Who is Aware of Circularity?
Firm-level Survey Evidence
from Uganda

Klaus Friesenbichler
Ina Meyer

Who is Aware of Circularity? Firm-level Survey Evidence from Uganda

Klaus Friesenbichler, Ina Meyer

Abstract

This paper studies the distribution of knowledge about the circular economy as a business concept. Knowledge about circularity is a prerequisite for the diffusion of innovation onto which the incorporation of more circularity into economic processes hinges. We study the economic factors affecting the distribution of knowledge across firms. Using novel survey data from Uganda, we present empirical evidence of circularity in a developing country context. In line with the resource-based view of the firm, the findings indicate that larger and more productive firms, and firms with proactive business strategies, are more likely to be informed about the circular economy. Exposure to environmental barriers, such as adverse climate change impacts or high energy intensity, is not related to the awareness of circularity. The findings suggest that policy makers should improve environmental regulations, inform entrepreneurs about opportunities in circular business models and facilitate the establishment of a waste sector to demonstrate a step towards implementation of circular economy principles.

E-Mail: klaus.friesenbichler@wifo.ac.at, ina.meyer@wifo.ac.at

Who is aware of circularity? Firm-level survey evidence from Uganda [1]

Klaus S. Friesenbichler[2]   Ina Meyer[3]

This is a draft version. The final version will be published in a forthcoming issue of the African J. of Economic and Sustainable Development

Abstract

This paper studies the distribution of knowledge about the circular economy as a business concept. Knowledge about circularity is a prerequisite for the diffusion of innovation onto which the incorporation of more circularity into economic processes hinges. We study the economic factors affecting the distribution of knowledge across firms. Using novel survey data from Ugandan, we present empirical evidence of circularity in a developing country context. In line with the resource-based view of the firm, the findings indicate that larger and more productive firms, and firms with proactive business strategies, are more likely to be informed about the circular economy. Exposure to environmental barriers, such as adverse climate change impacts or high energy intensity, is not related to the awareness of circularity. The findings suggest that policy makers should improve environmental regulations, inform entrepreneurs about opportunities in circular business models and facilitate the establishment of a waste sector to demonstrate a step towards implementation of circular economy principles.

Keywords: circular economy, innovation, diffusion, awareness, Uganda, firm, survey, resource-based view
JEL: Q53, Q56, N57

---

[2] Affiliation I: Austrian Institute of Economic Research (WIFO), Arsenal Objekt 20, 1030 Vienna, Austria; Tel.: +43 1 798 26 01 296; Fax: +43 1 798 93 86; Email: *Klaus.Friesenbichler@wifo.ac.at*

Affiliation II: Supply Chain Intelligence Institute Austria (ASCII), Josefstädter Straße 39, 1080 Wien, Austria.

[3] Austrian Institute of Economic Research (WIFO); Email: Ina.Meyer@wifo.ac.at

Who is aware of circularity? Firm-level survey evidence from Uganda

1. Introduction

Industrial development is challenged with scarce primary resources on the input side, and growing volumes of waste and emissions, on the output side. The concept of the circular economy (CE) addresses these challenges by seeking to combine economic development with closed material loops based on the strategies of reduction, reuse, and recycling of resources and goods. CE-initiatives thus aim at reducing, by design, materials, waste, energy and emissions for both environmental and economic efficiency purposes (Ellen MacArthur Foundation 2013; Mitrofanenko et al. 2021). The concept originated in developed countries and has quickly spread to catching-up economies such as China or India (Geng, Sarkis, and Bleischwitz 2019; Mathews and Tan 2011; Chen, Song, and Anggraeni 2019). Yet, little is known about the potential of circularity in developing countries, as only a few studies explored the claim for CE strategies among stakeholders in developing economies.[4]

The aim of this paper is to examine the distribution of the knowledge about the circular economy in Ugandan firms, which may be illustrative of the challenges faced by many developing economies and their business sectors. More specifically, the self-reported awareness of Ugandan firms towards the circular economy is assessed by means of survey. The rationale is that economic performance and awareness of the circular economy should be elements of mutual perception, so that greater resource efficiency becomes an element of the economic

---

[4] https://irp-cdn.multiscreensite.com/40a0e554/files/uploaded/CEcasereport_Footprints.pdf, https://ellenmacarthurfoundation.org/circular-economy-in-africa/examples-and-resources (retrieved September 16, 2024).

growth pattern. Both resource and economic productivity are thought to be required to increase social welfare.

Several business models have been identified in the context of circularity. For example, models that reduce resource loops, such as product-service systems, where users do not need to own physical products but rather consume services (e.g., car sharing), or models that exploit residual value (e.g., clothes return, re-use of agricultural organic wastes). In addition, circular business models may seek to close resource loops, for example, by extending the resource value in which waste and residue are turned into new forms of value thus creating circular value-chains (e.g., by different types of recycling and secondary resource use) (Bocken et al. 2016; Pieroni, McAloone, and Pigosso 2019).

It is not yet clear which circularity framework or model will best support businesses in developing countries. A few decades ago, before the African economies began to – partly - modernize, re-using and recycling were still commonplace, albeit on a small scale. However, with the overall acceleration of resource use (Haas et al. 2020) and economic growth, circularity as an institutionalized business model still seems to be lacking, more precisely there is a lack of knowledge on how to reuse/upcycle different waste streams for circular innovation through transforming waste into new products (Nijman-Ross et al. 2023). We therefore explore an early stage of the circular economy transition, where knowledge, awareness and commitment to the circular economy concept are recognized as prerequisites for initiating and accelerating the transition.

Since the implementation of circular economy hinges on firms, we draw on management theory (Schilke, Hu, and Helfat 2018; Teece 2007) to analyze data from an innovative survey

of Ugandan firms. The surveyed firms face challenges that may exemplify those of many other developing countries. The survey aim was to explore the potential for both economic diversification and the greening of the economy, following the objectives of the UN Sustainability Goals, namely SDG goal 9 "Industry, innovation and infrastructure" and SDG goal 12 "Responsible consumption and production".[5] Studying the distribution of knowledge about circularity principles and commitment, we structure our research along three exploratory hypotheses. These are related to firms' capabilities and organizational resources, their strategies and processes, and their export potential with respect to internationalization strategies. We find a greater likelihood for firms to be aware of the circular economy in larger, more economic efficient firms, firms that actively pursue a price or quality leadership strategy as opposed to mainly seizing market opportunities, and firms that perceive industrialized economies as potential markets. Prior exposure to adverse environmental impacts, or the firm-specific energy intensity does, however, not exert any effect on the awareness of firms regarding the circular economy.

We make several contributions to the literature. 1) We add to the rare empirical evidence about the knowledge of circular business concepts in developing economies. 2) We provide information about the distribution of knowledge on circularity principles across economic sectors, and 3) we identify a series of firm characteristics that affect respondents' awareness. Such empirical studies are key to theory formulation, and important enablers to shift the discussion from conceptual approaches stage to practice (Lüdeke-Freund, Gold, and Bocken

---

[5] https://www.un.org/sustainabledevelopment/sustainable-development-goals/ (retrieved September 16, 2024).

2019). This is relevant to policy makers seeking to advance circularity for the sake of developing economies.

1.1 Country background

With a GDP per capita in current US$ of 858 in 2021, the year of the survey, Uganda is classified as a low-income country (World Bank data). The economy is dominated by agriculture. Manufacturing and services exist but play a minor role. The country exemplifies the challenges faced by many least developed countries. These include weak institutions and organizational structures (e.g., de jure and de facto regulations, corruption, law enforcement), low public awareness and lack of political will, and thus a failure of governance.

Such problems ultimately lead to poor economic performance, such as insufficient capital formation or sluggish diversification of the economic activities (Shepherd 2016; K. Friesenbichler and Meyer 2022). Taken together, they undermine the potential for decarbonization and greening of the economy, in which the circular economy approach is embedded as one of the strategic remedies, or as an element of the transition process (Lüdeke-Freund, Gold, and Bocken 2019).

The country has committed to policy targets under the United Framework Convention on Climate Change (UNFCCC). This includes the Paris Climate Agreement to avoid dangerous climate change by limiting global warming to well below 2°C compared to pre-industrial levels. Uganda has also committed itself to the UN Sustainable Development Goals (SDG). By joining as first African country the National Determined Contribution (NDC) Partnership Plan for Climate Action in Africa, Uganda has shown ambition for climate mitigation: 'Uganda's NDC emphasizes adaptation actions, and the commitment to reduce emissions by 22% by 2030

relative to a business-as-usual scenario through actions related to energy, forestry and wetlands.'[6] To achieve these priorities, the plan identifies 49 activities. These include establishing a legal framework for climate action or the strengthening of climate funding mechanisms. The Ugandan Green Growth Development Strategy (2017/2018-2030/2031)[7] provides a framework for the operationalization of Uganda's Vision 2040, namely the attainment of a green and clean environment through sustainable utilization of the environment and natural resources. One concept that a greening of the Ugandan economy may as well require is the circular economy.

2. Literature and hypotheses

2.1 The circular economy

The circular economy is centrally defined as an economy where materials and resources, and their economic values shall be maintained in the economy for as long as possible by closed-loop production and consumption. The extraction of primary resources and the generation of waste shall thus be minimized and resource-efficiency being scaled up (Ellen MacArthur Foundation 2013; Stahel 2016; MacArthur, Zumwinkel, and Stuchtey 2015; Potting et al. 2017). However, definitions and emphases of the circular economy concept vary to different degrees, which poses a challenge for concise definitions (Kirchherr, Reike, and Hekkert 2017).

In overall, the circular economy is perceived as a means to jointly achieve economic development and environmental protection goals, and as an operationalization for businesses to

---

[6] See http://sdg.iisd.org/news/uganda-releases-first-ndc-partnership-plan-for-climate-action-in-africa/ (retrieved September 15, 2024).

[7] https://www.ndcs.undp.org/content/dam/LECB/docs/pubs-reports/undp-ndc-sp-uganda-ggds-green-growth-dev-strategy-20171204.pdf (retrieved on September15, 2024).

implement the concept of sustainable development, thus serving the SDGs (Morseletto 2020). As such, it has become an integral part of various policies and programmes around the world to allow for economic growth while decoupling from negative effects of resource depletion and environmental degradation, including climate change (United Nations Environment Programme 2024; European Commission 2020; Arai, Calisto Friant, and Vermeulen 2024; EPA 2021; African Circular Economy Alliance 2021). It is a strategy suitable for both advanced and developing economies (Felix Preston, Lehne, and Wellesley 2019; MacArthur, Waughray, and Stuchtey 2016), even though these models are often sector or resource specific (Lewandowski 2016). In Africa, many initiatives draw on experiences from the Global South, in which Chinese initiatives often provide demonstration effects (Bleischwitz et al. 2022; Schröder et al. 2019; Desmond and Asamba 2019).

The circular economy in advanced countries is initiated from the reduction, reuse, and recycling of wastes – the so-called "3 Rs". One focus of the circular economy is thus on mechanisms that control the flow of products, materials, and services through the economy and in specific value chains to ultimately reduce the rates of the extraction and production of primary resources and of (premature) waste streams. Three strategies are highlighted in the literature (OECD 2019): (i) Closing resource cycles by diverting waste from disposal via separate collection and subsequent processing into secondary raw materials (recycling); (ii) Slowing down resource cycles or flows by prolonging the useful life of products and their components via changes in product design, repair or reuse; (iii) Avoidance of resource flows through new business models and behavioral changes. This may include sharing, thereby

increasing the value added with less need for natural resources with respect to specific consumption needs.

In comparison, the circular economy strategy of the People's Republic of China – representing the major transition economy - with its Circular Economy Promotion Law of 2009, extends the 3 Rs by additional dimensions: to resolve its pressing environmental problems, to achieve the goal of building a wealthy society, and to promote and lead a new model of industrialization. This new model of industrialization is focusing on turning existing industrial parks, which have become the industrial engine of the country by generating more than 50% of China's GDP (2012), into eco-industrial parks applying principles of industrial symbiosis.[8] This requires the formation of closed loops resource flows among firms at a large scale, i.e., the transformation of value chains and the closing of industrial loops (Mathews and Tan 2011; Li and Lin 2016). For instance, to solve the structural and regional pollution in the sugar industry in the city of Guigang, the Guigang National Eco-Industrial (Sugar) Demonstration Park was constructed in 2001. It hosts industrial systems, including a cane field system, sugar system, alcohol system, papermaking system, heat and power cogeneration system, and integrated environmental treatment system (Lin et al. 2004). Through optimization and combination, the interface between input and output of various systems was connected to realize optimal resource flows and efficient waste utilization, and thus reduce adverse environmental impacts, generate value-added and regional employment opportunities.

---

[8] https://www.unido.org/our-focus-safeguarding-environment-resource-efficient-and-low-carbon-industrial-production/eco-industrial-parks (retrieved on September 15, 2024).

The 'circular economy' in Africa is documented by numerous case studies across the continent with initiatives different in size and economies of scale, and systemized by policy approach, e. g. extended producer responsibility, fiscal measures, national circular economy approaches, product-related policies or waste management and recycling, whereas the latter constitute by far the most famous approach (Mitrofanenko et al. 2021). Similarly, a map of seven businesses using principles of circular economy is drawn for Uganda, gathering results of field research (Buda 2022). Yet, there remains a lack of knowledge on the deployment of circular economy principles and ideas across the private sector, which this study aims to fill.

In our survey of firms (see section 3), we refer to the concept of circular economy including the following principles: (i) closing resource loops by diverting waste from disposal through separate collection and subsequent processing into secondary raw materials (recycling), and (ii) slowing resource cycles or flows by extending the useful life of products and their components through changes in product design, repair, refurbishment, or reuse (OECD 2019). As the African economy requires economic growth to meet basic needs, we omit from reductions in resource flows through the principles of reduce, refuse, rethink. However, it is worth emphasizing that the redesign of production and consumption systems is increasingly seen as an important feature of the circular economy, going beyond resource recovery and recycling (UNEP 2024). For the impacts on resource use of the different circular economy strategies, see for instance Meyer et al. 2024 or Haas et al. 2024.

2.2 Hypotheses

The diffusion of innovation of, for example, circular economy principles, is a social process which starts with the knowledge phase, in which agents become aware of an innovation.

Awareness implies the knowledge of the innovation's existence. This is the precondition for the persuasion phase, in which innovations are evaluated. If a diffusion effectively disseminates, the evaluation is positive, and subsequent decision, implementation and confirmation, or reconfiguration, stages follow (Rogers 2010). During this phase, the individual attempts to determine the nature of the innovation and how it can be implemented. These aspects are reflected against previous practice, perceived needs, the degree of innovativeness, and the norms of the social system (Sahin 2006).

From a firm's perspective, the circular economy concept is tightly related to innovative business models (Pieroni, McAloone, and Pigosso 2019; Lüdeke-Freund, Gold, and Bocken 2019), which can be interpreted as an organizational and market innovation in the Schumpeterian sense. From an organizational perspective, the question arises how competitive advantages can be maintained despite a change of markets like the establishment of circular systems. A managerial concept that seeks to explain the sources of enterprises' competitive advantage over time is the dynamic capabilities' framework (Schilke, Hu, and Helfat 2018), to which the transformation of a firm's resource base is essential (Teece, Pisano, and Shuen 1997; Eisenhardt and Martin 2000; Katkalo, Pitelis, and Teece 2010; Kump et al. 2019; Winter 2003). This concept has been widely applied to business model discussion in the circular economy context (Lüdeke-Freund, Gold, and Bocken 2019), even though circularity has been criticized due to its unclear theoretical foundation which transpires into implementation obstacles (Corvellec, Stowell, and Johansson 2022, Kirchherr et al. 2017).

The discussion of the role of dynamic capabilities in response to low cost or low quality competitors can be structured around three processes: sensing of opportunities and threats,

transforming their organizations and seizing market opportunities (Kump et al. 2019; Schilke, Hu, and Helfat 2018; Teece 2007). Hence, the objective is to realign organizational capacities and to explore new knowledge combinations which will lead to the development and seizure of opportunities. This may occur by introducing new products, processes and services. Yet, before that occurs, successful firms sense market and technological developments putting their competitive advantage at risk or providing new opportunities. Circularity implies the evolution of new, perhaps competing business models, and altered demand and supply structures, inter alia due to climate policies in export destinations, such as carbon taxation schemes or carbon border mechanisms, or due to national circular economy policies addressing e.g., extended producer responsibilities or waste management schemes. From this perspective, the circular economy may offer opportunities to domestic firms to increase their competitiveness, and perhaps partly catch-up with subsidiaries of multinational enterprises. A precondition to any firm-level action is the knowledge about the existence of a "circular economy" as a business model. Certainly, knowledge enables firms to evaluate circular economy concepts, which implies that knowledge does not necessarily lead to the effective implementation. Little is known about the distribution of such knowledge across economic sectors, or what firm characteristics shape it, in particular with respect to developing countries.

At the core of studies on organizational competitiveness is the so-called "resource-based view", a well-established strand of literature which argues that firms are more successful when they have assets that are valuable, rare, inimitable, and non-substitutable, they can achieve a competitive advantage over their competitors. In addition, firms' strategies are often complementary to these unique assets and therefore difficult to copy by competitors, which

shields them at least temporarily from competition (Barney 2001; Wernerfelt 1995). It is typically argued that larger and more productive firms are more abundant in organizational capabilities, which helps firms to develop competitive advantages which can be interpreted as "higher-order capabilities" associated with a learning-to-learn ability (Collis 1994; Winter 2003). Firms with a stronger resource base and greater absorptive capacities (Cohen and Levinthal 1990; Escribano, Fosfuri, and Tribó 2009; Engelen et al. 2014) are therefore more likely to be aware of novel business concepts such as the circular economy. This leads us to our first hypothesis:

Hypothesis I: More resource abundant firms are more likely to be informed about the circular economy.

The distribution of knowledge across firms is likely to be driven by the entrepreneurial orientation that is reflected by behavioral tendencies, managerial philosophies, and strategic decision-making practices (Rauch et al. 2009; Covin and Slevin 1991; Miller 2011). The vast literature also perceives two salient factors shaping the entrepreneurial orientation. These are competitive aggressiveness, defined as the intensity of a firm's effort to outperform rivals, and autonomy, which refers to independent action undertaken by CEOs and entrepreneurs. Both characteristics are not equally distributed across firms and are likely to be reflected in firms' strategic choices. Some firms rather proactively set a strategy and shape the market by imposing their price or quality competitiveness on other firms (Porter 1991). Other firms may act more opportunity driven and serve specific market segments.

Hypothesis IIa: Firms whose strategies are opportunity driven are less likely to be informed about the circular economy.

In addition to the proactiveness of firm strategies, the extent to which environmentally critically aspects such as waste disposal are addressed by firms might also shape the distribution of knowledge. Put differently, firms operating "dirty technologies" may be less likely to know about circular business models. Similarly, prior experience with environmental issues that have already hampered firms' performance may also foster knowledge about more environmentally friendly business concepts (Holland, Verplanken, and Van Knippenberg 2002).

Hypothesis IIb: Firms whose practices are more environmentally friendly are more likely to be informed about the circular economy.

Hypothesis IIc: Firms that have experienced environmental impacts that have hampered business operations are more likely to be informed about the circular economy.

Firms' innovations are not necessarily the result of a generic R&D process. There is a vast literature discussing the sources of innovation. Here, knowledge flows stemming from market processes, in particular from customers, take a prominent position (Hippel 1988; Desouza et al. 2008). The circular economy as a business models has spread from developed economies (Ellen MacArthur Foundation 2013; OECD 2018) to catching-up and eventually developing countries. We therefore expect that firms that perceive industrialized economies as export destinations are also more likely to follow the current discussion about policies and management, which again implies that they are more likely to know about the circular economy.

Hypothesis III: Firms who perceive industrialized economies as export destinations are more likely to be informed about the circular economy.

3. Method

3.1 Survey design and implementation

The analysis draws on data obtained from an innovative survey of firms in Uganda. The aim of the survey was to explore circular economy and diversification potential (Shepherd 2016) across sectors. Hence, strongly polluting industries, or commodities as well as agriculture-based industries were largely excluded from the analysis. Instead, the survey covers firms in four broadly defined sectors: Beverages and dairy (31 observations), construction and building materials (32), flori- and horticulture (42), and pharmaceuticals (28). In addition, 18 observations were used in a category not exactly defined. To obtain a viable sample that is stratified at the sector level, first census data of Uganda Bureau of Statistics was screened by the research team, yet not used due to data quality issues with respect to firms' industry affiliation. Hence, the sampling universe was obtained from member registries of industry associations.

The survey was fielded in 2020 during the COVID-19 pandemic. The questionnaire was answered by business owners and top managers. In some cases, the survey respondents called company accountants or human resource managers into the interview to answer questions about economic productivity and labor. The response rate was 53%, and the final sample size is 151. The number of observations varies in the subsequent analysis due to missing observations.

The methodology of the World Bank's Enterprise Survey Unit was followed in the survey design and implementation. Since private contractors conducted the survey, confidentiality of the survey respondents and the sensitive information respondents provide is necessary to ensure the greatest degree of survey participation, integrity, and confidence in the

quality of the data.[9] The survey instrument was designed by the research team in close collaboration with the World Bank, and closely collaborated with the local consultants fielding the survey. Given the nature of the questions, we do not expect any systematic survey bias (K. Friesenbichler, Selenko, and Clarke 2018).

The questionnaire asked about nominal values in Ugandan Shillings. Current exchange rates for 2021 were obtained from the World Bank to compute figures in United States Dollars.

3.2   Variables and descriptive statistics

The target variable is "awareness", a dichotomous variable, taking on the value of one if a respondent reported that she is well-aware of the concept of a "circular economy", and zero otherwise. To ensure a consistent understanding of the term and a common ground for self-reporting, respondents were given the following definition of the circular economy: "A "circular economy" seeks to foster both sustainable resource use and economic growth. It aims to minimize resource use and waste flows and prevent losses of values from premature wastes. This may entail material recycling, repair and reuse or establishing industrial synergies in which waste from one firm becomes an input into another." We therefore adopted a weak circular economy concept that abstracts from absolute reductions in resource use (see section 2.1). A total of 43% of the respondents have provided a positive answer.

Subsequently, the survey data are employed to construct a comprehensive set of right-hand-side variables, which are then utilized to evaluate the exploratory hypotheses (see Table

---

[9] See https://www.enterprisesurveys.org/en/methodology (accessed on September 16, 2024)

1). The rationale for the selection of these variables is discussed in greater detail in the section "Results and discussion".

Table 1 about here

Size. Firm size is measured by its labor stock, which we define as the number of employees in full time equivalents at the end of the fiscal year, including all employees and managers, in logarithmic terms. The median firm employs 47 people (mean: 291 s.d.; 1076).

Efficiency. We use sales per employee as a proxy for efficiency. Last fiscal year's sales revenue is defined as the establishment's total annual sales for all products and services. The median sales per employee amounts to 12,039 USD (mean: 71,2; s.d.:246,409).

Capital intensity. In addition to the efficiency indicator, capital intensity is defined as the capital stock per employee. Capital consists of three categories: machinery, vehicles and equipment; land and buildings; information and communication equipment. Respondents were asked to report current assets as reported in the balance sheet at the end of the last fiscal year. This net book value is the value of assets after depreciation. If this figure was not available, respondents were asked to provide an estimate of the replacement value, i.e., the cost of the currently used asset if they were to be purchased in their current condition. The median capital intensity per employee is 16,033 USD (mean: 58,163; s.d.: 222,036).

No environmental impacts hamper operations. Respondents were provided with a list of factors that potentially hamper the operations and were asked if that was the case in the past

three years. One answer option was "Environmental issues do not hamper operations", which 27% of all respondents chose.

Number of hampering factors. The list of factors that potentially hamper the enterprise's operations consisted of the following categories: Climate change related impacts (e.g., flooding, heat, drought; 65% reported such issues); soil pollution (15%); water pollution (13%); air pollution (6%); health effects on staff from pollution (8%); and a category "other". We compute the number of positive responses to measure the breadth of exposure to environmental issues (mean: 1.4) (see Figure 1).

Figure 1 about here

Price/cost leadership. The questionnaire included a question about how respondents would assess the strategic orientation (the positioning in the market) of their firm. An answer category was "We seek to achieve price and cost leadership", which was chosen by 35% of all respondents.

Quality leadership. The question about the strategic orientation of the firm offered an answer category "Quality leadership in our relevant market", which was selected by 38%.

Product or client focus. The question about the strategic orientation of the firm also offered specialization patterns: "We implement a niche strategy (selected customer and/or product groups)", "We react flexibly to market requirements", and "We implement a broad product differentiation strategy to distinguish ourselves from our competitors". These strategies focus indicate a high level of specialization that tends to be market driven, and to a

lesser extent by a firm's strategy. A total of 27% of the observations are assigned to this category.

Waste in-house. The questionnaire provides several options how the waste disposal is currently managed. We define a dummy variable taking on the value of one if "Waste disposal is handled in house (e.g., burnt)", and zero otherwise. 73% report that waste is being disposed in-house.

Cost of waste. The questionnaire asks respondents to provide an estimate of the cost of the waste management in percent of production costs. Four brackets were provided: < 2% (72.5% chose this option); 2% - 5% (22.8%); 5% - 10% (4.0%); and > 10% (only 0.7% selected this bracket).

Export potential in catching-up destinations. Another question provided a list of export destinations, asking about which has the biggest potential. We define a dummy variable taking on the value of one if a firm reported "China", the "Middle East" and "Other emerging economies (e.g., Brazil, Russia, India, South Africa)", and zero otherwise. 22% of the respondents answered this question positively.

Export potential in developed destinations. The question about the potential of export destinations also provided the option "Developed countries (e.g., EU, USA, Japan)". We again define a dummy variable taking on the value of one if this option was chosen, and zero otherwise (mean: 62%).

3.3 Regression analysis

We use regression analysis to explore the factors shaping the awareness of a circular economy as a business concept. The target variable is dichotomous, which is why we use

logistic regression in a series of specifications. We first tests whether firm-specific capabilities affect the respondent's awareness:

$$CE_{i,k} = \alpha_{i,k} + \delta_1\, CAP_{i,k} + z_k + \varepsilon_{i,k} \tag{1}$$

where CE denotes the awareness of firm i in sector k, CAP is the firm-specific capability and δ is the coefficient of interest. α denotes the intercept. The vector z denotes a series of sector dummies which are included to control for sector characteristics that might affect awareness and therefore capture selection effects. ε is the standard error. We cluster the standard errors at the sector level, which mirrors the stratification strategy on which the sample is based (Abadie et al. 2022).

Next, we explore if awareness is related to firm strategy (STRAT) and the market potential (MARK). These specifications include both firm size and sales per worker, which are the variables of interest of the first hypothesis and serve as firm-level controls ($x_{i,k}$).

$$CE_{i,k} = \alpha_{i,k} + \delta_2\, STRAT_{i,k} + x_{i,k} + z_k + \varepsilon_{i,k} \tag{2}$$

$$CE_{i,k} = \alpha_{i,k} + \delta_3\, MARK_{i,k} + x_{i,k} + z_k + \varepsilon_{i,k} \tag{3}$$

It is conceivable that the results for awareness suffer from an endogeneity issue (Angrist and Pischke 2009). Knowledge about the circular economy could not only be driven by the competitive positioning of a firm, but the knowledge about circularity itself could shape the competitive positioning. Such reverse causality issues have been documented in empirical work drawing on the resource-based view of the firm (Antonakis et al. 2010; K. Friesenbichler and Selenko 2017). Given that circular economy concepts are negligible in Uganda and therefore do not affect firm performance or behavior, we assume that endogeneity does not bias our results.

To assess the goodness of fit of the logistic regression, we first compute the area under the Receiver Operating Characteristic (ROC) curve for each regression specification. The curve is created by plotting the true positive values (probability of detection) against the false positive values (probability of false alarm) at various threshold settings. We next compute the area under the curve (AUC). A statistical model with high discrimination ability has an ROC curve that is close to one, whereas a model with no discrimination ability has an ROC curve close to nil. Hence, the indicator is a concordance, or c-statistic, which can range from zero to one, with a higher score indicating a better performance at correctly classifying outcomes.

4. Results and discussion

We implement a range of specifications to test the proposed hypotheses (see Table 2).

Table 2 about here

We estimate two regressions to test the first hypothesis stating that firms that are more resource abundant, from an economic perspective, are also more likely to report to be informed about the circular economy. The first specification includes firm size and sales per employee as a proxy for efficiency. Both coefficients are positive and significant. The marginal effect of firm size – with all other variables at their mean – is 0.12, and therefore slightly higher than the marginal effect of economic productivity (0.07). The second specification includes the capital intensity, which is insignificant, however. We support the notion of the resource-based view of the firm (Barney 2001; Wernerfelt 1995) that knowledge about circularity is more spread in larger and more economically productive firms.

Over and above capabilities, the entrepreneurial orientation of the firm may affect the likelihood to be informed about circularity concepts. This is the rationale for the second set of hypotheses. First, we ask about the firms' strategies, and uncover positive coefficients for firms that proactively seek to position their firm with respect to price or costs. We uncover positive and significant effects for these groups, with a larger magnitude of the marginal effect for price and cost driven strategies (β: 0.29; p-value: 0.000) than for quality driven firms (β: 0.21; p-value: 0.023). It seems that firms that seek to optimize their costing as part of their core strategy also monitor business concepts related to material flows more closely than firms that focus on product quality. In addition, we find that firms that act rather opportunity driven (e.g., by serving given customer groups or providing specific products) are less likely to be aware of the circular economy. The marginal effect is negative and significant (β: -0.24; p-value: 0.000).

Hypothesis IIb suggests that firms whose practices are more environmentally friendly are more likely to be informed about the circular economy. We use two proxies for such behavior. First, if waste disposal occurs "in-house". Firms are often faced with a lacking or underdeveloped waste management, which is why waste is often burnt. Second, we use a dummy variable taking on the value of one if a firm pays more than 10% of their production cost for waste disposal, and zero otherwise. Either indicator is statistically insignificant. In addition, with increasing impacts from climate change one may suspect that firms that already face hampering factors are more inclined to screen the market for new business concepts (Hypothesis IIc). Our results do not support the hypothesis that firms having experienced more environmental impacts, or no impacts at all, are systematically differently informed about the circular economy.

Albeit promoted and implemented in catching-up economies such as China (Mathews and Tan 2011; Li and Lin 2016), the concept of circularity emerged in industrialized economies. Given information flows related to innovations, we argue in our third hypotheses that firms that perceive industrialized economies as export destinations are more likely to be informed about the circular economy. We use domestic and African export destination potential as a benchmark and uncover a statistically insignificant coefficient of firms that perceive potential in catching-up destinations. The coefficient of the marginal effect is 0.26 (p-value: 0.016).

The control variables perform as expected. Testing hypotheses II and III, we control for firm size and efficiency which are central to hypothesis I. Larger firms and more efficient firms are more likely to report awareness of the circular economy. The unreported sector dummies are largely significant. With respect to sectoral stratification, firms in pharmaceuticals are – on average - less, and firms in construction and buildings materials more aware of the circular economy as a business concept. This is reflected by descriptive statistics indicating that the knowledge about the "circular economy" is not evenly distributed across sectors. In the resource-intensive sector construction and building materials, 60% report being well-aware of the concept. In contrast, in pharmaceutical this share is only at 28.6%. It is also rather low in dairy and beverages (32.2%), and in flori- and horticulture (33.3%). This points at a selection effect, where firms in certain industries are more likely to screen opportunities related to their inputs and residue structure than others.

5. Conclusions

The circular economy has attracted attention in both science and politics. The concept seeks to realize a double dividend by fostering both efficient resource use and business

development. It aims to minimize resource use and waste flows, and to prevent losses of values from premature wastes. This entails material recycling, repair and reuse or industrial synergies, in which waste from one firm becomes an input to another. To most firms, embedding circularity into their business model may require – sometimes minor - adjustments, but in some other cases change the business model altogether.

In developing economies, some firms must rely anyhow on re-used inputs due to financial restrictions or product availability. This corresponds to the industrial symbiosis approach underlying the circular economy, which can be interpreted as a means of keeping the added value in products or loops for as long as possible (Chen, Song, and Anggraeni 2019). Yet, this does not imply that circularity is an institutionalized business model or perceived as critical element of a potentially successful business strategy.

While it seems likely that some firms proactively screen resource-efficient opportunities, little is known about the distribution of the knowledge about circular economic models in developing economies. It is also unclear what shapes the distribution of such knowledge. These were the guiding research questions that we applied using an innovative cross-sectional survey among Ugandan firms. The country offers a viable setting, because environmental impacts already hamper the operations, and pressures of human-made climate change are likely to increase. This suggests that green structural change is an indispensable condition for potential and resilient growth strategies. Even though knowledge is a prerequisite for the distribution of circularity, knowledge itself does not necessarily imply that firms implement business concepts related to the circular economy.

The results of our survey indicate that certain firms are more likely to be informed about circularity as a business concept than others. These firms are more resource abundant from an economic point of view, implement a business strategy that proactively positions the firm on the market, and perceive industrial economies as export destinations, according to our survey results. These are the typical properties of economically more successful firms, which are the minority in developing countries, however. This result is in line with the resource-based view of the firm and suggests a positive relationship between environmental awareness and firm performance.

This result also fits into the international trade agenda which is pursued by international financial institutions aiming to promote economic and sustainable development. The trade potential is not equally distributed, however. Some sectors, like for instance pharmaceuticals, seem – due to their firm size and productivity levels – in a better position to develop co-operation and international trade with industrialized partners than firms in other sectors. This also requires that developed countries are willing to implement a strategic approach to knowledge diffusion and the application of green and circular business models. This result links to the notion that North-South trade - and the business relations that accompany them - facilitates the spread of environmental and climate standards in production from industrialized to developing countries. In an EU context, this phenomenon has become known as the "Brussels effect"(Bradford 2020), which may be strengthened by recent regulations such as the EU Supply Chain Due Diligence Directive (Felbermayr et al. 2024).This implies that knowledge spillovers, and entry and exit dynamics, affect both aggregate economic and resource

productivity. This, however, cannot be studied with the currently used cross sectional survey data.

At the same time, exposure to climate-change related factors that hamper operations or business practices do not affect the likelihood of knowledge about circularity. This is despite a substantial exposure to environmental damages. In the survey year 2021, almost 73% of the surveyed firms report environmental issues to have hampered their operations (63% report flooding, heat, and drought, which are directly related to climate change).

Altogether, these findings are critical when it comes to the awareness of green and circular business models. In a setting of sluggish economic performance, the potential for the spread of knowledge about the circular economy seems limited. While human-made climate-related impacts are likely to aggravate, this does not seem to alter the spread of knowledge about alternative economic concepts yet. However, this perception may change soon when climate change impacts will potentially occur at rising intensities and frequencies.

Green growth requires effective policy making, which poses a major challenge for developing economies. The presently used questionnaire asks whether firms have been fined for breaching environmental regulations by a regulatory agency. All firms provided negative responses, which suggests institutional and governance failure in the public administration of environmental targets. It is yet highly unlikely that all firms adhere to the environmental rules and regulations. Hence, one possible reason may be, that the de facto implementation of Ugandan environmental law seems to be lacking, too. The other explanation may be a self-reported social desirability bias, i.e. respondents feel the need to give answers that they think are socially acceptable (Carrington, Neville, and Whitwell 2010).

An important starting point for facilitating a circular economy and implementing circular business models in Uganda that emerged from the survey is to improve separate waste collection (be it organic or mineral waste) by establishing an institutionalized waste sector. This policy implication is based on 1) the questionnaire results that 73% of firms report that waste is being handled in-house (e.g., burnt), and 2) the fact that separate waste collection is a prerequisite for establishing material loops, i.e., for producing secondary resources. Separate waste collection also reduces landfills and their GHG emissions, and unprofessional waste burning in-house. Environmental legislation on separate waste collection should therefore be seen as a first viable step towards a green and circular economy in Uganda. Over and above sector development strategies and accompanying demonstration effects, policy makers may run information campaigns for entrepreneurs highlighting resource-efficient business opportunities and environmental needs.

References

Abadie, Alberto, Susan Athey, Guido W Imbens, and Jeffrey M Wooldridge. 2022. 'When Should You Adjust Standard Errors for Clustering?' *The Quarterly Journal of Economics* Forthcoming, qjac038 (October):36. https://doi.org/10.1093/qje/qjac038.

African Circular Economy Alliance. 2021. 'Five Big Bets for the Circular Economy in Africa'. In . Geneva. https://www.aceaafrica.org/.

Angrist, Joshua D, and Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton university press.

Antonakis, John, Samuel Bendahan, Philippe Jacquart, and Rafael Lalive. 2010. 'On Making Causal Claims: A Review and Recommendations'. *The Leadership Quarterly* 21 (6): 1086–1120. https://doi.org/10.1016/j.leaqua.2010.10.010.

Arai, Risa, Martin Calisto Friant, and Walter JV Vermeulen. 2024. 'The Japanese Circular Economy and Sound Material-Cycle Society Policies: Discourse and Policy Analysis'. *Circular Economy and Sustainability* 4 (1): 619–50.

Barney, J. B. 2001. 'Resource-Based Theories of Competitive Advantage: A Ten-Year Retrospective on the Resource-Based View'. *Journal of Management* 27 (6): 643–50. https://doi.org/10.1177/014920630102700602.

Bleischwitz, Raimund, Miying Yang, Beijia Huang, XU Xiaozhen, Jie Zhou, Will McDowall, Philip Andrews-Speed, Zhe Liu, and Geng Yong. 2022. 'The Circular Economy in China:

Achievements, Challenges and Potential Implications for Decarbonisation'. *Resources, Conservation and Recycling* 183:106350.

Bocken, Nancy M. P., Ingrid de Pauw, Conny Bakker, and Bram van der Grinten. 2016. 'Product Design and Business Model Strategies for a Circular Economy'. *Journal of Industrial and Production Engineering* 33 (5): 308–20. https://doi.org/10.1080/21681015.2016.1172124.

Bradford, Anu. 2020. *The Brussels Effect: How the European Union Rules the World*. New York: Oxford University Press, USA.

Buda, Gergely. 2022. 'Seven Businesses Using Principles of Circular Economy in Sub-Saharan Africa: Results of Field Research in Uganda.' *Afrika Tanulmányok / Hungarian Journal of African Studies* 16 (1): 5–20. https://doi.org/10.15170/AT.2022.16.1.1.

Carrington, Michal J, Benjamin A Neville, and Gregory J Whitwell. 2010. 'Why Ethical Consumers Don't Walk Their Talk: Towards a Framework for Understanding the Gap between the Ethical Purchase Intentions and Actual Buying Behaviour of Ethically Minded Consumers'. *Journal of Business Ethics* 97:139–58.

Chen, An, Yuyan Song, and Kartika Anggraeni. 2019. 'Promoting Industrial Symbiosis in China's Industrial Parks as a Circular Economy Strategy'. *The Circular Economy and the Global South: Sustainable Lifestyles and Green Industrial Development*, 134.

Cohen, Wesley M, and Daniel A Levinthal. 1990. 'Absorptive Capacity: A New Perspective on Learning and Innovation'. *Administrative Science Quarterly* 35 (1): 128–52.

Collis, David J. 1994. 'Research Note: How Valuable Are Organizational Capabilities?' *Strategic Management Journal* 15:143–52.

Corvellec, Hervé, Alison F. Stowell, and Nils Johansson. 2022. 'Critiques of the Circular Economy'. *Journal of Industrial Ecology* 26 (2): 421–32. https://doi.org/10.1111/jiec.13187.

Covin, Jeffrey G, and Dennis P Slevin. 1991. 'A Conceptual Model of Entrepreneurship as Firm Behavior'. *Entrepreneurship Theory and Practice* 16 (1): 7–26.

Desmond, Peter, and Milcah Asamba. 2019. 'Accelerating the Transition to a Circular Economy in Africa: Case Studies from Kenya and South Africa'. In *The Circular Economy and the Global South*, 152–72. Routledge.

Desouza, Kevin C., Yukika Awazu, Sanjeev Jha, Caroline Dombrowski, Sridhar Papagari, Peter Baloh, and Jeffrey Y. Kim. 2008. 'Customer-Driven Innovation'. *Research-Technology Management* 51 (3): 35–44. https://doi.org/10.1080/08956308.2008.11657503.

Eisenhardt, Kathleen M., and Jeffrey A. Martin. 2000. 'Dynamic Capabilities: What Are They?' *Strategic Management Journal* 21 (10–11): 1105–21. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E.

Ellen MacArthur Foundation. 2013. 'Towards a Circular Economy. Economic and Business Rationale for an Accelerated Transition'. Ellen MacArthur Foundation. http://circularfoundation.org/sites/default/files/tce_report1_2012.pdf.

Engelen, Andreas, Harald Kube, Susanne Schmidt, and Tessa Christina Flatten. 2014. 'Entrepreneurial Orientation in Turbulent Environments: The Moderating Role of Absorptive Capacity'. *Research Policy* 43 (8): 1353–69. https://doi.org/10.1016/j.respol.2014.03.002.

EPA, U. 2021. 'National Recycling Strategy: Part One of a Series On Building a Circula r Economy For All'. *US Environmental Protection Agency, Washington, DC*.

Escribano, Alvaro, Andrea Fosfuri, and Josep A. Tribó. 2009. 'Managing External Knowledge Flows: The Moderating Role of Absorptive Capacity'. *Research Policy* 38 (1): 96–105. https://doi.org/10.1016/j.respol.2008.10.022.

European Commission. 2020. 'A New Circular Economy Action Plan For a Cleaner and More Competitive Europe'. COM(2020) 98 final. Brussels: European Commission.

Felbermayr, Gabriel, Klaus Friesenbichler, Markus Gerschberger, Peter Klimek, and Birgit Meyer. 2024. 'Designing EU Supply Chain Regulation'. *Intereconomics* 59 (1): 28–34. https://doi.org/10.2478/ie-2024-0007.

Friesenbichler, Klaus, and Ina Meyer. 2022. 'Sectoral and Environmentally Friendly Growth Potential in Uganda'. WIFO Study commisioned by the World Bank 2022/4/S/WIFO project no: 5518. Vienna: Austrian Institute of Economic Research. Sectoral and Environmentally Friendly Growth Potential in Uganda.

Friesenbichler, Klaus S, Eva Selenko, and George Clarke. 2018. 'Perceptions of Corruption: An Empirical Study Controlling for Survey Bias'. *Journal of Interdisciplinary Economics* 30 (1): 55–77.

Friesenbichler, Klaus, and Eva Selenko. 2017. 'Firm Performance in Challenging Business Climates: Does Managerial Work Engagement Make a Difference?' *Asian Business & Management* 16 (1–2): 25–49.

Geng, Yong, Joseph Sarkis, and Raimund Bleischwitz. 2019. 'How to Globalize the Circular Economy'. *Nature* 565 (7738): 153–55. https://doi.org/10.1038/d41586-019-00017-z.

Haas, Willi, Fridolin Krausmann, Dominik Wiedenhofer, Christian Lauk, and Andreas Mayer. 2020. 'Spaceship Earth's Odyssey to a Circular Economy-a Century Long Perspective'. *Resources, Conservation and Recycling* 163:105076.

Haas, Willi, Ina Meyer, Doris Virág, Gerald Kalt, André Baumgart, Nina Eisenmenger, Mark Sommer, and Kurt Kratena. 2024. 'Circular Economy and Decarbonisation: Synergies and Trade-Offs'. Report commissioned by Klima- und Energiefond. 40. Vienna: Austrian Institute of Economic Research. https://www.wifo.ac.at/wp-content/uploads/upload-8360/s_2024_circulareconomy_decarbonisation_53260426.pdf.

Hippel, Eric von. 1988. *Sources of Innovation*. New York: Oxford University Press.

Holland, Rob W., Bas Verplanken, and Ad Van Knippenberg. 2002. 'On the Nature of Attitude-Behavior Relations: The Strong Guide, the Weak Follow'. *European Journal of Social Psychology* 32 (6): 869–76. https://doi.org/10.1002/ejsp.135.

Katkalo, V. S., C. N. Pitelis, and D. J. Teece. 2010. 'Introduction: On the Nature and Scope of Dynamic Capabilities'. *Industrial and Corporate Change* 19 (4): 1175–86. https://doi.org/10.1093/icc/dtq026.

Kirchherr, Julian, Denise Reike, and Marko Hekkert. 2017. 'Conceptualizing the Circular Economy: An Analysis of 114 Definitions'. *Resources, Conservation and Recycling* 127:221–32.

Kump, Barbara, Alexander Engelmann, Christina Schweiger, and Alexander Keßler. 2019. 'Towards a Dynamic Capabilities Scale: Measuring Organizational Sensing, Seizing, and Transforming Capacities'. *Industrial and Corporate Change* 28 (5): 1149–72.

Li, We, and Wenting Lin. 2016. 'Circular Economy Policies in China'. In *Towards a Circular Economy: Corporate Management and Policy Pathways*, 105–22. Anbumozhi V. and J. Kim (Eds.), ERIA Research Project FY20 14 No. 44. Economic Research Institute for ASEAN and East Asia. http://www.eria.org/ERIA_RPR_FY2014_44.pdf.

Lin, Yuejuan, Zhe Zhang, Feng Wu, and Nansheng Deng. 2004. 'Development of Ecological Industrial Parks in China'. *Fresenius Environmental Bulletin* 13 (7): 600–606.

Lüdeke-Freund, Florian, Stefan Gold, and Nancy M. P. Bocken. 2019. 'A Review and Typology of Circular Economy Business Model Patterns'. *Journal of Industrial Ecology* 23 (1): 36–61. https://doi.org/10.1111/jiec.12763.

MacArthur, E., D Waughray, and MR Stuchtey. 2016. 'The New Plastics Economy, Rethinking the Future of Plastics'. In *World Economic Forum*.

MacArthur, E., K Zumwinkel, and MR Stuchtey. 2015. 'Growth within: A Circular Economy Vision for a Competitive Europe'. *Ellen MacArthur Foundation*.

Mathews, John A., and Hao Tan. 2011. 'Progress Toward a Circular Economy in China: The Drivers (and Inhibitors) of Eco-Industrial Initiative'. *Journal of Industrial Ecology* 15 (3): 435–57. https://doi.org/10.1111/j.1530-9290.2011.00332.x.

Meyer, Ina, Mark Sommer, Kurt Kratena, André Baumgart, Nina Eisenmenger, and Willi Haas. 2024. 'Dekarbonisierung und Kreislaufwirtschaft. Ökonomische und biophysische Effekte verschiedener Szenarien für Österreich'. *WIFO-Monatsberichte* 97 (6): 345–58.

Miller, Danny. 2011. 'Miller (1983) Revisited: A Reflection on EO Research and Some Suggestions for the Future'. *Entrepreneurship Theory and Practice* 35 (5): 873–94.

Mitrofanenko, Alexander, Georgios Fylakis, Janet Skaalvik, and Louise Lieberknecht. 2021. *Circular Economy on the African Continent: Perspectives and Potential*. GRID-Arendal. Vancouver: Grid-Arendal.

Morseletto, Piero. 2020. 'Targets for a Circular Economy'. *Resources, Conservation and Recycling* 153:104553.

Nijman-Ross, Elke, Jessie Umuhire Umutesi, Joseph Turay, David Shamavu, Winifred Awinpoya Atanga, and David Lang Ross. 2023. 'Toward a Preliminary Research Agenda for the Circular Economy Adoption in Africa'. *Frontiers in Sustainability* 4:1061563.

OECD. 2018. *Business Models for the Circular Economy: Opportunities and Challenges from a Policy Perspective*. Paris: OECD. https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf.

———. 2019. 'Business Models for the Circular Economy'. *OECD Working Papers*, 2019. https://doi.org/10.1787/g2g9dd62-en.

Pieroni, Marina P.P., Tim C. McAloone, and Daniela C.A. Pigosso. 2019. 'Business Model Innovation for Circular Economy and Sustainability: A Review of Approaches'. *Journal of Cleaner Production* 215 (April):198–216. https://doi.org/10.1016/j.jclepro.2019.01.036.

Porter, Michael E. 1991. 'Towards a Dynamic Theory of Strategy'. *Strategic Management Journal* 12 (S2): 95–117. https://doi.org/10.1002/smj.4250121008.

Potting, José, Marko P Hekkert, Ernst Worrell, and Aldert Hanemaaijer. 2017. 'Circular Economy: Measuring Innovation in the Product Chain'. *Planbureau Voor de Leefomgeving*, no. 2544.

Preston, Felix, Johanna Lehne, and Laura Wellesley. 2019. *An Inclusive Circular Economy: Priorities for Developing Countries*. Chatham House, Energy, Environment and Resources Department. https://www.chathamhouse.org/sites/default/files/publications/research/2019-05-22-Circular%20Economy.pdf.

Rauch, Andreas, Johan Wiklund, G.T. Lumpkin, and Michael Frese. 2009. 'Entrepreneurial Orientation and Business Performance: An Assessment of Past Research and Suggestions for the Future'. *Entrepreneurship Theory and Practice* 33 (3): 761–87. https://doi.org/10.1111/j.1540-6520.2009.00308.x.

Rogers, Everett M. 2010. *Diffusion of Innovations*. Fourth Edition. New York: The Free Press, Simon and Schuster.

Sahin, Ismail. 2006. 'Detailed Review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based on Rogers' Theory'. *The Turkish Online Journal of Educational Technology* 5 (2). https://files.eric.ed.gov/fulltext/EJ1102473.pdf.

Schilke, Oliver, Songcui Hu, and Constance E. Helfat. 2018. 'Quo Vadis, Dynamic Capabilities? A Content-Analytic Review of the Current State of Knowledge and Recommendations for Future Research'. *Academy of Management Annals* 12 (1): 390–439. https://doi.org/10.5465/annals.2016.0014.

Schröder, Patrick, Manisha Anantharaman, Kartika Anggraeni, and Timothy J Foxon. 2019. 'The Circular Economy and the Global South'. *The Circular Economy and the Global South. Routledge. Https://Doi. Org/10.4324/978042* 9434 (006).

Shepherd, Ben. 2016. 'Uganda. Improving Export Performance'. Policy Paper F-38213-UGA-1. F-38213-UGA-1. London: International Growth Centre.

Stahel, Walter R. 2016. 'The Circular Economy'. *Nature News* 531 (7595): 435.

Teece, David J. 2007. 'Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance'. *Strategic Management Journal* 28 (13): 1319–50. https://doi.org/10.1002/smj.640.

Teece, David J., Gary Pisano, and Amy Shuen. 1997. 'Dynamic Capabilities and Strategic Management'. *Strategic Management Journal* 18 (7): 509–33. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z.

United Nations Environment Programme, International Resource Panel. 2024. 'Global Resources Outlook 2024 - Bend the Trend: Pathways to a Liveable Planet as Resource Use Spikes'. Nairobi: United Nations. https://wedocs.unep.org/20.500.11822/44901.

Wernerfelt, Birger. 1995. 'The Resource-Based View of the Firm: Ten Years After'. *Strategic Management Journal* 16 (3): 171–74.

Winter, Sidney G. 2003. 'Understanding Dynamic Capabilities'. *Strategic Management Journal* 24 (10): 991–95. https://doi.org/10.1002/smj.318.

Figures and Tables

Figure 1: Hampering factors
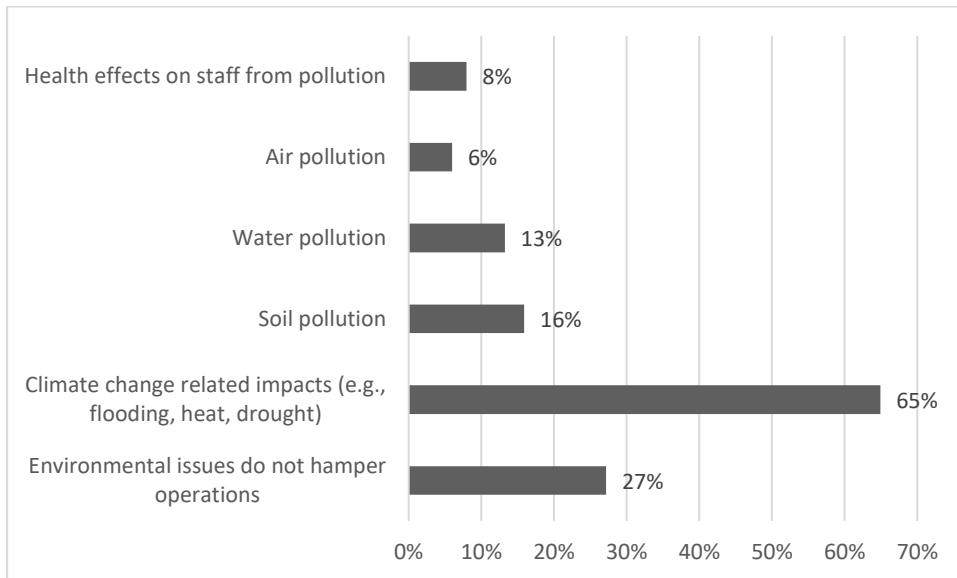
Source: Own illustration.

Note: "Has any of the following environmental issues hampered your enterprise's operations in the past three years?"

Table 1: Hypotheses and variables

| Hypotheses	Variable
H I: More resource abundant firms are more likely to be informed about the circular economy.	Firm size (number of employees) Sales per employee Capital intensity
H IIa: Firms whose strategies are opportunity driven are less likely to be informed about the circular economy.	Cost/price strategy Quality strategy Product/client focus
H IIb: Firms whose practices are more environmentally friendly are more likely to be informed about the circular economy.	In-house waste management Cost of waste management
H IIc: Firms that have experienced environmental issues that have hampered business operations are more likely to be informed about the circular economy.	Number of environmental factors hampering operations No environmental factors hamper operations
H III: Firms who perceive industrialized economies as export destinations are more likely to be informed about the circular economy.	Destination: catching-up economies Destination: developed economies

Table 2: Regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Labor stock (log.)	0.49***	0.42***	0.49***	0.46***	0.46***	0.47***	0.56***	0.51***
	(0.131)	(0.160)	(0.131)	(0.153)	(0.154)	(0.163)	(0.072)	(0.131)
Labor Prod. (log.)	0.30***		0.30***	0.25***	0.27***	0.28***	0.27***	0.25***
	(0.080)		(0.080)	(0.090)	(0.070)	(0.080)	(0.092)	(0.074)
Capital ratio (log.)		-0.04						
		(0.095)						
No env. hampering factor			0.25					
			(0.420)					
No. of hampering factors (log.)				0.00				
				(0.348)				
Cost/Price strategy					1.20***			
					(0.195)			
Quality strategy					0.88**			
					(0.406)			
Product/client focus					-0.98***			
					(0.239)			
Waste in-house						0.01		
						(0.727)		
Waste cost						-0.39		
						(0.503)		
Destination, catching-up							0.47	
							(0.429)	
Destination, developed econ.							1.06**	
							(0.444)	
Constant	-5.57***	-2.38**	-5.64***	-5.18***	-6.15***	-5.25***	-5.04***	-6.03***
	(1.182)	(0.997)	(1.141)	(1.472)	(0.988)	(1.252)	(0.708)	(1.135)
Sector fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	138	80	138	93	137	138	103	138
Pseudo R^2	0.205	0.136	0.206	0.163	0.221	0.223	0.199	0.224
AUC	0.788	0.727	0.788	0.754	0.802	0.801	0.786	0.797

Note: This table reports the regression results explaining awareness of a circular economy as a business concept. AUC denotes the Area under curve. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

APPENDIX

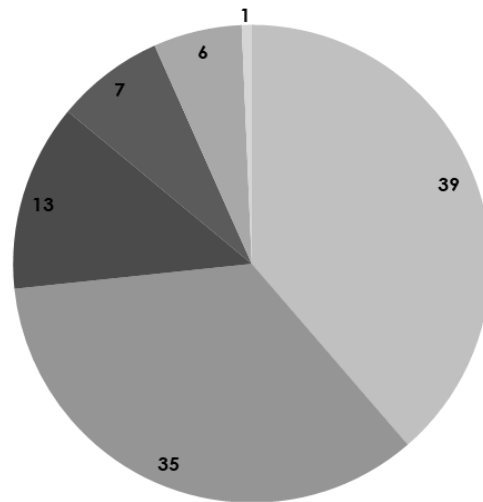*Figure 2: Distributions of size (left) and productivity (right)*
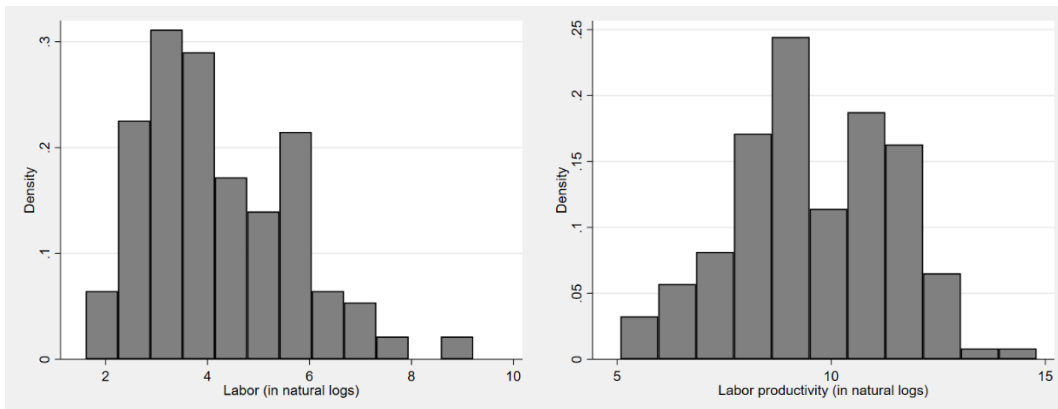
Source: Own illustration.

Note: Labor stock in full time equivalents serves as a proxy for size, and labor productivity in USD as a proxy for efficiency. Both graphs are in natural logarithms.

Figure 3: Strategic orientation

Source: Own illustration.
Note: "How would you describe the strategic orientation (the positioning in the market) of your firm?"