

Determining factors of eco-innovation adoption: An empirical study of micro and small enterprises in Johannesburg, South Africa.

Kiru Sichoongwe | Postdoctoral Research Fellow
South African Research Chair (SARChI) in Industrial Development



the dtic

Department:
Trade, Industry and Competition
REPUBLIC OF SOUTH AFRICA



TRADE & INDUSTRIAL POLICY STRATEGIES



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TIPS FORUM 2024: Small business, inclusive growth and industrial policy in South Africa

Presentation Outline

- INTRODUCTION
- STUDY OBJECTIVES
- THEORETICAL FRAMEWORK
- METHODS
- FINDINGS
- POLICY IMPLICATIONS

1.0 INTRODUCTION

- The world is faced with major environmental problems like climate change.
- Innovative solutions and environmentally friendly technologies are needed to prevent/decrease the effects of such problems.
- Eco-innovation: "business models which support the development of products and services (systems) with environmental benefits, reduce resource use/waste, and are economically viable" (Machiba, 2012, p.8).

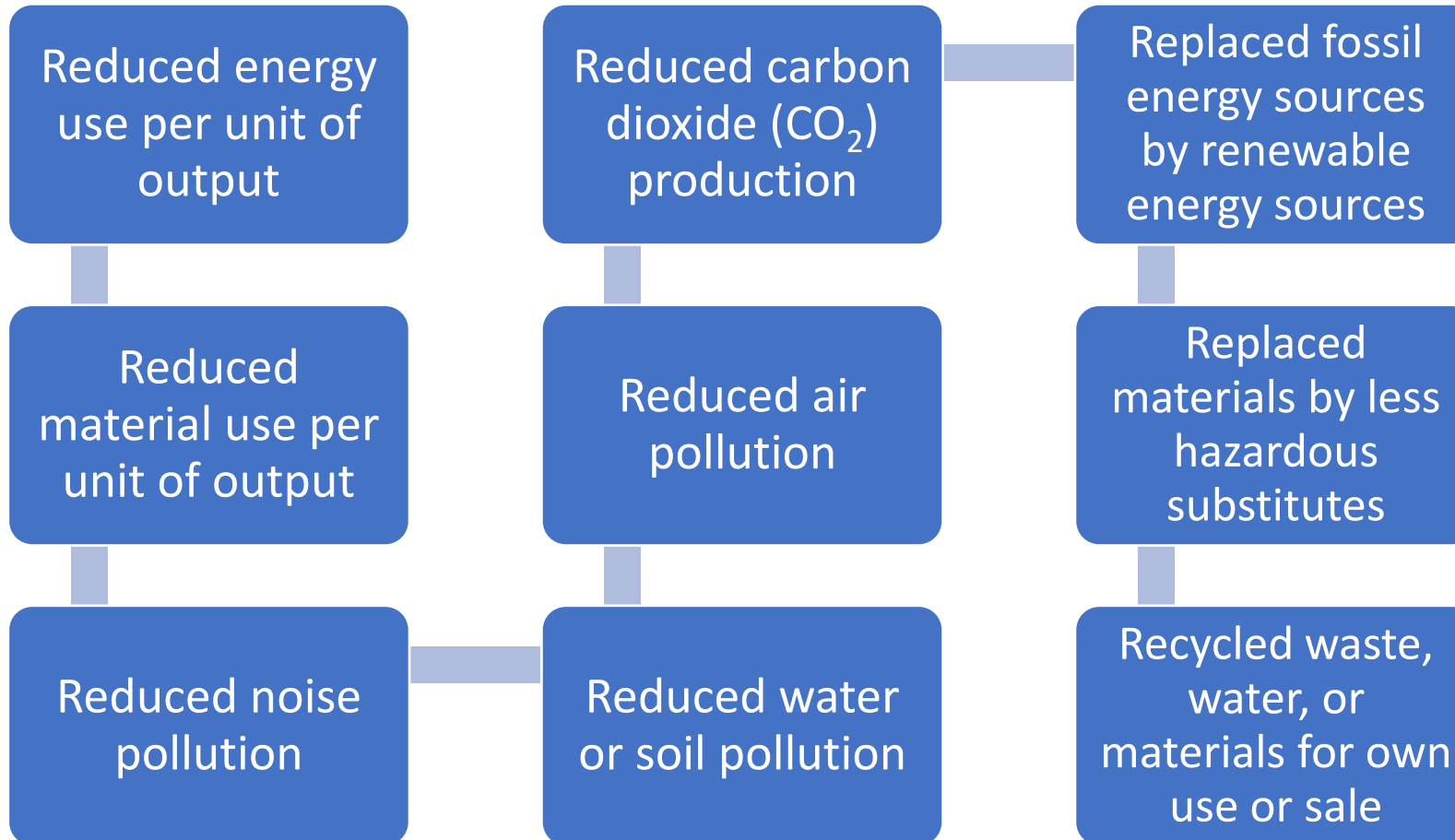
INTRODUCTION...

- Eco-innovation is the cutting-edge method for addressing environmental issues. It provides options to support industrial activity (Aboelmaged & Hashem, 2019).
- The subject of eco-innovation in relation to micro and small enterprises (MSEs) is still in its infancy and merits greater attention, particularly given the significance of these businesses to the economic systems of various countries (Passaro *et al.*, 2022).
- MSEs serve as the backbone of the industrial systems of many countries, creating 90% of jobs while contributing more than 60% of all pollutants (OECD, 2019).

INTRODUCTION...

- Due to these reasons, further research is necessary to fully understand the factors that influence MSEs' adoption of eco-innovation, to help quicken the advancement of eco-innovative techniques, and enforce the beneficial externalities produced by these firms for the entire socioeconomic environment.
- There is a dearth of research on the adoption of eco-innovation in South African business enterprises. This research was a response to fill this critical knowledge gap.
- Gaining an understanding of the driving dynamics behind eco-innovation may assist policymakers in developing appropriate measures that would promote its development and acceptance in the economy's industrial sector.

BENEFITS OF ECO-INNOVATIONS



2.0 OBJECTIVES

2.1 Study Objective

- To determine the factors that influence the adoption of eco-innovation technologies by micro and small enterprises in Johannesburg, South Africa.

2.1 THEORETICAL BASIS

- **(i) Natural Resource-based View (NRBV) Theory**

- **(ii) Innovation Diffusion Theory (IDT)**

(i) Natural Resource-based View

- **Pollution prevention:** to minimize emissions, effluents and waste.
- **Product stewardship:** integrates stakeholders' perspectives and consider the voice of the environment into product design and development processes.
- **Sustainable development:** promotes the consideration of economic, environmental and social issues on a global scale.

(ii) Innovation Diffusion Theory

- **Knowledge:** Characteristics of the decision making unit e.g s socio-economic, communication behaviour etc.
- **Persuasion:** Perceived characteristics of the innovation eg. Relative advantage, compatibility, complexity etc.
- **Decision:** firms decide whether to adopt or reject the innovation.
- **Implementation:** an innovation is put into practice.
- **Confirmation:** continued adoption or Discontinuance.

3.0 METHODS

- As a way to determine the drivers of eco-innovation adoption, a probit model was used. The dependent variable is binary in nature (eco innovation adoption).
- With the use of qualitative response models, one can relate multiple independent variables to the likelihood of an event. When examining MSEs' characteristics linked to adoption choices, such models are frequently helpful (Gujarati *et al.*, 2015).
- The values of the binary dependent variable are zero and one. The probit analysis yields statistically significant findings of the independent variables that increase or lower the likelihood of adoption (Gujarati, 2015).

METHODS...

- Following Greene (2018) we specify the Probit model as:

$$y_i^* = X_i\beta + \varepsilon_i \quad (1)$$

- Where X_i is the vector of independent variables, β is a vector of parameters to be estimated, and ε_i is the error term. The relation between y^* and the binary dependent variable y_i is expressed as follows:

- $$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} \quad (2)$$

- Where $y_i = 1$ when an enterprise i adopts an eco-innovation, $y_i = 0$ when an enterprise i does not adopt an eco-innovation. The errors of y_i^* are assumed to be normally distributed.

3.1 Sources of Data

Data Type

- Secondary data was used, from the survey "Innovation in micro and small enterprises in Johannesburg".

Sample Size

- This survey was conducted in 2022, by the University of Johannesburg (UJ). The survey covered 1,021 MSEs firms.

Aim of the Survey

- The aim of this survey was to learn more about the challenges that businesses encounter and about the environment in which they operate.

4. FINDINGS

- **(i) Table 1: Descriptive statistics**
- **(ii) Table 2: Probit Regression Estimates for the Determinants of Eco-Innovation**

(i) Table 1: Descriptive statistics

Variable	Measurement	Mean	Std. Dev.
Dependent variable: Adoption			
Adoption	Dummy =1 if the business enterprise adopted eco-innovation, 0 otherwise.	0.059	0.235
Gender	Dummy = 1 if the owner of the business is male, 0 otherwise.	0.925	0.644
Age_manager	Continuous variable indicating the age in years of the manager for the firm.	41.117	11.798
Experience	Work experience of the manager in the sector (years)	14.146	10.024
Firm_affiliation	Dummy =1 if the business enterprise belongs to any business association, 0 otherwise.	1.951	0.272
Age of the enterprise	Continuous variable showing the duration in years an enterprise has been in business.	12.856	10.47
No. of employees	Total number of employees at the end of the fiscal year 2022.	4.312	3.082
Innovation_new products	Dummy = 1 if firm innovated by introducing new products (FY2022).	0.358	0.48
Innovation_improved products	Dummy = 1 if firm innovated by introducing improved products (FY2022).	0.169	0.375
Innovation_new services	Dummy = 1 if firm innovated by introducing new services (FY2022).	0.021	0.142

Variable	Measurement	Mean	Std. Dev.
Innovation_Improved services	Dummy = 1 if firm innovated by introducing improved services (FY2022).	0.029	0.169
R&D activities	Dummy = 1 if business enterprise engaged in Research and Development (R&D) activities for innovation (FY2022).	0.025	0.158
Environmental taxes	Dummy = 1 if existing environmental taxes played a significant role in the business enterprise's decision to introduce eco-innovations between March 2019 and February 2022.	0.093	0.291
Govt. subsidies	Dummy = 1 if government subsidies for environmental innovations played a significant role in the business enterprise's decision to introduce eco-innovations between March 2019 and February 2022.	0.038	0.192
Env. Regulations	Dummy = 1 if existing environmental regulations played a significant role in the business enterprise's decision to introduce environmental innovations between March 2019 and February 2022.	0.265	0.442
Market demand	Dummy = 1 if current or expected market demand for environmental innovations played a significant role in the business enterprise's decision to introduce eco-innovations between March 2019 and February 2022.	0.012	0.108
Enterprise reputation	Dummy = 1 if improving the enterprise's reputation played a significant role in the business enterprise's decision to introduce eco-innovations between March 2019 and February 2022.	0.007	0.083

Table 2: Probit Regression Estimates for the Determinants of Eco-Innovation

Variables	Marginal effects (dy/dx)
Innovation_new products	0.044**
	(0.019)
Innovation_improved products	0.081***
	(0.039)
Innovation_new services	0.059
	(0.073)
Innovation_improved services	0.095**
	(0.076)
R&D activities	0.062**
	(0.051)
Environmental taxes	0.181***
	(0.059)
Govt. subsidies	0.124***
	(0.065)
Env. regulations	-0.003
	(0.007)
<i>Number of obs</i>	1,021
<i>LR chi2</i>	206.87
<i>Prob > chi2</i>	0.0000

4.1 Summary of the Findings

Environmental tax

- Environmental tax has a positive influence on eco-innovation adoption.
- This is consistent with earlier studies that environmental taxes can promote eco-innovation adoption by business enterprises (Krass et al., 2013; Zheng *et al.*, 2023).

Government subsidies

- Government subsidies have a positive relationship with eco-innovation adoption.
- The findings are consistent with those of (Ren et al., 2021; Wang et al., 2021) in which a positive result was reported between subsidies and the adoption of eco-innovation by enterprises.

Research & Development (R&D) activities

- (R&D) activities have a positive influence on the adoption of eco-innovation).
- These results conform to those of other previous studies by Ale Ebrahim *et al.* (2008). Dimakopoulou *et al.* (2022) and Ha *et al.* (2022) which indicate that R&D spending activities are positively associated with eco innovation adoption.

5.0 POLICY IMPLICATIONS

- Policy measures should design an environmental tax with the same scope as the environmental damage it is intended to repair. The pricing must provide firms with the flexibility to determine the most effective environmental "footprint" reduction strategies.
- Policy intervention should ensure that subsidies are administered in a way that promotes the use of environmentally friendly alternatives, while discouraging the use of products with a comparatively significant risk to the environment.

- Policies should be designed to offer financial support to enterprises, to prevent innovative MSEs from failing due to funding issues. Also, the need to prioritise investments that will help enterprises foster innovation.
- Policymakers should directly support R&D activities that underpins sustainable innovation. Investment on environmental R&D activities is essential to reduce emissions.

Thank you!

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