fiscal and external factors instead of the PCA generated. Again, the optimum lag was automatically selected for all models and was checked for possible indication of serial correlation using Breusch Godfrey LM test (bgodfrey), homoscedasticity using Cameron and Trivedi's decomposition of IM test and structural break using the recursive cumulative sum test. In all cases, nothing was found to change the results (**Table 2**).

The result shows that price expectation (lag of consumer price index) seemsto positively and statistically significantly affect the general consumer price index and one of its component food consumer price. Similarly, fiscal factors seem to positively and statistically significantly affect general consumer price and its constituents, food and non-food consumer price index. Fiscal factor is consistently significant in all GCPI and its components. On the other hand the result for an estimated model using conventional indicators for monetary, fiscal and external factors, the second part GCPI and its components, shows that price expectation seems to have consistent effects on all GCPI and both of its components CPIF and CPINF. Again, deficit financing (FD) and M2 have a significant effect on general consumer price and one of its components, food consumer price. While the others, fortunately, resulted in similar findings in both significance and direction for both types of models, the effect of M2 on consumer price diverges from the indicator generated through PCA. This might be due to the inclusion of lending rates in monetary factors (Mp).

In general, the empirical result indicated by the ARDL model seems to show that, the factors de-

Table 3. ARDL model output using conventional and PCA generated.

	(1)	(2)	(3)	(4)	(5)	(6)
CPI(1)	CPI 0.550*	CPIF	CPINF	CPI 0.968***	CPIF	CPINF
	(0.226)			(0.105)		
CPIF(1)		0.544*			0.871***	
		(0.221)			(0.115)	
CPINF(1)			0.356			0.998***
			(0.210)			(0.113)
Mp	0.0364	0.0465	0.0370			
	(0.0327)	(0.0424)	(0.0250)			
Ep	0.0195	0.0189	0.0155			
	(0.0196)	(0.0260)	(0.0141)			
Fp	0.270*	0.272*	0.362**			
	(0.103)	(0.100)	(0.100)			
DRC	–0.0155	–0.0419	0.0352	0.0286	0.0303	–0.00904
	(0.0631)	(0.0811)	(0.0517)	(0.0694)	(0.0865)	(0.0629)
DFC	0.0598	0.0985	–0.0125	0.0958	0.126	0.0306
	(0.0585)	(0.0769)	(0.0426)	(0.0469)	(0.0581)	(0.0435)
M2				0.312**	0.465***	0.194
				(0.104)	(0.121)	(0.106)
NEERI				0.00860	0.00420	–0.0119
				(0.0374)	(0.0455)	(0.0345)
FD				0.132*	0.201*	0.0510
				(0.0619)	(0.0770)	(0.0567)
cons	0.0650	0.0820	0.0116	0.0720	0.0591	0.108*
	(0.0596)	(0.0704)	(0.0541)	(0.0536)	(0.0666)	(0.0495)
N	37	37	37	37	37	37
R2-Adj	0.80	0.72	0.87	0.77	0.77	0.82
likelihood Test	46.74	36.73	57.61	47.89	39.84	51.07
AIC	–79.48	–59.45	–101.2	–81.78	–65.69	–88.15

Standard errors in parentheses, model (1-3) were estimated using PCA indicators model (4-6) were estimated conventional indicators * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

termining consumer price differ from food to non-food. The price expectations and fiscal factors were the main causes of Ethiopian general consumer price hiking. While these hold for food consumer prices, the non-food consumer price is mainly affected by fiscal factors.

4.2 Discussion

This study relies on the outcomes in **Table 3** for the interpretation of the estimated coefficients. The model from columns (1) to (6) fitted the results of consumer price indices and its components, food and non-food. The coefficients can be understood as a one unit increase in units of the significant variables because all variables were normalized, the consumer price indices (general, food or non-food) are anticipated to change for the better or worse by roughly the comparable coefficient value. The variables with p-value < 0.05 were thought of as statistically significant. Bearing these in mind the discussion is summed up in the four points below.

First, the price expectation (lag of consumer prices) has significantly deterred mining Ethiopian consumer prices. Estimates using ARDL for GCPI and

CPIF show that price expectation seems positively and statistically significantly affecting Ethiopian price hiking (see coefficient = 0.55, coefficient = 0.54 respectively in **Table 3**). Change in the unit in price expectation most likely possesses a 0.55 rise of a point in the Ethiopian general consumer prices, ceteris paribus. This generally indicates that the past prices of general and food consumer prices were influencing the current prices and so forth in Ethiopia. In other words, the consumers were purchasing goods and services assuming the price will likely increase in the future, which is pressuring general consumer prices to hike in Ethiopia. This discovery is in line with the findings of research conducted in Ethiopia where it was shown that price expectation is the main driver of price hiking as mentioned in the literature.

Second, the fiscal factors are positively and statistically significantly determining Ethiopian general, food and non-food consumer prices. This variable is generally a combination of total government expenditure, import tax revenue, and domestic indirect tax revenue (excise, VAT, etc.) a change in the unit in fiscal factor most likely possess a 0.27 rise of a point in the general consumer prices ceteris paribus. Two arguments would likely support this evidence. First, part of total government expenditure which is not financed by taxation, and attributes inflation to the financing of the consequent deficit by methods that involve an increase in money supply may have resulted in the significance of these factors. Second, in contrast, the fraction of public expenditure which is financed through taxation like import tax and partly attributes inflation to the extra cost increases that individual seek in their efforts to obtain the rate growth of net of tax real incomes which they have come to expect. This finding is supported by another research [36].

Third, the external factors are positively determining Ethiopian general, food and non-food consumer prices as indicated by the variable Ep, whereas a different effect of direction is observed when a conventional indicator is used for general consumer price. This variable is generally created by the linear combination of the nominal effective exchange rate, the value of fuel import, the value of fertilizer imports, imports of raw material, and remittance inflow. The statistical insignificance of this indicator is, however, odd to what we have expected. The aggregated data, that we have used in this study, may have contributed to such findings, as it may hide the daily, and monthly effects of such variables.

Finally, the effect of monetary factors in determining consumer prices (general, food or non-food) was changed by the inclusion of nominal lending rate, when information in money supply is combined with the information in lending interest rate as condensed to a single variable Mp by PCA. Although money supply seems to affect consumer prices positively and significantly, this effect was changed by the nominal lending rate (tighter monetary policy). This is clearly indicated in the model when M2 was used instead of Mp (monetary factor), which was found positive and statistically significantly determining general and food consumer price indices in Ethiopia. Such evidence was found by numerous researchers as mentioned in the literature.

5. Conclusions and recommendation

This paper explored the major causes of Ethiopian consumer price increases. Utilizing data from the Ethiopian National Bank, we condensed the information from an array of monetary sector, external sector and fiscal sector variables to estimate the causes of Ethiopian consumer price hiking through the ARDL model.

Our key findings are threefold. Firstly, price expectation is one of the drivers of general and food consumer price hiking in Ethiopia. The consumers purchasing basic items in the expectation of a price increase in the future are actually pressuring consumer prices to hike in Ethiopia. Secondly, we found that fiscal factors were consistently contributing to the food, non-food and general consumer price hiking. Increasing expenditure involving increasing tax rates mainly on import and domestic indirect tax by the government attributes to the rise in consumer prices. Third, the effect of monetary factors in de-

termining consumer prices (general, food or non-food) was attenuated by nominal lending rate, when information in money supply is combined with the information in lending interest rate as condensed to a single variable Mp by PCA. Although money supply seems to affect consumer prices positively and significantly, this effect was countered by the nominal lending rate. In sum price expectation and fiscal factors were seems to have a positive and significant effect on the Ethiopian consumer prices hiking.

We hope that the context under investigation is characteristic of the majority of developing countries. The majority of developing countries experience instability in the macroeconomic environment (unstable general price). Whatsoever, monetary factors, fiscal factors and price expectations seem to increase consumer prices, although the magnitude of significance is different. So, this study area may serve as a case of how different factors can contribute to price hiking. Due to the paucity of data in the developing countries context, it would be beneficial to pursue additional research in developing countries in order to set the most appropriate policies; much remains to be understood about the effect of each consumer price expectation on consumer prices using policy intervention. A drawback here is the lack of disaggregated longitudinal data in developing countries, which would allow us to see price over time and to study how changes in factors could change several years after some intervention has been made. Openly, more complete data would be recommended in order to further analyse the effect of different factors on aggregate price.

The empirical result in this study indicated by the ARDL model seems to show that, the price expectations and fiscal factors were the main causes of hiking Ethiopian consumer prices. To contain the rise in consumer prices (inflation), therefore, the government needs to reduce the import tax rate and domestic indirect tax rates such as excise tax and value-added tax on basic consumer items. Sound government policies are essential to address inflation anticipations (by providing clear information to the societies) and government policies to change public opinion.

Conflict of Interest

There is no conflict of interest.

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