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BARRIERS AND ENABLERS FOR ADOPTING CIRCULAR BUSINESS MODELS BY SMALL - TO - MEDIUM ENTERPRISES IN ZIMBABWE

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Abstract

Stakeholders in Zimbabwe are increasingly becoming concerned about resource deficiency. Most of them are now agreed that adopting circular business models (CBMs) could represent an elixir for ensuring cleaner production, moving towards zero waste, optimising resource efficiency, ensuring environmental sustainability, and more importantly increasing the returns of small to medium enterprises. The purpose of the study was extending the theory of planned behaviour to examine factors that hinder or enable SMES to adopt CBMs. Data was collected from a purposively chosen sample of 250 SMEs operating in Harare and, was analysed using

logistic regression equation with two dependent variables, adopt or not adopt. The findings show that the probability of adopting CBMs by SMEs depend on reducing technological, organisational, legislative and economic as well as social, cultural and environmental barriers. Giving subsidies and fiscal incentives may encourage SMEs to recycle, reuse, demanufacture and restore products as part of transiting towards CBMs. Such policies will also reduce the cost of producing green products and in turn, stimulating their demand. The contribution of the study is applying logistical regression equation to interrogate barriers and enablers for the adoption of CBM by SMEs operating in Zimbabwe.

Keywords: Zimbabwe, Circular Business Models, Linear Business Models, SMEs, Theory of Planned Behaviour

INTRODUCTION

The importance of SMEs to Zimbabwe's economy is well-interrogated in empirical literature. SMEs represent 90% of all business in Zimbabwe (Mataruka et al (2024; Muzurura et al., 2024), contribute at least 60% of the gross domestic product and generate 50% of employment (International Trade Centre, 2023; Muzurura, 2024; Government of Zimbabwe (GoZ), 2023). However, there is now growing recognition that the SMES should urgently transit from using linear business models (LBMs) towards circular business models (CBMs). This is because LBMs are considered to be resource inefficient, as raw materials are sourced from suppliers, transformed into finished products, sold to end consumers and discarded after the end of life (Chaudhary et al., 2023; Mutambara and Muzurura, 2023. In many studies, LBMs are also known as "cradle-to-grave" or "take-make-waste" (Guttentag et al., (2018); Patwa et al., 2021; Bocken et al., 2018; Aitku, 2020). LBMs are also criticised for assuming that natural resources are abundant, renewable, easily available and, inexpensive to dispose (Bonsu, 2020; Shao et al., 2019; Collucci and Vecchi, 2021). In contrast, CBMs, also known as cradle-to-cradle minimise waste, transform production and consumption systems and promote the regeneration and restoration of products after their shelf-life. By extending, the life of a product, CMBs decouple value creation from waste generation and in the process, closing material and energy loops in production systems (Varju et al., 2019; Santa-Maria et al., 2021; Kirchherr et al., 2018). Zimbabwe has not been spared from the adverse impact of climate change and global warming. Therefore, the need to promote business models in SMEs that are cyclical and regenerative has become very urgent to reduce carbon footprint, a major consequence of LBMs. Some of the direct benefits that comes with the adoption of CBMs include addressing profligate production systems in SMEs (Christensen, 2021; D'Agostini et al., 2020; Elzinga et

al., 2020), promoting resource sufficiency and eco-effectiveness (Kumar et al., 2021; Chauhan et al., 2021; Chaudhary et a., 2021), speeding up exnovations of unsound business practices and technologies (Milios, 2021; De-Angelus et al., 2018; Gaur et al., 2018); Geissdoerfer et al., (2018); Yang et al., 2018); Sahu et al., 2020; Oghazi, 2021), ensuring resilience of socio-ecological systems through biomimicry (Baldisseri et al., 2020; Bressanelli et al., 2018; Bocken et al., 2020; Ellen et al., 2015), extending product and natural resources value (Moktadir et al., 2020; Nogueira et al., 2020), enlarging industrial symbioses (Dhir et al., 2021a; Donner et al., 2021; Guldmann and Huulgaaard, 2020; Patwaa et al., 2021), balancing off growth rates of urbanisation and industrialisation (Hobson, 2020; Sahu et al., 2020; Dhir et al., 2020), promoting high value material cycles in production systems (Brunnhofer et al., 2020; Chauhan et al., 2021; Olsson et al., 2018Palmie et al., 2019), and increasing resource flows roundput through reuse, restore and recycle strategies (Dokter et al., 2021); Bertassini et al., 2021; Pesce et al., 2020; Pathak and Endayilalu, 2019)

Some of the principal activities associated with CBMs include addressing renewability of products, upgrading production systems, reusing remanufacturing of products to ensure longevity of product use, cascading consumption behaviour and, and dematerialising raw materials in manufacturing processes (Patwaa et al., 2021; Cantu, 2021; Bonsu, 2020; Atiku, 2020; Yang et al., 2018). There are no formal estimates of the economic damages caused by LBMs in Zimbabwe. However, a critical concern relates to the sustainability of SMEs, especially the long-term impact of LBMs on promoting equality within and between generations. SMEs activities in Zimbabwe are fragmented and largely unregulated. Hence, the process of adopting CBMs by SMEs may require significant socio-economic reconfiguration to manage the way SMEs behave and interact with consumers.

Recent studies in other developing economies reveal that most consumers are becoming more sensitive to the impact of LBMs on the natural environment (Gupta et al., 2019; Hussain and Malik, 2020; Jabbour et al., 2020; Werning and Spiner, 2020). Prior studies also demonstrate that most consumers are willing to change their consumptive habits, behaviours, attitudes and cultural beliefs and are likely to support SMEs that embrace CBMs (Edbring et al., 2019); Bonsu, 2020; Cantu, 2021; Sahu et al., 2020; Palmie et al., 2019). Very few studies have been done to understand the barriers that hinder the adoption and implementation of CBMs by Zimbabwe's SMEs. In Zimbabwe, SMEs have been reported to have higher waste generation, lower rates of recyclability, and lower product reusability when compared to SMEs in other developing economies (Muzurura, 2024; Mutambara and Muzurura, 2023). Hence, the purpose of this study is to modify the extended theory of planned behaviour to understand factors that hinder the adoption and implementation of CBMs by SMEs in Zimbabwe. The study is

significant for three main reasons; first, the concept of CBMs is founded on achieving resource efficiency and eco-efficiency (Blomsma et al., 2019; Mallory et al., 2021; Kraus et al., 2021; Kumar et al., 2021). Therefore, the adoption of CBMs by Zimbabwe's SMEs might enable the country to balance environmental sustainability and national development. Adopting CBMs may assist the country not only to reduce inputs of virgin materials in production systems and processes, but to increase resource throughput in production processes of SMEs. Second, CBMs are built on the basis of sustainable use of raw materials, product reusability and restorative capacity of natural resources. If SMEs adopt CBMs they are likely to minimise value destruction in the overall production and consumption chains. Third, CBMs apply material cycles, renewable and cascade-type energy flows (Bocken et al., 2020; Dhir et al., 2021; Oghazi and Mostaghel, 2018). Consequently, SMEs that adopt CBMs are likely to increase energy throughput flows by combining high value material cycles and traditional recycling and remanufacturing systems. Through the multiplier effect, the adoption of CBMs may reduce the country's exposure to systematic risks such as higher resource prices' volatilities and supply-chain disruptions. In addition, the adoption of CMBs may allow SMEs in Zimbabwe to achieve a precise balance among performance, profitability and environmental impact. Against this background, the main purpose of the study is to embed logistic regression analysis into the theory of the planned behaviour to explore barriers and enablers for the adoption of circular business models by SMEs in Zimbabwe.

LITERATURE REVIEW

Theoretical Literature Review

A number of theories that have been applied in literature to explore the adoption behaviour of SMEs. These theories include the consumer preferences theory, personal construct theory (Catulli and Reed, 2017; Kelly,1955), the cognitive involvement theory (Andrews et al., 1990; Ertz et al., 2017; Houston and Rothschild, 1978), the actor network theory (Latour (1999; Petersen and Riisberg, 2017), the theory of reasoned action (TRA) (Ajzen, 1991), the Lancaster's model and the means-end theory (Arnould and Thompson, 2005), the simple expectancy-value theory (Santamaria et al., 2016, the stakeholder theory (Chiappetta Jabbour et al., 2020), transaction cost economics (TCE) (Dossa et al., 2020), the resource-based view (Jakhar Suresh et al., 2019) and the theory of planned behaviour (TPB) (Ajzen, 1991). The TPB asserts that the behavioural intention to perform certain behaviours such as adoption of new business models can be predicted with high accuracy from various factors including; attitudes toward the behaviour, subjective norms, self-identity, affective beliefs, self-efficacy and perceived behavioural control and perceptions of behavioural control (Abbey et al.,

2015; Ajzen, 1991, Cantu, 2021; Shao et al., 2021a; Sarja et al., 2021). Besides the wide use of the TPB in social and psychological studies, this theory has not been widely used in business and economic sciences especially in studies that focus on SMEs in Zimbabwe.

Empirical Literature Review

A CBM is defined as an organisational ecosystem that create, capture and deliver value by expanding products' useful lives through remanufacturing, repairing or designing long-life products (Govindon and Hasanagic, 2018; Oghazi and Mostaghel, 2018; Bocken et al., 2020; Kirchherr et al., 2019) report that in a CBMs, materials and products are used, recycled and recovered instead of being discarded after use. CBMs embrace a number of issues such as industrial ecosystems (D'Agostini et al., 2020; Patwa et al., 20212; Shevchenko et al., 2020' Kazancoglu et al.,2020; Kumar et al., 2021; Avila-Gutierrez et l., 2021), product services systems and cleaner production processes (Dhir et al., 2021; Elzinga et al., 2020; Chauhan et al., 2021; Cantu, 2021; Ranta et al., 2018), sufficiency, eco-efficiency and eco-effectiveness (Gaur et al., 2018; Gupta et al., 2019; Paletta et al., 2020) resilience of socio-ecological systems (Hobson, 2021; Ingemarsdotter et al., 2020; Bocken et al., 2019), performance economy (Muzurura et al., 2017; Hopkinson et la., 2018; Hussain and Malik, 2020), concept of zero emissions (Collucci and Vecchi, 2021; Jabbour et al., 2020), natural capitalism (Blomsma et al., 2019; Aitku, 2020; Yu et al 2021a), and economic growth potential (Ellen et al., 2015; Zucchello and Previtali, 2019; Vermunt et al., 2019; Kraus et al., 2021). Edbring et al (2016) demonstrate five types of CBMs that can be used by SMEs as circular supplies, resource recovery, product life extension, sharing platforms, as well as products and services. Bocken et al (2016) also report CBMs strategies as extending product value, encouraging sufficiency, extending resource value, and industrial symbiosis. Many studies demonstrate that CBMs contribute to sustainable economic growth and development (Cho et al., 2017; Khodro and Hazen, 2017; Lutz et al., 2017; Neto et al., 2017; Pappas, 2017), create environmental quality (Huber, 2017; Gruen, 2017; Booker and Meelen, 2017), and improve economic prosperity and social equity (Guttentag et al., (2018); Hwang and Griffiths, 2017; Catulli et al 2017a; Iran and Schrader, 2017; Booker and Meelen, 2017; Abdar and Yen, 2017; Lan and Armstrong, (2018)). CBMs must not always about resource efficiency but about sustainable development with companies and consumers acting as enablers (Dhir et al., 2021a; Donner et al., 2021). CBMs solve problems such as how to use remanufactured and demanufactured products (Chauhan et al., 2021; Brunnhofer et al., 2020; Sehnem, 2019; Repo et al., 2018), how to develop product and services systems (Blandhini et al., 2019; Baldisseri et al., 2020), how to promote a sharing economy (Abbey et al., 2017; Binninger and Ourahmoune, 2015; Evans, (2018), and how to

maximise collaborative consumption in a society (Cantu, 2021; Bonsu, 2020)). CBMs are also concerned with resource sufficiency by ensuring product durability, upgradability, reparability and re-manufacturability of products (Patwaa et al., (2021); Bauwans et al., (2020)). Resource sufficiency implies the rejection of designed obsolescence and increased marketing efforts to boost sales before the end of the technical lifetime of products (Wieser, 2016). In CBBs, re-manufacturing of products is concerned with reuse processes, restoration or replacement of components that are not useful anymore (Catulli et al., 2017). Remanufacturing products help to create products that are comparable to similar new products (Hobson et al., 2016).

A number of factors have been advanced for hindering the adoption of CBMs. These include government policies, institutions, structures and anti-consumption behaviour (Cantu, 2021; Patwaa et al., 2021; Dhir et al.,2020; Sarja et al., 2021; Kraus et al., 2021); cultural and social factors (Hobson, 2020; Govindon and Hasanagic, 2018; Hopkinson et al., 2018; Yang et al., 2018; Yu at al., 2021), consumer and producer behaviour (Patwaa et al., 2021; Wierser and Troger, 2018; Shao et al., 2021), psychological existentialism and indent creation (Lee and Kim, 2018); Bocken et al., 2019), cognitive biases (Singh and Giacosa, 2019)) and green self-identity, voluntary simplicity, self-congruity and perceived value (Confente et al.,2019; Xie et al ., 2019); organisational and financial barriers (Jensen et al., 20219; Singh et al., 2021; Russel et al., 2019; Mishra et al., 2019; Confente et al., 2019)).The extant argues that the possibility of extending the TPB into a dual-process of attitude-behavioural relations in SMEs can enrich empirical literature in business sciences. After the introduction and background, the rest of the paper is organised as follows; Part 1 provides an overview of studies that examined the adoption of circular economy. Part 2 describes the methodology of the study. Part 3 discusses research model and hypothesis development. Part 4 presents a summary and discussions of the main findings. Section 5 presents recommendations and conclusions.

Theoretical Framework and Hypotheses Development

We specify a theoretical demand for the adoption of CBMs by SMEs in Zimbabwe as in equation 1

$$CBM = H\,(Y) \qquad \text{(a)}$$

Where,

CBMs depicts circular business models and *Y* is a vector of factors that influence the adoption CBMs by SMEs in Zimbabwe. The elements of *Y* can be into sub-sectoral vectors representing legislative and economic barriers (LEB), technological related barriers (TRB), and consumer-related barriers (CRB), organisational related barriers (ORB) and social, economic and environmental barriers (SCEB)

Expressing equation (1) as a functional form result in equation 2.

$CBMs = F\ (LEB, TRB, CRB, ORB, SCEB)$ (b)

We can express equation (b) as a linear regression shown in (c)

$CBM = a_0 + \gamma_1 LEB + \gamma_2 TRB + \gamma_3 CRB + \gamma_4 ORB + \gamma_5 CRB + \varepsilon$ (c)

We argue that the adoption of CBMs by SMEs is not a linear process but that each SME can either decide to adopt or not to adopt these models. This implies the use of linear probability model or some form of binary choice models such as Tobit, Logit and Probit. Model. The paper disregard the use of linear probability model since it does no guarantee that the probability of adopting or not adopting CMBs will not lie between 1 and 0. We thus transform equation (c) to a logistic multiple regression in the form of the logit model.

Starting from a logit regression equation we get equation 4;

$P_i = H(Y = 1IY_i) = \gamma_i + \gamma_2 Y_i$ (d)

Where,

P_i is the probability of an SME adopting or not adopting a CBM. This probability depends on a set of variables denoted by Y_i. Equation (d) can be expressed into a more familiar cumulative logistic function;

$\Pr(y_i = 1|y_i) = \frac{e^{y_i\partial}}{1+e^{y_i\partial}} = \frac{1}{1+e^{-\partial y_i}} = \Lambda(y_i^{\partial})$ (e)

Where,

$y_i\partial$ is just a linear function of some kind which if substituted in G: $\Re \twoheadrightarrow (0,)$, that G is a probability function that takes values between 0 and 1. After some mathematical manipulation we get the following likelihood function;

$\mathcal{L} = \prod_{1=1}^{N} \Lambda\,(y_i\partial)^{y_i}[1 - \Lambda(y_i\partial)]^{1-y_i}$ (f)

We can linearize equation (f) by assuming natural logs to get equation (h)

$ln\mathcal{L} = \sum_{i=1}^{N}(\,y_i \ln[\Lambda(y_i\partial)] + (1 - y_i)\ln\,[1 - \Lambda(y_i\partial)]$ (h)

Substituting equation (h) into equation (e) we obtain equation (i);

$ln\mathcal{L} = \sum_{i=1}^{N}\left\{y_i ln\left[\frac{1}{1+e^{-\partial y_i}}\right] + (1 - y_i) ln\left[1 - \frac{1}{1+e^{-\partial y_i}}\right]\right\}$ (i)

Final Model Specification

The Y_i in the linear predictor in equation (i) can be expanded into a more general and familiar regression equation j:

$P\ (h = 1/Y) = H\{(LEB, TRB, CRB, ORB, SCEB)\}$ (j)

Where,

$P\ [h = 1\ /\ Y]$ is the probability that a SME may adopt A CBM or not

$$P\left(CBM = \frac{1}{Y}\right) = a_0 + \partial_1 LEB + \partial_2 TRB + \partial_3 CRB + \partial_4 ORB + \partial_5 SCEB + e_t$$

Hypothesis Development

Legislative and Economic-related Barriers (LEB)

Policy elements such as taxation, subsidies, price controls and regulations drive the adoption of CBMs (Trigkas et al., 2020; Mishra et al., 2019; Reim et al., 2019). As observed by Urbanati et al (2021) policies relating to recycling, remanufacturing and reusing motivate organisations to implement CBMs. Frequent changes in government policies and the absence of policies that incentivise firms to recycle, reuse, remanufacture and restore products significantly makes it difficult for small firms to adopt and implement SMES (Brunnhofer et al., 2021; Guldmann and Huulgaaard, 2020; Russell et al., 2020). Policies that allow firms to transit from LEMs to CBMs such as those that reduce material and waste management costs, promote end-of-life product management, and cleaner production eliminate price volatility and uncompetitive prices of recycled products are known to support the adoption of CBMs (Paletta et al., 2019; Kumar et al., 2019; Patwa et al., 2021). Studies also establish that lack of sound legislations, environmental laws, regulations, compliance monitoring and lack of support for SMEs pose significant barriers to the implementation of CBMs in developing economies (Hagejard et al., 2020; Gusmerotti et al., 2019; Nishijima et al., 2020). The following hypothesis is adopted.

H_1: There is a positive relationship between cultural factors and government policies in Zimbabwe.

Organisational related barriers (ORB)

Organisational barriers to adoption and implementation of CMBs include poor leadership, insufficient organisational structure and lack of innovative culture within the organisations (Nogueira et al., 2020; Hagejard et al., 2020). Employment know-how, organisational culture, mind-set and commitment can smoothen an organisation's transition to a CBM (Bocken et al., 2019). According to Linder and Williander (2017), complexities in CBM arise from remanufacturing, recycling and refurbishing products, hence, financial risk as an organisational barrier is higher in CBMs. Current literature acknowledge financial risks as an organisational barrier posing significant barriers to the adoption of CBMs (Kirchherr et al., 2018; Brunnhofer et al., 2020; Bianchini et al., 2019). Adopting CBMs require huge investment in technology, employee training and reconfiguration of production processes (Ranta et al., 2018; Werning and Spiner, 2020; Sehnem, 2019). In addition, the profitability of remanufactured or recycled products depends on market demand, which is difficult to forecast and consequently becomes a major organisational barrier to the adoption

of CBM (Narimissa et al., 2020). However, other studies show that CBMs have the potential to reduce raw material costs and generating more revenue from remanufactured products, and hence have the potential to drive SMEs to invest in CBMS (Jensen et al., 2019). We thus propose the following hypothesis.

H_2: Organisational-related barriers positively influences the adoption of circular business models by SMEs in Zimbabwe

Technological-related Barriers (TRB)

In most CBMs, technology is a critical requirement for the successful adoption of CBMs (Jabbour et al., 2018; Donner et al., 2021; Kumar et al., 2021). Studies show that technologies such as cloud management, cyber-physical systems, artificial intelligence support the implementation of CBM. The absence of an organisation's technological capacity the ability of the organisation to access important resources has been reported to affect the implementation of CBMs (Ageyemang et al., 2019; Hussain and Malik, 2020; Ingemarsdotter et al., 2020). For example, priori researches demonstrate that when SMEs lack technical information regarding new business innovations such as remanufacturing or/and recycling process of products this may hinder the transition from LES to CBMs (Collucci and Vecchi, 2021; Olsson et al., 2018; Oghazi and Mostaghel, 2018). Hence, the hypothesis;

H_3: Technological-related barriers have a positive relationship with the probability of adopting CBMs by SMEs in Zimbabwe.

Consumer-related Barriers (CRB)

In CBMs consumers are expected to be dynamic participants in reusing products in their daily lives. The choice by a consumer to buy and use recycled products depend on various attributes such as green self-identity, design, price, quality, durability and also the consumer's own perceptions (Muzurura et al., 2023; Chauhan et al., 2021; Avilla-Gutierrez et al., 2020; D' Agostin et al., 2020). However, studies also establish that some consumers may regard products produced by CBMs as expensive and thus may not want to purchase such products in the presence of affordable substitute products (Bonsu, 2020; Milios, 2021; Sarja et al., 2021). In addition, most products produced in CBMs may need consumers to change their lifestyles and consumption behaviour. Many studies show that most consumers in developing countries have wrong perceptions about remanufactured, recycled or refurbished products by deeming them unreliable (Yu at al., 2021; Mallory et al., 2021; Kumar et al., 2021; Kazancoglu et al., 2021).

The concept of CBMs has started gaining traction in Zimbabwe's SMEs and most consumers are also not aware.

H_4: Consumer related barriers positively affect the probability of implementing CBMs by SMEs in Zimbabwe.

Social, cultural and Environmental barriers

Social, cultural and environmental factors have been reported as significant barriers to the adoption of CBMs by SMEs. Social and environmental factors refer to resource shortages and potential adverse environmental effects wrought by business operations, which can drive companies to implement the CBMs (Jakhar et al., 2019; Linder and Williander, 2017; Murray et al., 2017; Urbanati et al., 2021). CE practices enable firms to minimise business operation risks and promote environmental safety ().D'Agostini et al. (2020) recognised environmental concerns and healthy lifestyles as enabling forces for CEBM. CBMs are practices that are considered an opportunity to address environmental safety concerns and minimise business operation risk (Esken et al., 2018; Jakhar et al., 2019). We thus adopt the following hypothesis.

H_8: Social, cultural and environmental factors influence the probability of SMEs adopting CBMs in Zimbabwe.

METHODOLOGY

For the purposed of the study, a descriptive research design was adopted. A structured questionnaire was utilised to collect data from a purposively selected sample of 250 SMEs operating in Harare. The questionnaire was first pre-tested on 10 respondents who provided positive feedback that was used to refine the final questionnaire. The final questionnaire consisted of 15 questions all focusing on the adoption process of a CBM. A five-point Likert Scale was utilised to measure the responses with 1 as strongly disagree and 5 as strongly agree. 60% were male from the 20 to 50 age group, and the rest being females. The data was analysed using Stata version 14.0.

FINDINGS AND DISCUSSIONS

The section below discusses descriptive statistics, multicollinearity, the logit regression output, the log odds ratio and the marginal effects.

Descriptive Statistics

Table 1 shows that social, cultural and environmental factors have the highest standard deviation whilst legal and economic factors have the least.

Table 1: Descriptive Statistics

Barriers	Observation	Standard deviation	mean	min	max
LEB	250	1.23	80.55	45	80
ORB	250	4.55	5.50	23	65
TRB	250	1.30	10.25	15	50
CRB	250	4.25	7.25	20	45
SCEB	250	12.45	35.45	35	70

NB: LE-legal and economic barriers, OB-organisational barriers, TB-technological barriers, CB-consumer related barriers and SCE-social, cultural and environmental related barriers

Multicollinearity Test

As shown in Table 2, there is no correlation among all the factors since the threshold for Pearson correlation is 0.80. This table shows that the individual effects of the independent variables can be isolated.

Table 2: Multicollinearity Tests

Barriers	hLEB	hORB	hTRB	hCRB	hSCEB
hLEB	1.00				
hORB	2.55	1.00			
hTRB	2.21	0.08	1.00		
hCRB	1.35	0.55	-0.15	1.00	
hSCEB	-1.22	0.05	1.65	0.02	1.00

Logit Regression Output

Table 3 shows the logit regression output where legislation and economic related barriers, organisational barriers, technologic factors, consume-related barriers and social, cultural and environmental related barriers are all statistically significant. Legislative and economic factors. Organisational barriers and social, cultural and environmental related barriers have negative coefficients implying that increasing these factor by a unit will reduce that adoption of circular business models by SMEs in Zimbabwe. On the other hand, technology and consumer-related barriers are statistically and positive suggesting that increasing these factors by a unit increase the probability of adopting CBMs by Zimbabwe's SMEs.

Table 3: Logit regression output

Factor	Coefficient	Std. Error	Z	P>Z
hLEB	-0.05	0.02	-5.07	0.00*
hORB	-0.01	0.05	-4.56	0.02**
hTRB	0.07	0.01	3.25	0.01**
hCRB	0.15	0.06	4.60	0.00*
hSCEB	-0.04	0.02	4.66	0.04**
Pseudo R-squared= 0.10				
Prob>Chi-square =0.00				
Loglikelihood= --35				
No of observation =250				
LR chi2(13) = 50.25				

*Significant at 99% level, **significant at 95% percent level

Log Odds Ratios

The odds ratios show how a change in a unit increases the odds of an SME adopting a CBM. As shown in Table 4, the odds ratio of legislative and economic related barriers is 1.05 indicating that that a unit increase in this factor increases the adoption of CBM by 1.05. The odds ratio for organisational related barriers is 95% showing that a 1% in this factor decreases the adoption of CMBs if SMEs face organisational related barrier such as lack of resources both physical and human capital. Technological related barriers have an odds ratio of 0.85 suggesting that 1% change in the odds of adopting a CBM decreases by 75% if SMES are not exposed to innovations that allow for recycling, remanufacturing or repurposing products they produce. The odd ratio of consumer related barriers is 0.35, hence a 1% change in consumer-related barriers decreases the adoption of CBM by SMES a Cultural factors have an odds ratio of 0.74, hence a 1% change in the odds of adopting CBM. A unit change in social, cultural and environmental related barriers increases the odds of adopting CBMs by a factor of 1.45.

Table 4: Log Odds ratios

Factor	Odds Ratio	Std. Error	Z	P>Izl
LEB	1.05	0.01	-4.05	0.00
ORB	0.95	0.08	-4.25	0.02
TRB	0.75	0.05	5.45	0.05
CRB	0.35	0.07	2.99	0.00
SCEB	1.45	0.12	4.13	0.01

Marginal Effects

Studies that have utilised logit equations demonstrate that interpreting marginal effects is necessary to support discussions of findings (Cameron and Trivedi, 2009). The marginal effect shows the magnitude of the effects of changes on the independent variable. Marginal effects are discussed using Table 5.

Table 5: Marginal effects

Barrier	dy/dx	Std. Error	Z	P >|z|	Mean
hLEB	1.30	0.08	-3.50	0.01	100.43
hORB	-0.10	0.05	-6.20	0.00	45.65
hTRB	-1.20	0.01	3.01	0.01	60.25
hCRB	-1.05	0.01	2.99	0.06	80.00
hSCEB	-0. 85	0.10	4.04	0.00	90.50
Marginal effect after logit y=Pr(CMBs/(predict=0.90					

[*] dy/dx is for discrete change of dummy variable from 0 to 1

If legislative and economic (LE) related barriers support the adoption and implementation of CBMs the probability of adopting these models increase by a factor of 1.45. If SMEs adopt CBMs they may achieve economies of scale by saving production costs through reusing, recycling and using less materials, components and products. Many priori studies also demonstrate that government policies such as offering tax incentives and subsidies may help SMEs to adopt CBMs (Atiku, 2020; Milios, 2021; Vermunt et al., 2019; Yu et al., 2021). The coefficient of organisational related barriers (OB) is -0.10 indicating that reducing organisational barriers can increase the probability of adopting CMBs by 10%. This finding has support in empirical literature (Sarja et al., 2021; Kumar et al., 2021; Kirchherr et al., 2019). Technological barriers (TB) has a coefficient of -1.20, hence increasing OB by one unit reduces the probability of SMEs adopting and implementing CBMS. Transiting from LEs requires enabling technologies that support product designs, revamp supplier value chain designs (Bocken et al., 2019; Baldisseri et al., 2020; Kazancoglu et al., 2021). Reducing consumer related barriers increases the probability of SMEs adopting CBMs. The transition to CBMs depends on the acceptability of reused, recycled and remanufactured products by consumers. Even though recycled or remanufactured products may appear attractive for consumers at a point in time, it may be difficult to forecast future sales due to evolving cost structures, changing consumer preferences and technological development. Studies also confirm that if consumers find these products

expensive and also perceive them as of lesser quality they may be reluctant to adopt them (Blomsma et al., 2018; Bocken et al., 2020; Patwa et al., 2021). The coefficient of social, cultural and economic (SCE) barriers is negative and statistically significant at 99% level of confidence. If SCE barriers are reduced by 1% the probability of adopting CBMs by SMEs increases by 85%. Recyclable packaging, components and products need to be returned for repurposing and if consumers do not return them after productive life, the cycle will not be closed (Oghazi and Mostaghel, 2018). This suggests the importance of consumers changing the social and cultural behaviour towards consuming recycled products.

RECOMMENDATIONS

The findings suggest a number of recommendations. The government should come up with policies that reduce legislative and economic related barriers in Zimbabwe. Transiting to CBMs may be very expensive for small-to-medium enterprises that are already burdened with high production costs. Providing fiscal incentives and subsidies to SMEs may assist them in reducing the costs of production, and also to access technological innovations required in circular business models. Policies that encourage big firms to partner with SMEs can also help to reduce organisational, financial and technological related barriers that confront most SMEs in Zimbabwe. The adoption of CBMs by Zimbabwe's SMEs is still at embryonic stage in Zimbabwe. Whilst SMEs may embrace CBMs, consumers may also be reluctant to demand the products. The government is encouraged to subside the cost of production to make the products competitive and affordable without compromising quality, reliability and durability. To ensure that SMEs safely adopt CBMs, the government can also provide financial support such as guaranteeing lines of credit for green funding instruments such as carbon credits and bonds. These financial instruments may facilitate the effective adoption and implementation of CBMs hence, enabling SMES to implement ecological innovations as well as energy-saving technologies which may not be available in Zimbabwe.

CONCLUSIONS

Circular business models may be defined as a business systems whose major aim is to replace the end-of-life concept associated with linear business models with a cradle-to-cradle processes that promote recycling, restoring and reusing of materials during production, distribution and consumption processes. The paper investigated barriers that hinder SMES from adopting circular business models in Zimbabwe, given that SMEs have become critical actors in Zimbabwe's strategy for economic growth and national development. This study recommends reorienting government policies to provide fiscal incentives, subsidies and green financing

instruments to SMEs. This might enable SMEs to transform their production systems to ensure environmental sustainability, eco-efficiency and resource sufficiency, key issues in CBMs. The study relied on a binary choice model and assumes that SMEs can either adopt or not adopt Circular business models. This is a limitation is the scope of the study as it is possible to have many choices such as adopting, deferring the adoption, not adopting first and later adopt. For this and many other reasons, future study may want to explore the use of multinomial regression models with more than two dependent variables. In addition, future studies may also want to apply both qualitative and qualitative approaches to broaden the scope of the study through triangulation of findings.

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