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Stepping towards the Green Transition: Challenges and Opportunities of Estonian Companies

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Abstract: Addressing the sustainability crisis requires innovative approaches such as sustainable technological entrepreneurship. The case of Estonia, as an example of a twin (digital and green) transition, is examined. We explored Estonian entrepreneurs' perceptions of challenges and opportunities related to the green transition. The data were collected via an online survey from 532 Estonian companies, focus groups, and individual semi-structured interviews with 42 experts. Survey data were analyzed using proportional odds logistic regression, and interview data were examined using thematic analysis. Based on the interview findings, the main perceived entrepreneurial opportunities related to green transitions were increasing production efficiency and favoring taxation for green products and services. The main challenges included losing competitive advantage, coping with crises, and the need for long-term planning and significant investments. Survey findings revealed that too much pressure only from politicians and a lack of innovation might increase the likelihood of perceived company cost increases. More pressure from other stakeholders and increased innovation were associated with higher odds of viewing the green transition as an opportunity. This study provides valuable insights into the perceptions of Estonian entrepreneurs regarding the challenges and opportunities of the green transition and contributes to their categorization.

Keywords: green deal; green transition; twin transition; sustainable entrepreneurship; companies survey; challenges; opportunities

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1. Introduction

Climate change, sustainable development, and environmental awareness among different stakeholders are the main topics of today's agenda. One of the means to tackle climatic change is implementing innovative and advanced technologies and developing novel business models, among other actions, as existing research in this field demonstrates [1–3]. Understanding the opportunities and challenges of green/sustainable entrepreneurship is the key to finding new business solutions for this development.

Sustainability and technological entrepreneurship are strongly interrelated, e.g., by using technology and innovation to create new products, services, and processes that address environmental and social sustainability challenges [4,5]. A significant body of scientific evidence shows how companies tackle climate change by implementing innovative and advanced technologies, including digitalizing business processes [5–7]. Companies are increasingly investing in renewable energy, energy efficiency, and carbon capture and storage technologies [8,9]. Additionally, companies are implementing innovative technologies such as electric vehicles, battery storage, and green buildings to reduce greenhouse gas emissions [10]. Other companies are implementing circular economy principles that promote waste reduction, resource efficiency, and sustainability in production and consumption [11]. For instance, in the agriculture sector, companies are using digital technologies and sensors to improve crop management and reduce waste [12]. Specific examples include smart water management systems to optimize water use and reduce waste in agriculture, industry,

and households [13], as well as technology to track and manage supply chain impact for sustainability in trade [14].

The European Union's "Green Transition" refers to the EU's efforts to become a carbon-neutral continent by 2050, which includes measures such as increasing the use of renewable energy, reducing greenhouse gas emissions, and promoting sustainable transportation and agriculture [15]. The "twin transition" in Europe refers to the simultaneous transition toward both a green and a digital future. The EU has identified these two transitions as key priorities for its future development, and has launched several initiatives to promote and support both [16]. The digital transition involves a shift towards a more connected, data-driven economy that harnesses the power of new technologies to create jobs and boost competitiveness [17]. The legislation on this topic updates frequently, and the research field is rapidly developing in response to new changes.

The EU recognizes that these two transitions are interdependent and complementary, and offer significant opportunities for growth, job creation, and environmental protection. The EU's initiatives to support the twin transition include the European Green Deal and the Digital Single Market, which aim to create a single market for digital goods and services in the EU [18]. The twin transition is seen as a significant challenge for European companies and organizations. However, it is also seen as a major opportunity for those who can adapt and embrace the new technologies and business models it brings [4,5], as well as an effective instrument to tackle environmental problems [19].

Implementing the twin transition in the EU is ongoing [4], and many countries, such as Italy, Finland, Denmark, Netherlands, and Germany, have activities and policies in the field [20], with many companies investing in twin transition [21]. It has been indicated through analysis that the impact of this transition on regional growth is reliant on the socio-economic and territorial characteristics of the regions [20]. Regions that are most prepared for this transition are typically metropolitan regions with expertise in providing knowledge-intensive services. Such regions exhibit the highest potential for economic growth and benefit the most economically from the twin transition of digital and green technologies. In contrast, agricultural regions with the lowest GDP per capita levels in Europe are less likely to experience economic growth due to their low level of readiness for the structural changes that accompany the twin transition. High-tech regions present higher overall growth potential than regions specialized in low-tech manufacturing. Furthermore, regions with carbon-intensive manufacturing activities, whether low or high tech, show lower levels of readiness for the green transition and are therefore expected to have comparatively lower growth rates than non-carbon-intensive regions [20].

Estonia, being part of the Baltic Sea Region, tends to follow the lead of its more developed neighbors in transitioning towards a greener economy. The key trends associated with the green transition in the Nordic–Baltic region are characterized by increasing interconnectedness in the energy system, political landscape, and various sectors [22]. The region is witnessing the emergence of green innovation and new technologies as key drivers of change. In addition, individuals are becoming an increasingly important part of the green transition as active citizenship takes on a larger role [23]. The focus on the social and distributional impacts of the green transition is also growing in prominence.

The Nordic Council of Ministers has articulated a vision for the region's transformation into a "digital green transition" [24], which encompasses the integration of renewable energy, progressive climate policies, and the growth of green innovation in both the corporate and academic spheres. A study reveals [24] that certain countries, namely Finland, Norway, and Denmark, have recently implemented a series of forceful policies aimed at leveraging digital technologies to drive the green transition. At the national level, policy documents in certain Nordic countries concentrate on specific aspects of the transition to a more environmentally sustainable economy, including low-carbon initiatives, competitiveness in the environmental technology industry, and circularity [25]. The Nordic approach to greening the economy goes beyond the conventional green growth strategies and emphasizes the active role of state actors in guiding the economy through policy interventions and promot-

ing technological advancement and innovation in green technologies in collaboration with relevant industries [26]. The movement towards climate neutrality through a digital green transition is perceived as a competitive advantage for Nordic states [27].

In the case of Estonia, the country has evolved from a post-Soviet state to a leader in digital technologies and a "unicorn factory" economy through a combination of government policies, investments in education and technology, and a strong entrepreneurial culture [28]. In the early 2000s, the Estonian government began to focus on developing the country's digital infrastructure and promoting the use of technology in various sectors of the economy. This included investments in high-speed internet, developing a digital ID system and creating an "e-Estonia" initiative to encourage the use of digital services in the public and private sectors [28]. Additionally, the Estonian government has promoted education and technology investment by providing free IT education and encouraging private-sector investment in research and development. Estonia also has a dynamic entrepreneurial culture, which has helped to foster the growth of startups and technology companies. As a result, the country has a supportive startup ecosystem, including various incubators, accelerators, and government-backed programs that provide funding, among other resources [29]. As a result of these efforts, Estonia has become a leader in digital technologies and home to several successful technology companies, including the company Bolt (formerly Taxify) and the e-commerce platform TransferWise, both of which have achieved the "unicorn" status, meaning that their valuation exceeded $1 billion [30].

The current study aims to explore Estonian entrepreneurs' perceptions of challenges and opportunities related to the green transition through a survey and interviews. Our study's country-specific approach focuses on Estonia as a unique case example of twin transition, both digital and green. The digital transition is a substantial part of the technological entrepreneurship trend taking place currently. The perceived challenges and opportunities related to the green transition have yet to be extensively and empirically studied in literature, not only for Estonian companies, but also generally, as most of the literature focuses on circular economy transition challenges and opportunities. Understanding the opportunities and challenges of green/sustainable entrepreneurship is the key to finding new business solutions for tackling the sustainability crisis.

This paper is organized as follows: The next section focuses on the development of the questionnaire and survey and a description of the research methodology, both quantitative and qualitative. The Results section presents an empirical analysis of quantitative and qualitative data. The final section provides a discussion, including limitations and future research directions.

2. Materials and Methods

The survey of the companies and interviews was part of broader research that included four main goals: (1) identify opportunities and challenges for Estonian foreign economic policy and entrepreneurship arising from the green transition; (2) identify possible measures and instruments (mainly related to foreign economic policy) to support companies in carrying out the green transition; (3) identify the awareness of Estonian companies about the green transition and how much the green transition is taken into account when planning future activities; (4) propose realistic policy recommendations at various levels.

Development of the survey to identify opportunities and challenges for Estonian foreign economic policy and entrepreneurship arising from the green transition had three stages: analysis of the background information and desk research on the challenges and opportunities for companies within the green transition; development of the questionnaire for surveys, focus groups, and interviews, based on best practices; and data collection. In this study, quantitative and qualitative methods were used to answer the following research questions:

1. What are Estonian entrepreneurs' perceptions of the opportunities related to green transition/sustainable entrepreneurship?
2. What are Estonian entrepreneurs' perceptions of the challenges related to green transition/sustainable entrepreneurship?

Via desk research of survey studies, an overview is provided of the abovementioned broad categories of challenges and opportunities revealed by the companies' perceptions of the Green Deal, the green transition, and the circular transition. The circular economy has gained significant attention as a central concept for the green transition, as it offers an alternative to the traditional linear economy model (take–make–use–dispose) based on the extraction of finite resources and the generation of waste [11]. Many experts and policymakers see the circular economy as a key strategy for transitioning to a more sustainable economy [24,31]. For instance, the circular economy has been recognized as a central concept in several international agreements, such as the United Nations 2030 Agenda for Sustainable Development and the European Union's Green Deal [15].

Horizon project research performed by R2π Consortium [32] revealed numerous obstacles at company and value chain levels, as well as from EU and local level policy perspectives. Difficulties in financing new business models, taxation systems, resistance to change, and the perceived lack of consumer demand are key obstacles that may hamper the circular transformation.

A survey conducted by Ibec in collaboration with the Environmental Protection Agency (EPA) in Ireland [33] found that businesses view the transition towards a sustainable Europe as a source of business opportunities and local employment, including in Ireland. Progressive companies that embrace this new mentality are poised to become technological leaders in their respective industries. The survey results revealed that approximately half of the participating companies saw the transition to a circular economy as a long-term opportunity for their organization, though the potential business risks must also be considered.

Research conducted by the European House—Ambrosetti and the Enel Foundation [34]—showed that although the circular economy has become a central issue in European policy discussions, many European countries still lack a comprehensive national strategy for implementing the circular economy as a competitive advantage, which may pose challenges to businesses. Companies should view the shift from linear to circular models as a strategic decision for their organization. The circular economy is perceived as a means of gaining a competitive edge through diversification, market expansion and cost reduction, which can mean new opportunities for companies. However, most European business leaders believe that their countries are unprepared to face the challenges posed by the circular economy.

PwC surveyed nearly 300 businesses across 13 European countries to assess their preparedness for the European Union's Green Deal [35]. The results showed that fewer than half of the organizations considered themselves prepared. The largest challenges facing these companies were a lack of organizational capacity and processes to comprehend the full implications of the Green Deal, estimate the costs of Green Deal levies, take advantage of available incentives, and optimize the opportunities arising from the transition to more sustainable economies. The Green Deal also prioritizes a transition to the circular economy and the survey findings indicated that businesses are taking action to decrease waste generation and emissions, as well as promote extended product lifecycles and reuse.

Literature review and desk research of other surveys and best practices [31–39] revealed that there are a variety of challenges and opportunities that companies may face in adopting measures related to the European Union's Green Deal (Table 1).

European companies generally perceive the green transition as both an opportunity and a challenge [35]. On the one hand, the transition to a more sustainable economy presents opportunities for companies to innovate and develop new products and services that support environmental sustainability. For example, companies in the renewable energy sector benefit from the increased demand for clean energy. Additionally, companies that

demonstrate their commitment to sustainability may attract customers who prioritize environmentally friendly products and services [40].

Table 1. The challenges and opportunities in the green transition.

Challenges	Opportunities
- Financial barriers: high investment costs in renewable energy and energy-efficient technologies. - Lack of knowledge/expertise: not sufficiently understanding the regulations and requirements related to sustainability. - Resistance to change: from employees and other stakeholders who are not on board with the company's sustainability efforts. - Limited access to financing: this is related to sustainable investments and lack of access to green technologies in the case of some companies. - Lack of consumer demand: insufficient consumer demand for sustainable products and services. - Limited policy support: challenges in implementing measures related to the Green Deal if there is limited policy support from governments.	- Increased competitiveness: improved efficiency, reduced costs, and meeting the growing demand for sustainable products and services as a result of adopting green technologies/practices. - New business opportunities: investments in low-carbon technologies, renewable energy, and sustainable infrastructure. - Improved brand reputation: higher customer loyalty as consumers increasingly prioritize sustainable products/services. - Better risk management: companies can improve their long-term resilience and reduce the risks associated with regulatory changes, such as carbon pricing, by reducing their carbon footprint and exposure to environmental risks. - Access to funding and investment: companies that adopt green measures may be eligible for various forms of financing, such as grants, low-interest loans, and private investment, to support their transition to a sustainable business model. - Improved innovation and productivity: by embracing green technologies and practices, companies can drive innovation and improve productivity, leading to increased efficiency and cost savings.

On the other hand, the green transition also presents challenges for companies. The transition to a more sustainable economy may require significant investments in new technology and equipment, which can be costly [11]. Additionally, companies may face regulatory hurdles as governments implement policies to support the transition [41]. Furthermore, companies may also face increased competition from other companies investing in sustainable practices [36].

Based on Sandberg and Alvesson [42], we argue that our proposed categorization of opportunities and challenges makes a theoretical contribution to the literature by organizing/structuring the phenomenon, which concerns the green transition's impact on companies. This type of contribution can be valuable by providing a clear and organized way of thinking and by synthesizing what is known about the green transition, as well as providing a framework for future research, which can be used as a starting point for exploring the green transition in more detail.

Based on the examples from the literature, a quantitative survey questionnaire was developed to empirically investigate barriers and opportunities of the green transition in the case of Estonian companies. Since companies tend to perceive the green transition and circular transition as similar processes, chosen available surveys of companies were analyzed from the survey design point of view to develop a questionnaire, focus group, and interview questions for our empirical analysis. The questionnaire had seven blocks, including (1) general information about the respondents, (2) the general effect of the green transition, and finally, specific (3) challenges and (4) opportunities related to the green transition. Several other blocks were designed to fulfill other research objectives of the project, including awareness and policy recommendations. The basic principles of the survey design were the following: the questionnaire was designed to be clear, simple, and easy to understand; the questions were worded neutrally, avoiding leading or biased questions. It was also important to ensure that the questions were relevant and not repetitive or unnecessary. Aside from the survey, qualitative interviews were conducted as well. Both quantitative and qualitative data collection techniques, as well as the analysis methods, are discussed in more detail in the following sections.

2.1. Quantitative Data Collection Methods

Using the EU Survey platform, an online survey was distributed to a stratified simple random sample in mid-February 2022. This sample was extracted from a population of all the economically active Estonian companies based on the 2019 data from the Estonian e-Business Register. The initial database consisted of about 240,000 business entities, from which only economically active companies were included (i.e., had nonzero revenue and at least one employee). Furthermore, to ensure data quality, bankrupt and liquidated companies were excluded, along with organizations that had either negative revenue, liabilities, or owner's equity.

After removing enterprises with duplicate email contacts and incomplete data, over 56,000 companies remained for the final population, which was used to extract a stratified simple random sample. To apply this sampling method, 5 strata based on company size (1–4, 5–9, 10–49, 50–249, and 250+ employees) and 18 strata (see Table 2) related to the Estonian classification of economic activities (*Eesti Majanduse Tegevusalade Klassifikaator* or EMTAK) were identified, yielding a total of 90 strata (5×18) in the population. From each stratum, a specified number of business organizations were randomly selected (using the *dplyr* software package in R) to result in a sample with the same proportions of companies across different sizes and industries, as represented in the population.

Table 2. The Estonian classification of economic activities applied in the study.

Code	Industry
A	Agriculture, forestry, and fishing
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam, and air conditioning supply
E	Water supply; sewerage, waste management, and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific, and technical activities
N	Administrative and support service activities
P	Education
Q	Human health and social work activities
R	Arts, entertainment, and recreation
S	Other service activities

The Estonian version of the Statistical Classification of Economic Activities in the European Community or NACE (*nomenclature statistique des activités économiques dans la Communauté européenne*).

The aim was to obtain a sample size of at least 382. This would enable the capacity to reliably generalize the findings to a population of over 50,000 subjects [43]. Furthermore, to account for a potentially low response, which was expected to be around 5%, the survey was initially distributed to $382/0.05 = 7640$ companies. However, due to a lack of participation, the latter was extended to over 22,000 companies by taking another 3 stratified random samples from the population. Finally, responses from 551 representatives from different business organizations were received, which resulted in a response rate of around 2.5% by the end of March 2022. Thereafter, based on logical inconsistencies between the survey answers, 19 low-quality responses were identified and removed, which yielded a final sample of 532 qualified responses.

Figure 1 shows that the distribution of companies across industries and company size in the population (see panel a) appears similar to the obtained survey sample (see panel b). The latter also includes cases where the respondents could not identify their company's field of activity (indicated by NA), and in some instances enterprises claimed to have zero

employees (since organizations without employees were excluded based on 2019 data, yet data collection occurred in 2022). Nevertheless, the sample appears to be relatively representative of the population as it includes predominantly micro-enterprises (i.e., small companies with less than ten employees) from all industries.

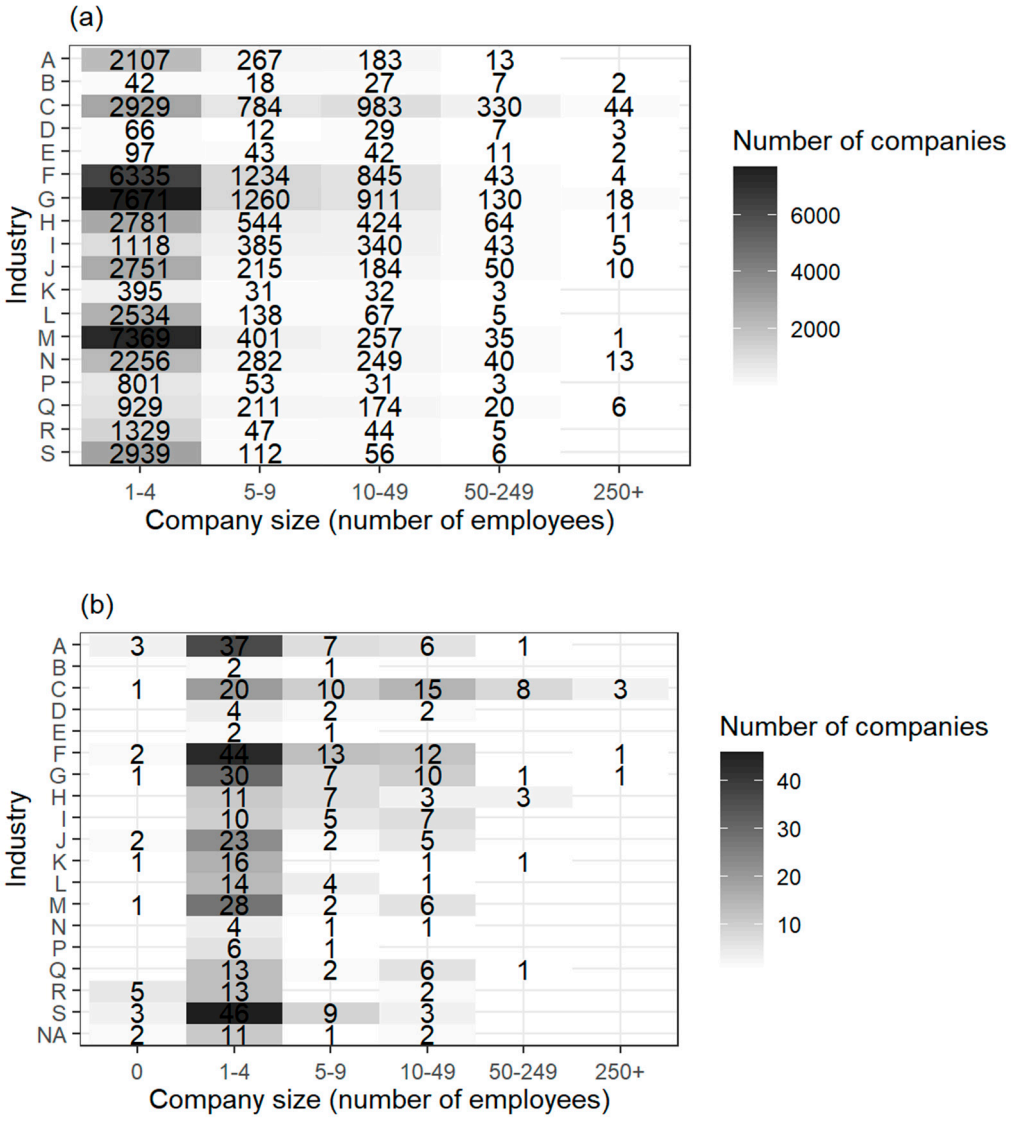

Figure 1. Distribution of companies across industries and company size: (**a**) Population, n = 56,298; (**b**) Survey sample, n = 532.

The survey (along with the interviews described later in the text) was conducted at the request of the Estonian Ministry of Foreign Affairs. The survey questions, which were investigated in this study, have been translated into English and are included in Appendix A. The full version of the entire survey is in Estonian and available upon reasonable request. The questions presented in Appendix A include sections concerning (1) the general information about the respondents, (2) the general effect of the green transition, and finally, specific (3) challenges and (4) opportunities related to the green transition.

2.2. Qualitative Data Collection Methods

Focus groups (n = 31) and semi-structured interviews (n = 11) were used to collect qualitative data. The role of focus groups and semi-structured interviews was to determine Estonian people's awareness of EU climate goals and their implications. The interview

questions were formulated according to the research questions and were designed to support and enrich the data gathered through the online survey.

The semi-structured interviews were conducted in the period 31 March to 27 May 2022. A total of 42 people from different target groups participated in focus groups and semi-structured interviews. The interviews involved a premeditated heterogeneous sample designed to maximize the variation/diversity across the interviewees. Based on the research task, four focus groups were formed. These included entrepreneurs and representatives of professional associations and state institutions who were in daily contact with issues related to the green transition (see Table 3).

Table 3. Sample description of the focus group interviews (n = 31).

Focus Groups	Data Collection Period	Number of Participants
1. Entrepreneurs (medium and large companies)	31 March 2022	8
2. Entrepreneurs (micro and small companies)	4 April 2022	8
3. Representatives of professional associations	1 April 2022	11
4. Representatives of state institutions	4 April 2022	4

Due to the time constraints of the participants and the restrictions resulting from the COVID-19 pandemic, the focus group interviews took place in Microsoft Teams and the Zoom environment. The average length of the focus group interviews was about 1.5 h, and they were conducted by three different interviewers/researchers. All focus group interviews were video-recorded. In addition, the participants in the focus groups were able to provide written comments in a dedicated Google Drive file during the interviews. The interviewees were also offered the opportunity to convey additional comments via email after the interview. Furthermore, interviewers maintained researcher diaries to document critical aspects of focus groups. In addition to the focus group interviews, 11 semi-structured interviews were conducted with entrepreneurs, experts, and representatives of academic circles (see Table 4). Individual interviews were conducted by the experienced researcher.

Table 4. Sample description of semi-structured interviews (n = 11).

Participants	Data Collection Period	Number of Participants
1. Entrepreneurs	31 March–4 April 2022	2
2. Experts	23–27 May 2022	3
3. Academics	1–20 May 2022	6

Similar to focus groups, individual interviews were conducted in the Microsoft Teams environment, except for two interviews that took place in person (face-to-face). The average length of the semi-structured interviews was 1 h (40 min–1.5 h), and they were video-recorded. The following sections explain the applied data analysis methods.

2.3. Data Analysis Methods

2.3.1. Quantitative Survey Analysis Methods

The survey responses were summarized with descriptive statistics and further analyzed with inferential statistics. The latter included proportional odds logistic regression, which is appropriate when the dependent variable is on an ordinal scale. This method was applied with the *MASS* software package in R through the *polr()* function. This regression method is specified with the following equation:

$$\begin{aligned} \ln\{\text{Odds}(Y \leq k)/\text{Odds}(\text{Odds}(Y > k)\} = a_k + b_1\text{New products} + \\ b_2\text{New tech uncertainty} + b_3\text{Consumer pressure} + b_4\text{Employee pressure} + \\ b_5\text{Investor pressure} + b_6\text{Political pressure} + b_7\text{Join science and industry} + \varepsilon \end{aligned} \quad (1)$$

where the dependent/response variable in model 1 is Y, which denotes the survey answers to the question about how the respondent perceives that his/her company's costs may

change in the near future as a result of the green transition. The variable is also referred to as "Green costs", and its multiple-choice answers to this question are on an ordinal scale, represented by k. The latter takes the values of −1 (costs will decrease), 0 (costs will remain the same), and 1 (costs will increase). In an alternative model specification, Y refers to a variable called "Green opportunity", which denotes a statement that the green transition means an opportunity, and the k categories of this response variable range from 1 (completely disagree) to 7 (completely agree). These dependent variables are intended to capture challenges in terms of costs and opportunities in general. Furthermore, they are predicted with up to seven independent/predictor variables.

First, "New products" refers to the survey question about how the green transition may affect the respondent's company, in terms of launching new products to the market, on a scale of 1 (very negatively) to 7 (very positively). This aims to capture perceptions regarding innovation. Second, "New tech uncertainty" includes the survey question about the extent to which the green transition might be hampered by the uncertainty related to new technologies, on a scale of 1 (does not hamper at all) to 5 (hampers significantly). It is intended to capture perceptions concerning the success or failure of technological innovation. Moreover, "Consumer pressure", "Employee pressure", "Investor pressure", and "Political pressure" refer to four separate survey questions about the extent to which the green transition is pressured by a company's respective stakeholders on a scale of 1 (very little) to 5 (very much). These variables aim to capture coercive societal influences. Finally, "Join science and industry" includes a yes (1) or no (0) question about whether the respondent believes that the Estonian companies could benefit more from the green transition in case scientific and industrial fields cooperate more broadly towards environmentally friendly technologies. It aims to measure the need for innovative technological collaborations improve current practices.

Furthermore, a_k in Model 1 denotes constants for each level of the ordinal response $k - 1$, and ε is the error term. Moreover, b represents coefficients, which indicate the change in log odds of Y for a one-unit change in a predictor variable while holding other predictors constant. For a simplified interpretation, these coefficients are also exponentiated, which enables the use of odds ratios (ORs). An OR larger than 1 implies that a predictor is related to the increased odds of greater Y (either in perceptions of "Green costs" or "Green opportunity") by OR—1 times. On the other hand, an OR lower than 1 indicates that a predictor is associated with decreased odds of greater Y by 1—OR. Additionally, the ORs are reported with exponentiated 95% confidence intervals (CI), where crossing 1 implies an insignificant result.

However, it is important to note that these odds of the independent variables are assumed to be similar on all the k categories of the response variable Y. This refers to the proportional odds assumption, which was assessed through the Brant–Wald test. (The value $p < 0.05$ implies that the assumption does not hold.) The latter was implemented in R with the brant software package. Table 5 shows that according to the test, this assumption is satisfied in terms of the entire model in both panels a and b, indicated by the probability (p-value) of Omnibus, which is larger than 0.05. The same conclusion applies to the individual predictors reported in the table. However, the independent variable "Join science and industry" was excluded from the first model in panel a as it did not satisfy the assumption of proportional odds ($p = 0.04$) in an unreported test. On the other hand, the predictor remained in panel b, where the assumption was met ($p = 0.1$), as shown in the table.

Aside from the proportional odds assumption, the applied regression method also assumes no multi-collinearity between the independent variables. Table 6 reveals that there are no overly high correlations between the predictors. Similarly, Table 7 shows no signs of multi-collinearity, based on the variance inflation factor or VIF test (which was applied with car package in R), as none of the VIF values are larger than 10 (in the case of both panels a and b). Lastly, the proportional odds logistic regression assumes that the dependent variable must be ordinal, which is satisfied with collected survey data.

Table 5. The Brant–Wald test: (**a**) Model predicting green costs; (**b**) Model predicting green opportunities.

(a) Model Predicting Green Costs			
	X2	**df**	**Probability**
Omnibus	6.19	6	0.40
New products	0.62	1	0.43
New tech uncertainty	0.83	1	0.36
Consumer pressure	1.74	1	0.19
Employee pressure	0.53	1	0.47
Investor pressure	1.52	1	0.22
Political pressure	0.56	1	0.45
(b) Model Predicting Green Opportunity			
	X2	**df**	**Probability**
Omnibus	37.04	35	0.37
New products	5.26	5	0.39
New tech uncertainty	3.63	5	0.60
Consumer pressure	2.10	5	0.84
Employee pressure	6.50	5	0.26
Investor pressure	3.48	5	0.63
Political pressure	2.64	5	0.76
Join science and industry	9.18	5	0.10

Table 6. Spearman correlation matrix.

	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**
I Green costs	1								
II Green opportunity	−0.3 ***	1							
III New products	−0.2 ***	0.6 ***	1						
IV New tech uncertainty	0.1 ***	−0.1 **	−0.1	1					
V Consumer pressure	−0.2 ***	0.6 ***	0.4 ***	−0.1	1				
VI Employee pressure	−0.2 **	0.6 ***	0.5 ***	−0.1	0.7 ***	1			
VII Investor pressure	−0.1 **	0.4 ***	0.4 ***	−0.04	0.5 ***	0.6 ***	1		
VIII Political pressure	0.2 ***	−0.4 ***	−0.3 ***	0.1 ***	−0.2 ***	−0.3 ***	−0.1	1	
IX Join science and industry	−0.1	0.2 ***	0.2 ***	−0.01	0.1 ***	0.2 ***	0.2 ***	−0.1	1

Note: *** $p < 0.01$; ** $p < 0.05$.

Table 7. The variance inflation factor test.

	(a) VIF–Model Predicting Green Costs	**(b) VIF–Model Predicting Green Opportunity**
New products	1.299	1.286
New tech uncertainty	1.017	1.028
Consumer pressure	2.001	1.956
Employee pressure	2.009	2.034
Investor pressure	1.576	1.578
Political pressure	1.103	1.102
Join science and industry		1.043

2.3.2. Qualitative Interview Analysis Methods

After transcribing the qualitative data, we used the principles of thematic analysis [31] to identify green transition opportunities and challenges across the data set expressed by the participants. The thematic analysis approach allows the identification, analysis, and reporting of patterns or themes within the data [31]. Using this approach, we strived to capture topics related to the research questions and to provide a more detailed and nuanced account of challenges and opportunities reported by the interviewees within the data set.

Before analysis, in the transcription process, all interviewees were anonymized, and transcripts were numerically coded. In the first phase of the analysis, we familiarized ourselves with all data sets, reading and rereading the data and identifying the initial ideas and potential themes (based on the research questions). In the second phase of the analysis, we focused on identifying the challenges and opportunities within each theme. In the current article, we will present the data related to one of the main themes, extracted from the data: "green transition implications to business".

After identifying the main themes, we focused on identifying the challenges and opportunities. Upon completing our analysis, we shared the preliminary findings with participants of semi-structured interviews for their input. Unfortunately, no further comments were received.

3. Results

3.1. Survey Findings

3.1.1. Results from Descriptive Statistics

Figure 2 reveals that there seems to be significant uncertainty about whether the green transition can be viewed as an opportunity (see panel a), while with greater certainty, the respondents expect that this transition will increase the costs/expenditures of their company (see panel b). Interestingly, panel b indicates that only a small fraction of respondents (3%) believe that the green transition may lead to cost-saving opportunities. Thus, it appears that Estonian businesses predominately anticipate upcoming financial challenges ahead related to the climate-neutral movement in Europe.

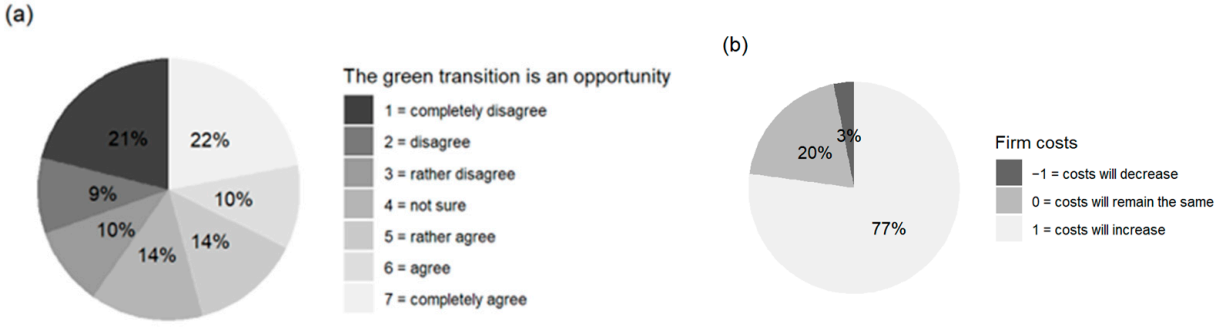

Figure 2. Survey answers to the questions: (**a**) 2.1. How much do you agree with the following statement? "The green transition means an opportunity." (n = 532); (**b**) 2.2. How are the costs of your company expected to change as a result of the green transition? (n = 446, NA = 86).

Furthermore, according to Figure 3, the respondents perceived that their company's business development could be mostly hindered by political instability, resource scarcity, and regulative costs. Additionally, Figure 4 reveals that aside from the risk of a greenwashing image, the green transition is perceived to be hampered mainly by investment costs, availability of money, and regulatory uncertainty. Such findings imply that the movement towards a carbon-neutral Europe is mostly seen as a costly challenge arising from policymakers.

Furthermore, as depicted in Figure 5, most the respondents believe that their company will not reap any benefits from the transition to green practices. The respondents hold particularly negative views about market expansion. This could be due to concerns that some competitors may obtain an advantage in adapting to green regulations, and the increased bureaucracy might create entry barriers as well. Lastly, Figure 6 reveals that the pressure toward the green transition is predominantly perceived to be emerging from politicians.

Overall, the descriptive statistics overwhelmingly indicate that the green transition is viewed by most Estonian companies as a costly challenge resulting from political coercion. Moreover, there appears to be significant uncertainty concerning the arising opportunities.

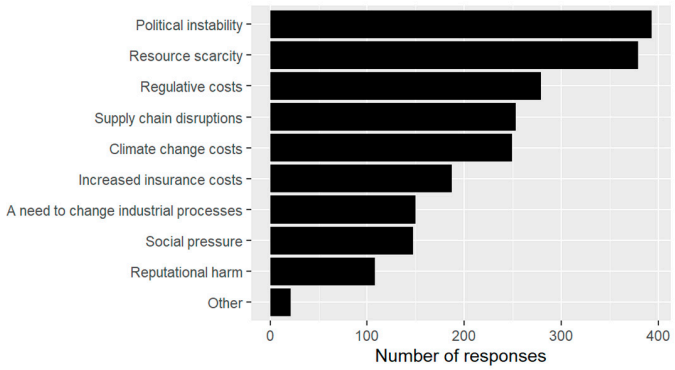

Figure 3. Perceived factors hampering business development in the near future based on survey questions 3.1–3.10 (n = 532).

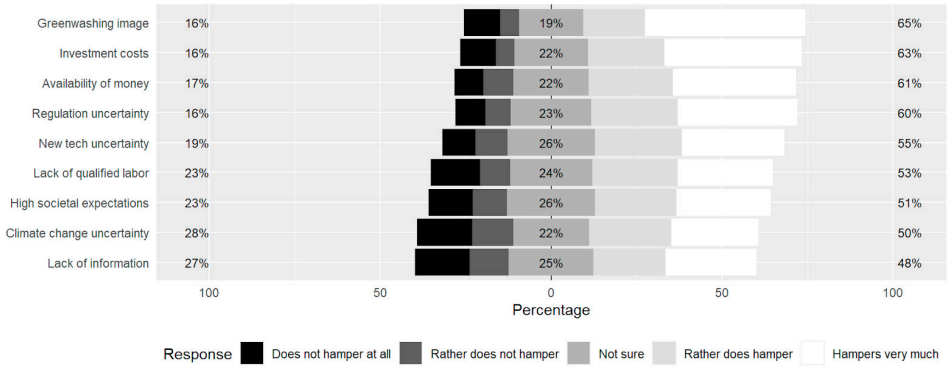

Figure 4. Perceived factors hampering the green transition based on survey questions 3.11–3.19 (n = 532).

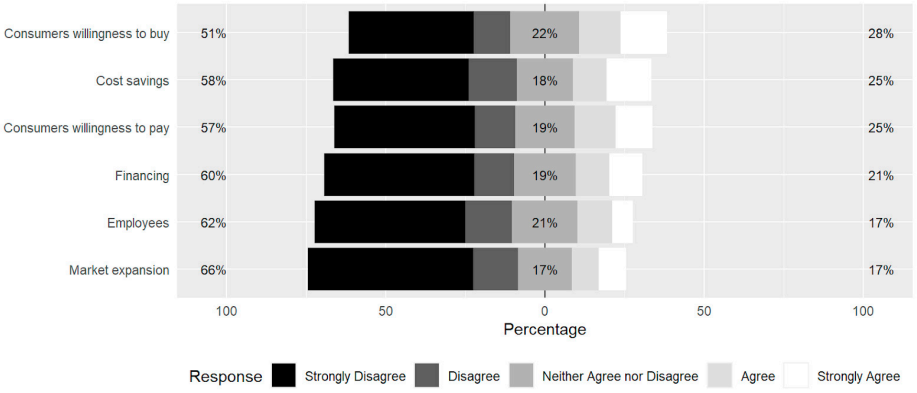

Figure 5. Perceived benefits of the green transition to companies based on survey questions 4.1–4.6 (n = 532).

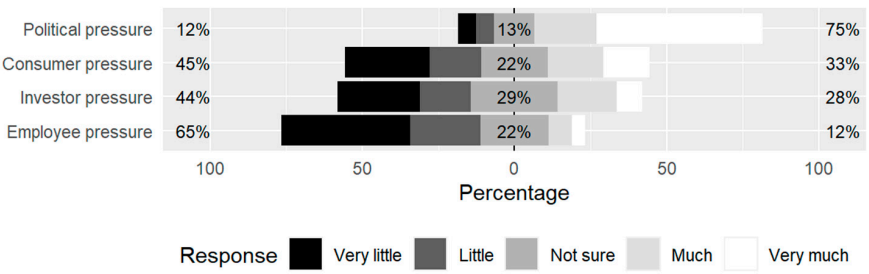

Figure 6. Perceived pressure for the green transition based on survey questions 2.4–2.7 (n = 532).

3.1.2. Results from Proportional Odds Logistic Regressions

The regressions in Table 8 indicate with high statistical significance ($p < 0.01$) that an increase in the perceived pressure from politicians ("Political pressure") for the green transition is associated with a greater likelihood of perceiving that the transition will lead to larger company expenses ("Green costs"). A similar effect on the latter can also be observed in case the respondents held stronger beliefs that the goal of carbon-neutral Europe is hindered by uncertainty surrounding technological innovation ("New tech uncertainty"). Interestingly, the findings reveal that when the green transition was perceived to have a more positive effect on introducing new products to the market ("New products"), there was a significantly lower likelihood of cost increases.

Table 8. Findings of proportional odds logistic regressions.

	Dependent Variable:	
	Green Costs	**Green Opportunity**
	(1)	**(2)**
New products	−0.167 **	0.664 ***
	(0.075)	(0.065)
New tech uncertainty	0.194 **	−0.117 *
	(0.094)	(0.067)
Consumer pressure	−0.115	0.355 ***
	(0.114)	(0.084)
Employee pressure	0.060	0.396 ***
	(0.134)	(0.106)
Investor pressure	−0.130	0.200 **
	(0.112)	(0.082)
Political pressure	0.317 ***	−0.277 ***
	(0.098)	(0.076)
Join science and industry		0.542 ***
		(0.174)
AIC	541.8	1632.6
BIC	574.6	1688.2
Log likelihood	−262.9	−803.3
Deviance	525.8	1606.6
Observations	446	532

Note: Standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Furthermore, as indicated in Table 8, when it was believed that Estonian companies could benefit from the cooperation between scientific and industrial fields ("Join science and industry"), the green transition was perceived more likely as an opportunity ("Green opportunity"), compared to those who hold a different viewpoint regarding such collaboration. Moreover, "New products", as well as "Consumer pressure", "Employee pressure", and "Investor pressure" also increased the likelihood of viewing the transition in question as an opportunity. However, a negative effect appeared in the case of "Political pressure".

Table 9 allows for a more specific interpretation of the effect sizes through the use of odds ratios. First, larger "Political pressure" is associated with 37% higher odds ($1.37 - 1 = 0.37$) of increases in "Green costs" (see panel a) and 24% lower odds ($1 - 0.76 = 0.24$) of perceiving the green transition as a "Green opportunity" (see panel b). These effect sizes correspond, respectively, to odds ratios of 1.37 (95% CI [1.13, 1.66]) and 0.76 (95% CI [0.65, 0.88]). However, "Consumer pressure", "Employee pressure", and "Investor pressure" were associated, respectively, with 43%, 49%, and 22% higher odds of perceiving the green transition as a "Green opportunity". The smaller effect related to investors is likely since the population of Estonian companies is mostly composed of

micro-enterprises that may depend less on capital providers. These findings further imply that achieving carbon neutrality in Estonia may require societal pressure from all stakeholders, not just politicians. This applies especially to companies' economic stakeholders, such as consumers, employees, and investors, who engage in economic transactions with these businesses.

Table 9. Findings of proportional odds logistic regressions with odd ratios: (**a**) Model predicting green costs; (**b**) Model predicting green opportunity.

(a) Model Predicting Green Costs	
	Dependent Variable
	Green Costs
New products	0.85 ** (0.73, 0.98)
New tech uncertainty	1.21 ** (1.01, 1.46)
Consumer pressure	0.89 (0.71, 1.12)
Employee pressure	1.06 (0.82, 1.39)
Investor pressure	0.88 (0.70, 1.09)
Political pressure	1.37 *** (1.13, 1.66)
Observations	446
(b) Model Predicting Green Opportunity	
	Dependent Variable:
	Green Opportunity
New products	1.94 *** (1.71, 2.21)
New tech uncertainty	0.89 * (0.78, 1.02)
Consumer pressure	1.43 *** (1.21, 1.68)
Employee pressure	1.49 *** (1.21, 1.83)
Investor pressure	1.22 ** (1.04, 1.44)
Political pressure	0.76 *** (0.65, 0.88)
Join science and industry	1.72 *** (1.22, 2.42)
Observations	532

Note: Exponentiated CI in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 8 also shows that "New tech uncertainty" is associated with 21% greater odds of increases in "Green costs". In contrast, "New products" is related to 15% lower odds of rising "Green costs". This implies that it might be necessary for policymakers to support environmentally friendly innovation solutions predictably. Furthermore, "New products" ("Join science and industry") was associated with 94% (72%) greater odds of perceiving the green transition as a "Green opportunity" (compared to a reference group). These were also the largest reported effect sizes, which correspond, respectively, to odds ratios of 1.94 (95% CI [1.71, 2.21]) and 1.72 (95% CI [1.22, 2.42]). Such findings emphasize the need for a twin transition, which embodies not only a shift towards responsible business practices, but also towards technological innovation. The latter can be vital for cost reduction, thereby making a transformative change in society, which offers new business opportunities under sustainable development.

3.2. Interview Findings: The Green Transition Implications for Businesses

As a result of the qualitative analysis of interviews and focus groups, we arrived at six themes brought out by the interviewees while discussing the challenges and opportunities of the green transition. Reported themes were as follows: (1) awareness (Table 10); (2) competitive advantage and product/service development (Table 11); (3) regulation and licensing (Table 12); (4) production, manufacturing, and technology (Table 13); (5) marketing and communication (Table 14); (6) and metrics and measuring (Table 15). In each of mentioned themes, both challenges and opportunities were highlighted. Interviewees thoughts, expressed during interviews, are highlighted below.

Table 10. Theme 1: Awareness.

Challenges	Opportunities
• Entrepreneurs' negative attitude towards the green transition • Low awareness of what steps are needed for the green transition	• Entrepreneurs who are interested in green transition and taking steps towards it • Initiating best practices and sharing them with entrepreneurs • Tackle green and digital transitions at the same time

Table 11. Theme 2: Competitive advantage and product/service development.

Challenges	Opportunities
• Product development is long-term, expensive, and research-intensive, while applicability is limited • The product development related to the green transition is expensive and decreases the competitive advantage • Need to keep the products price level stable because the consumer is not ready to choose a green product and pay more for it • Companies lack equity capital to make green investments • Finding financing options for the transition due to the need for additional investments	• Company's environmental friendliness increases competitive advantage and makes polluters accountable • Reducing green products' taxation • Selling green products at a higher price • Digitalizing services • Investing in technology that allows more efficient production • Discovering new consumption models

Table 12. Theme 3: Regulations and licensing.

Challenges	Opportunities
• Regulations that support green transition. For example, valorization of raw materials or construction of sea turbines, and other	• Environmental licensing/labelling, including exported products

Table 13. Theme 4: Production, manufacturing, and technology.

Challenges	Opportunities
• Production efficiency: inputs, volumes, replacement of an old technology • Manufacturing sector faces economic and political pressure (change in industrial structure) • Packaging is a complex issue and creates confusion and greenwashing • Cost of new technology	• Valorization of raw materials • Replacing old technologies

Table 14. Theme 5: Marketing and communication.

Challenges	Opportunities
• Quick access to necessary information • The line between going green and greenwashing	• Stakeholders must understand why the product service is changing and how it will benefit them • Using facts and emotions in a way that makes people change their behaviour • The person/consumer and society must know the green turn price (price, packaging, consumption, and others)

Table 15. Theme 6: Metrics and measuring.

Challenges	Opportunities
• Current green transition metrics have lack of clarity	• Carbon footprint calculators for different sectors as a tool for increasing competitive advantage • New measurement metrics to provide more transparency to supply chain, companies, national levels • Non-financial reporting

Mentioned challenges in the current theme were entrepreneurs' negative attitudes towards the green transition and low awareness of the steps that need to be taken to support the green transition within the companies (Table 10). However, opportunities that were pointed out highlighted that those entrepreneurs that have a positive attitude toward the green transition could lead the way and set a good example. The initiation of good practices and the green transition, as well as digital transformation (twin transition) at the same time, were seen as opportunities for raising awareness.

The interviewees pointed out that many companies have already achieved something in the context of the green transition, be it collecting residual heat, processing production residues, increasing energy efficiency, or something else. Simultaneously, it was also illustrated that there are companies whose managers are not interested in the green transition and where, in the best case, only what is necessary is executed under the people's and regulations' compulsion.

> "If [. . .] a leader is a person who is not interested in this topic [. . .], then there is nothing to do. In the best case, he takes those unavoidable steps under the compulsion of the people working in his company. He does not do a millimetre more because he is not interested in this topic. He is not interested in the long-term and future of this company. He looks ahead a year or two, and this green theme does not fit into it". (27)

Interviewees also strongly believed that if the entrepreneur or manager has a positive attitude towards the green transition, it is more likely that necessary changes for the green transition within the company will be made.

> "Personally, I know a lot about green transition, because I am green in my world-view". (12)

> "I deal with companies that have an understanding and desire to be advocates and pioneers in Estonia on this topic . . . There are people around me, from my social media network to friends and acquaintances, . . . everyone is very aware and interested in the topic". (27)

Several interviewees mentioned that the green transition should be addressed in Estonia in the same way as the digital transition, and it would be a competitive advantage for a country to initiate the twin transition. However, it would be difficult at the beginning and would need additional costs.

> "The state tries to encourage that twin transition is our opportunity, let us take advantage of it, we will make a leap in development (joint approach of the digital and green revolution). Sometimes customers say that it is rather difficult at the beginning (the pain point of the European directives is in mind), brings additional costs". (32)

The interviewees added that it is essential to deal with green issues after Russia's aggression against Ukraine, which led to a rapid increase in energy prices and opened a window of opportunity for the green transition.

> " . . . after 24 February [. . .] looking at the economic situation, we realized that if up until now dealing with the environment and the green transition were urgent,

then it is extremely urgent. These topics are even more important today than a month ago". (27)

Overall, the general opinions expressed throughout the interviews left the impression that there is a lot that can be completed to raise awareness about the green transition.

Topics and ideas expressed by the interviewees about the challenges of the current theme varied from planning, losing competitive advantage, the investment aspect of product development, and pricing to finding investment and capital to change consumption models and undertake the green transition (Table 11). At the same time, the same aspects were mentioned as opportunities if they were used wisely by the companies. For example, during the interviews, it was recognized that the green transition requires a long-term perspective from the company.

"Before the dreamers and visionaries, ... in cooperation with various stakeholders can come to the grassroots level, it will take time, nothing will happen overnight". (37)

The interviewees also pointed out some aspects related to product development and competitiveness in connection with the green transition, i.e., that the green transition is difficult initially, that it brings additional costs, and that it reduces competitive advantage. Additionally, the possibility of losing the competitive advantage due to the green transition was mentioned as a point of concern and challenge.

"There are those among entrepreneurs who ask what will happen to our competitiveness". (32)

"Green transition reduces our competitive advantage". (27)

Interviewees also noted that consumer is not ready to pay more for environmentally friendly products, while the manufacturing price for the company is higher.

"Potential obstacle can also be that buyers are not willing to pay a higher price for an environmentally friendly product or service but the price of such a product/or service is more expensive for the company". (26)

Simultaneously, it was recognized that the old consumption models no longer work under the conditions of the green transition, and it is necessary to find new consumption models—to consume less and more expensively.

"[...] in the ideal world people would consume only as much as they need, not more, and this would allow, let us say, to consume less, but more expensively [...]". (34)

Additionally, as one possibility, it was mentioned that environmental effects should ideally be considered when pricing products, and that the market can be influenced through green products. As a potential opportunity for the business interviewees, it was recognized that if the customer demands proof of the company's environmental friendliness, it will provide a competitive advantage.

"In our case, we have the educated customer is the price. If more and more customers start demanding certain certificates, certain proof that the company is responsible, it will create advantages for our companies". (33)

"Speaking about organically grown products, our consumer decides, and our consumer is price sensitive. Many entrepreneurs have the question that they would like to produce organically, but the business model does not add up. They are entrepreneurs and they must not go bankrupt". (31)

Representatives from manufacturing sector, especially food production, shared that increasing prices in this sector is extremely complex. Maintaining price levels could be achieved mainly due to investing to new technologies that enable more efficient production.

"The food sector is currently in such a situation where input prices are growing fast and rapidly, but it is not possible to increase these selling prices, because the

> retail chains have a very tough price war among themselves. This has put a lot of pressure on the profitability and ability of companies to cope with these rapid changes in packaging and raw materials. The purchasing power of consumers (electricity, heating has become more expensive) has decreased, there is less money left to buy innovative and more expensive products. The food sector is in a situation where we think it would be wise to postpone projects that are not essential, that do not support daily coping and that increase costs and food prices. We need more efficient production, but the technology is expensive". (17)

In the agricultural sector, for example, it was pointed out that companies are closing organic production since it makes no sense and is too expensive.

> "Our company is owned by farmers, among them there are also organic producers, they gradually stop their production because it is not reasonable and beneficial". (12)

> "Entrepreneurs look at the wallet, look at the purchasing power of consumers and make their decisions accordingly". (24)

The capital requirement and investment needs were pointed out by the interviewees as challenges.

> "Finding additional resources is difficult in both production and service". (2)

> "Today, the biggest challenge in GT is finding financial resources". (16)

Interviewees pointed out that the pricing of products and services should consider environmental impact.

> "The effects of the environment should be taken into account when pricing products and services". (6)

Digitalising services was seen as an opportunity.

> "Service providers who do not produce anything have switched to digital versions". (32)

In summary, the interviewees admitted that during the crisis (COVID-19 and the Ukrainian war), it has been difficult for entrepreneurs to deal with topics related to the green transition. Instead, the activities related to the green transition were postponed to when companies would perform better because entrepreneurs make decisions primarily based on the company's wallet and the consumer's ability to pay.

> "If he (entrepreneur) sees that it is a big money hole to change the packaging or to remake the disposal system or to produce his product from completely different materials, which he has to obtain under completely different conditions, from other regions (customs duties, other), then the motivation immediately drops away. If he does not see a profitable activity as an entrepreneur, then this is [. . .] a bigger argument than being environmentally friendly. Even if he is informed and knows and looks to see if he can make these changes in his system, he finds out that measuring the CO_2 footprint costs 10 thousand, replacing the materials costs the same, and then it does not make sense. He can sell his stuff without saying I am sustainable. When the buyer no longer buys a product-service that would be sustainable, this is when a revolutionary change begins to take place". (40)

Under the theme of regulations and licensing, many sector-specific needs to supplement existing regulations were highlighted by the interviewees (Table 12). Mentioned necessary supplements were considered as challenges to tackle issues related to the green transition. Additionally, the need for licensing was mentioned, but mainly as an opportunity and tool for increasing competitive advantage. For example, valorization is crucial because it reduces production waste, enables the selling of valorized products at a higher price, and creates new innovative products, including new jobs. At the same time, ideas remain in terms of regulations or capabilities (challenges and opportunities vary in different sectors).

> "It is important not to set restrictions on raw materials due to their origin but to determine which quality indicators they must meet. For example, we want to extract phosphorus from sewage sludge and produce high-quality animal feed. However, the regulation stipulates that the phosphorus used in animal feed must come from natural mines (In the legislation, a requirement to create additional environmental burden is written in)". (35)

Interviewees considered it essential to have environmental licenses, including for exported products. Additionally, different sectors need different kinds of certificates and regulations. For example, exporting companies are already making the certificates consumers ask for.

> "[. . .] companies that sell large products (for example, metal products such as a house) must have all environmental licenses. No one will buy products if you have not produced them in a sustainable and environmentally friendly, and proven way because procurements have already been made in such a way that there is no other way to get through". (27)

On the positive side, interviewees pointed out that companies are already seeking the environmental certificates.

> "Companies in our sector (packaging) are acquiring various environmental certificates for their production, and they keep adding them, and this is all at the request of customers . . . " (33)

The interviewees saw many challenges and opportunities in production, from production efficiency, economic and political pressure, packaging issues, and the cost of new technology to restructuring the whole sector (Table 13). For example, dominating the opinion of interviewees was the idea that inputs and production volumes are decreasing due to the green transition, which means that more efficient delivery and packaging changes are needed. The interviews looked at how to find solutions to replace the old technology with "sensible" options so that the production sector would not be exhausted under excessive economic and political pressure.

> "Politically—we need an agreement with the groups of beneficiaries for whom the "old" technology is useful. The GT means changing the industrial structure, which means that the manufacturing sector is at risk during this transition. It would be naive to think that competitors will not use this opportunity to exert pressure [. . .]". (25)

In addition, it was acknowledged that the manufacturing sector requires large investments and changes in consumption habits.

> "When we talk about production, we must remember that it requires big investments and changing the consumption paradigm. To what extent is society ready to start consuming in a different way?" (14)

Interviewees highlighted that packaging-related issues are complex, creating both confusion and greenwashing. Thus, companies are struggling with how to deal with issues related to materials.

> "The dairy industry is an energy-intensive production. The second topic is packaging, very confusing, very challenging and there is a lot of greenwashing". (12)

> "Some kind of material-based goals (e.g., plastic materials) [. . .], companies are confused by the fact that how these goals are planned to be achieved, there are goals, but there are no solutions. Many companies today do not see the existing solutions for these goals that have been proposed". (33)

In terms of both packaging and valorization, as well as other sector specific issues, the interviewees had different opinions, from selling livestock and forest without valorization to

restrictions related to the valorization of raw materials that should be addressed, beginning with regulation and financing support.

Marketing and communication were considered tools for creating awareness and communicating competitive advantage (Table 14). Interviewees mainly saw opportunities in marketing and communication; that being said, they mentioned that the line between green transition and greenwashing is thin. The same idea was related to footprint calculators, which were seen as an opportunity to market green products.

> "Various carbon footprint calculators have been added continuously, which provides a market and competitive advantage. I see a fine line there between turning green and greenwashing, that marketing versus being green". (33)

The interviewees also considered marketing and communication very important, as they provide messages to consumers.

> "Communication to interested parties on how to talk about facts and emotions, which would make people change their behaviour". (36)

Footprint calculators and tools to help to see the whole supply chain of the product were considered by interviewees a great way to promote green products, as well as an opportunity to support the green transition.

> "[. . .] Lack of transparency. Throughout the supply chain, from production to the consumer. I would really like to beep the QR code, and I will find out on which field this thing started and in which containers it was kept for how long and what happened to it in the meantime. That as long as it's all a state secret, or at least I have to trust what the manufacturer or the intermediary communicates". (34)

The topic of carbon footprint calculators came up in several interviews, seemingly seen as a strengthening aspect of competitiveness (also seen in a previous theme: marketing and communication). However, interviewees stated that calculators needed to be included in some sectors (e.g., construction, energy, food production, textile, tourism), and their usage resulted in contradictory results for those that exist today (Table 15). All metrics related to the green transition were considered as much an obstacle (due to the current lack of clarity) as an opportunity for entrepreneurs.

> "Last week, our good competitor Volvo Trucks unveiled a footprint calculator where you can choose a diesel, electric or gas truck for all European countries and some of the world and see what the footprint is, down to water use, energy and CO_2. If you choose an electric truck and Estonia, the result is the ugliest in the world, because the carbon footprint of Estonian electricity production is among the largest, depending on the day or the moment you look at it . . . Estonia is one of the dirtiest places because of the use of oil shale in electricity". (11)

Non-financial reporting was mentioned as an underused opportunity by interviewees.

> "If we bring non-financial reporting very deeply into our economic metrics at the national level, I think that is a strong signal. To come up with these metrics, [. . .] so that I can understand that the country's health is not only shown by GDP, but the sustainability index also shows the country's health. Competition between countries would change to other bases so that it would be an effective paradigm change". (40)

Interviewees acknowledged that it was necessary to start the green transition where the potential is significant. (It differs in all sectors.) The greatest potential was seen in new start-ups (born to be green); new measurement metrics, such as the sustainability index; and greater transparency at all levels, including the national level.

4. Discussion

This paper aimed to explore Estonian entrepreneurs' perceptions of challenges and opportunities related to the green transition. The green transition focuses on shifting towards a low-carbon economy, a critical component of the broader twin transition. The

focus groups and interview results of Estonian companies show that interviewees consider both digital (and technological) and green transitions when talking about green transition. One of the main outcomes is that the complete substitution of ecologically detrimental technologies with their environmentally sustainable counterparts may need to be more attainable due to inherent limitations.

Estonian companies predominantly view the green transition as a challenge rather than an opportunity. The main concerns include financial barriers such as increased costs and limited access to financing, as well as limited policy support, lack of consumer demand, and regulatory uncertainty. The Estonian companies also perceive that the green transition will increase the costs of their business, with only a small fraction expecting cost-saving opportunities. They anticipate financial challenges related to the climate-neutral movement in Europe and perceive that their business development could be hindered by political instability, resource scarcity, and regulative costs. The pressure towards the green transition is mostly perceived to be from politicians. Overall, the findings suggest that the green transition is seen by most Estonian companies as a costly challenge resulting from political coercion, with significant uncertainty regarding the arising opportunities.

The descriptive statistics of the survey revealed that the Estonian companies view the green transition mainly as a costly challenge arising from political decisions. Additionally, the findings of proportional odds logistic regressions show that too much pressure solely from politicians and a lack of innovation may increase the likelihood of perceived company cost increases by 37% and 15%. However, more pressure from other stakeholders, such as consumers, employees, and investors, was associated with higher odds of viewing the green transition as an opportunity (43%, 49%, and 22%, respectively). Furthermore, the survey findings also emphasized the need for a twin transition, which would embody a shift toward technological innovation. That is, when respondents believed that the green transition might enable the launch of more products to the market, this transition was perceived as 94% more likely to be an opportunity. Similar results were found (with 72% likelihood) when broader cooperation between scientific and industrial fields was believed to benefit the Estonian firms (compared to the reference group who did not favor such a collaboration).

Based on the interview findings, the main perceived entrepreneurial opportunities related to green transition were increasing production efficiency and favorable taxation of green products. The main perceived challenges were losing competitive advantage, coping with constant crises (COVID-19 and energy prices increases, among other factors), and the need for long-term planning and significant investments.

General results from the desk research show that companies tend to perceive the green transition and circular transition as similar processes. Companies' circular economy efforts seem primarily driven by internal factors such as reducing costs and enhancing sustainability strategies. External factors are less critical for circular transition.

There are numerous obstacles hampering the circular transformation, including difficulties in financing new business models, taxation systems, resistance to change, and the perceived lack of consumer demand. Businesses view the transition towards a sustainable Europe as a source of business opportunities and local employment. Many European countries still lack a comprehensive national strategy for implementing the circular economy as a competitive advantage.

This paper's theoretical contribution reveals and categorizes green-transition-related challenges and opportunities for companies, together with twin transition aspects. In contrast, most literature and research papers currently focus on circular-economy-related challenges and opportunities. Convergence research points in this study include Estonian entrepreneurs' perception that the green transition is a challenge, with limited opportunities for cost savings due to financial barriers, lack of policy support, consumer demand, and regulatory uncertainty. Additionally, this study highlights the need for a twin transition, which would involve the convergence of the green and digital transitions and the importance of collaboration between the scientific and industrial sectors. Proportional

odds logistic regressions show that pressure from stakeholders beyond politicians, such as consumers, employees, and investors, may increase the likelihood of perceiving the green transition as an opportunity. These findings demonstrate the complex interplay of social, economic, and political factors in implementing the green transition.

These findings for companies imply that they should be prepared for financial challenges in the green transition and consider alternative financing options to support their transition to a sustainable business model. Companies may also need to invest in knowledge and expertise to understand the regulations and requirements related to sustainability. Moreover, these findings emphasize the importance of innovation, which implies that the movement toward carbon neutrality must be accompanied by technological advancement/digitalization as a twin transition. Companies should focus on green innovation, especially related to production processes, which could be crucial for enterprises to reduce costs, thereby overcoming financial difficulties. This may transform the green transition from a costly challenge to a profitable opportunity. Furthermore, qualitative findings indicate that underfunded research may pose a challenge, while similarly quantitative results imply that connecting science and industry could more likely lead to opportunities.

For policymakers, the findings highlight the need for clearer and more consistent policies to support the green transition, along with measures to address the challenges faced by companies, such as limited access to financing and limited policy support. Policies should also encourage and incentivize companies to adopt green technologies and practices, as well as promote sustainable business models. Similarly, they could facilitate innovation by investing more in education/science and its application in industrial business practices. Furthermore, politicians should encourage societal pressure toward the green transition through other stakeholders, such as consumers, employees, and investors. This may balance regulative pressure with tangible market opportunities for companies.

For wider society, the findings suggest a need to raise awareness and understanding about the benefits of the green transition, as well as the role that companies, policymakers and individuals can play in supporting the transition. This will be important in driving consumer demand for sustainable products/services and ensuring that the green transition benefits everyone. Estonia has the potential to benefit from the EU's digital and green transition. As a country with a strong technology sector, Estonia has the capabilities to develop and implement digital technologies that can help the country transition to a more sustainable and environmentally friendly economy. Additionally, Estonia's highly developed digital infrastructure and e-government services can be leveraged to support the implementation of green policies and initiatives. The EU's digital and green transition presents opportunities for Estonian companies to develop and export innovative technologies and solutions related to digitalization and sustainability. The country can also benefit from access to funding and support from the EU for green projects/initiatives. Moreover, by embracing the digital and green transition, Estonia can improve its competitiveness by attracting investment in technology- and sustainability-related sectors. Additionally, the transition can help the country to address environmental challenges and improve the quality of life for its citizens.

The limitations of our study include the following: First, the sample size is limited to 532 representatives from Estonian enterprises who participated in the survey, as well as the 42 experts who participated in the interviews. While the stratified random sample of the survey may provide more generalizability, the purposive heterogeneous sample of the interviews likely offers less representative findings of the entire population of Estonian companies. Furthermore, our quantitative data collection via survey might be subject to question bias (as a result of the framing/wording of the questionnaire), non-response bias (due to a small response rate), and response bias (i.e., inaccurate responses due to social desirability). The latter may have also affected our interviews, in addition to the observer bias (i.e., interviewers unconsciously influencing responses or interpreting them subjectively), which tends to be typical for qualitative data collection. Finally, it is important

to note that our study only examined the case of Estonia, which may limit its generalizability to other countries or regions.

Future research directions can focus on a deeper examination of the challenges and opportunities perceived by entrepreneurs at different stages of their business lifecycle, including start-ups, growing enterprises, and mature companies, as well as among different industries. Additionally, there is potential to explore the effectiveness of policy measures aimed at promoting green transitions and fostering green entrepreneurship in Estonia by tracking and analyzing their impact over time. Furthermore, an investigation into the role of financial institutions and investors in supporting green and sustainable entrepreneurship, as well as how they can help address the challenges identified, may provide valuable insights.

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Appendix A

Survey questionnaire

1. GENERAL INFORMATION
   1.1. What is your company's main field of activity?
   A = "Agriculture, forestry and fishing"
   B = "Mining and quarrying"
   C = "Manufacturing"
   D = "Electricity, gas, steam and air conditioning supply"
   E = "Water supply; sewerage, waste management and remediation activities"
   F = "Construction"
   G = "Wholesale and retail trade; repair of motor vehicles and motorcycles"
   H = "Transportation and storage"
   I = "Accommodation and food service activities"
   J = "Information and communication"
   K = "Financial and insurance activities"
   L = "Real estate activities"
   M = "Professional, scientific and technical activities"
   N = "Administrative and support service activities"
   P = "Education"
   Q = "Human health and social work activities"
   R = "Arts, entertainment and recreation"
   S = "Other service activities"

NA = "Cannot tell"

1.2. How many employees are in your company?

"0", "1–4", "5–9","10–49", "50–249", "250+", "NA"

2. GENERAL EFFECT OF THE GREEN TRANSITION

2.1. How much do you agree with the following statement? "The green transition means an opportunity."

From 1 = "completely disagree" to 7 = "completely agree"

2.2. How are the costs of your company expected to change as a result of the green transition?

−1 = "decrease", 0 = "remain the same", 1 = "increase", NA = "no opinion", NA = "cannot tell"

2.3. How the green transition may affect your company, in terms of launching new products to the market?

From 1 = "very negatively" to 7 = "very positively"

2.4. How much is the green transition pressured by consumers?

From 1 = "very little" to 5 "very much"

2.5. How much is the green transition pressured by employees?

From 1 = "very little" to 5 "very much"

2.6. How much is the green transition pressured by investors?

From 1 = "very little" to 5 "very much"

2.7. How much is the green transition pressured by politicians?

From 1 = "very little" to 5 "very much"

3. GREEN TRANSITION CHALLENGES

3.1. Could the development of your company be hindered in the near future by resource scarcity/costs (e.g., related to energy, labor, capital)?

0 = "no", 1 = "yes"

3.2 Could the development of your company be hindered in the near future by political/regulative uncertainty?

0 = "no", 1 = "yes"

3.3 Could the development of your company be hindered in the near future by increased insurance costs or lack of insurance?

0 = "no", 1 = "yes"

3.4 Could the development of your company be hindered in the near future by reputation loss?

0 = "no", 1 = "yes"

3.5. Could the development of your company be hindered in the near future by social pressure?

0 = "no", 1 = "yes"

3.6. Could the development of your company be hindered in the near future by climate change costs?

0 = "no", 1 = "yes"

3.7. Could the development of your company be hindered in the near future by regulative costs (e.g., carbon tax)?

0 = "no", 1 = "yes"

3.8. Could the development of your company be hindered in the near future by the need to change industrial processes?

0 = "no", 1 = "yes"

3.9. Could the development of your company be hindered in the near future by supply chain disruptions?

0 = "no", 1 = "yes"

3.10. Could the development of your company be hindered in the near future by other factors?

0 = "no", 1 = "yes"

3.11. How much is the green transition hampered by regulative uncertainty?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.12. How much is the green transition hampered by the availability of qualified labor?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.13. How much is the green transition hampered by investment costs?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.14. How much is the green transition hampered by uncertainty towards new technologies?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.15. How much is the green transition hampered by uncertainty related to climate change?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.16. How much is the green transition hampered by the availability of financial resources?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.17. How much is the green transition hampered by overly high societal expectations?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.18. How much is the green transition hampered by the risk of a hypocritical (greenwashing) image?

From 1 = "does not hamper at all" to 5 = "hampers very much"

3.19. How much is the green transition hampered by a lack of information?

From 1 = "does not hamper at all" to 5 = "hampers very much"

4. GREEN TRANSITION OPPORTUNITIES

4.1. How much might your company benefit from the green transition in terms of increasing consumers' willingness to pay?

From 1 = "not at all" to 5 = "very much"

4.2. How much might your company benefit from the green transition in terms of increasing consumers' willingness to buy?

From 1 = "not at all" to 5 = "very much"

4.3. How much might your company benefit from the green transition in terms of attracting more qualified and productive employees?

From 1 = "not at all" to 5 = "very much"

4.4. How much might your company benefit from the green transition in terms of obtaining less expensive financing from investors/banks?

From 1 = "not at all" to 5 = "very much"

4.5. How much might your company benefit from the green transition in terms of saving costs?

From 1 = "not at all" to 5 = "very much"

4.6. How much might your company benefit from the green transition in terms of expanding to new markets?

From 1 = "not at all" to 5 = "very much"

4.7. Could the Estonian companies benefit more from the green transition if scientific and industrial fields cooperate more broadly towards environmentally friendly technologies?

0 = "no", 1 = "yes"

References

1. Carrión-Flores, C.E.; Innes, R. Environmental Innovation and Environmental Performance. *J. Environ. Econ. Manag.* **2010**, *59*, 27–42. [CrossRef]
2. Antonioli, D.; Cecere, G.; Mazzanti, M. Information Communication Technologies and Environmental Innovations in Firms: Joint Adoptions and Productivity Effects. *J. Environ. Plan. Manag.* **2018**, *61*, 1905–1933. [CrossRef]
3. Costantini, V.; Crespi, F.; Marin, G.; Paglialunga, E. Eco-Innovation, Sustainable Supply Chains and Environmental Performance in European Industries. *Mak. Buy. Collab. More Sustain. Prod. Consum.* **2017**, *155*, 141–154. [CrossRef]
4. Muench, S.; Stoermer, E.; Jensen, K.; Asikainen, T.; Salvi, M.; Scapolo, F. *Towards a Green & Digital Future*; Publications Office of the European Union: Luxembourg, 2022.
5. Zajc, M. Information Communication Technologies as Enabler of Green Transition: Education and Research Perspectives. In Proceedings of the 2022 30th Telecommunications Forum (^{TEL}FOR), Belgrade, Serbia, 15–16 November 2022; IEEE: Piscataway, NJ, USA, 2022; p. 1.
6. Matos, S.; Viardot, E.; Sovacool, B.K.; Geels, F.W.; Xiong, Y. Innovation and Climate Change: A Review and Introduction to the Special Issue. *Technovation* **2022**, *117*, 102612. [CrossRef]
7. Ortega-Gras, J.-J.; Bueno-Delgado, M.-V.; Cañavate-Cruzado, G.; Garrido-Lova, J. Twin Transition through the Implementation of Industry 4.0 Technologies: Desk-Research Analysis and Practical Use Cases in Europe. *Sustainability* **2021**, *13*, 13601. [CrossRef]
8. Mazur, C.; Hall, S.; Hardy, J.; Workman, M. Technology Is Not a Barrier: A Survey of Energy System Technologies Required for Innovative Electricity Business Models Driving the Low Carbon Energy Revolution. *Energies* **2019**, *12*, 428. [CrossRef]
9. Popescu, M.-F.; Constantin, M.; Chiripuci, B.C. Transition to a Sustainable Energy Production and Consumption Model—Mapping the Patterns of Success. *J. Bus. Econ. Manag.* **2022**, *23*, 915–936. [CrossRef]
10. Park, K.; Kim, Y.; Kim, S.; Kim, K.; Lee, W.; Park, H. Building Energy Management System Based on Smart Grid. In Proceedings of the 2011 IEEE 33rd International Telecommunications Energy Conference (INTELEC), Amsterdam, The Netherlands, 9–13 October 2011; IEEE: Piscataway, NJ, USA, October 2011; pp. 1–4.
11. Rizos, V.; Behrens, A.; van der Gaast, W.; Hofman, E.; Ioannou, A.; Kafyeke, T.; Flamos, A.; Rinaldi, R.; Papadelis, S.; Hirschnitz-Garbers, M.; et al. Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers. *Sustainability* **2016**, *8*, 1212. [CrossRef]
12. Zhai, Z.; Martínez, J.F.; Beltran, V.; Martínez, N.L. Decision Support Systems for Agriculture 4.0: Survey and Challenges. *Comput. Electron. Agric.* **2020**, *170*, 105256. [CrossRef]
13. Kamienski, C.; Soininen, J.-P.; Taumberger, M.; Dantas, R.; Toscano, A.; Cinotti, T.S.; Maia, R.F.; Neto, A.T. Smart Water Management Platform: IoT-Based Precision Irrigation for Agriculture. *Sensors* **2019**, *19*, 276. [CrossRef] [PubMed]
14. Kazancoglu, I.; Ozbiltekin-Pala, M.; Mangla, S.K.; Kumar, A.; Kazancoglu, Y. Using Emerging Technologies to Improve the Sustainability and Resilience of Supply Chains in a Fuzzy Environment in the Context of COVID-19. *Ann. Oper. Res.* **2022**, *322*, 217–240. [CrossRef] [PubMed]
15. European Commission. *The European Green Deal*; European Commission: Brussels, Belgium, 2019.
16. European Commission. *A European Strategy for Data*; European Commission: Brussels, Belgium, 2020.
17. European Commission. *2030 Digital Compass: The European Way for the Digital Decade*; European Commission: Brussels, Belgium, 2021.
18. European Commission. *A Digital Single Market Strategy for Europe*; European Commission: Brussels, Belgium, 2015.
19. Bianchini, S.; Damioli, G.; Ghisetti, C. The Environmental Effects of the "Twin" Green and Digital Transition in European Regions. *Environ. Resour. Econ.* **2022**. [CrossRef] [PubMed]
20. Maucorps, A.; Römisch, R.; Schwab, T.; Vujanovic, N. *The Future of EU Cohesion. Effects of the Twin Transition on Disparities across European Regions*; The Vienna Institute for International Economic Studies (Wiiw), Bertelsmann Stiftung: Vienna, Austria, 2022; p. 56.
21. Veugelers, R.; Faivre, C.; Rückert, D.; Weiss, C.T. The Green and Digital Twin Transition: EU vs. US Firms. *Intereconomics* **2023**, *58*, 56–62. [CrossRef]
22. Gunashekar, S.; Gloinson, E.R.; Dunkerley, F.; Virdee, M.; d'Angelo, C.; Feijao, C.; Ali, G.-C.; Skjoldager, M.; Frøshaug, A.S.; Vad, T.B. *Addressing Societal Challenges in Norway: Key Trends, Future Scenarios, Missions and Structural Measures*; RAND: Santa Monica, CA, USA, 2021.
23. Kaefer, F. Aivar Ruukel on Ecotourism in Estonia. In *Sustainability Leadership in Tourism*; Springer: Berlin/Heidelberg, Germany, 2022; pp. 69–74.

24. Enabling the Digital Green Transition. *A Study of Potentials, Challenges and Strengths in the Nordic-Baltic Region*; Nordic Council of Ministers: Copenhagen, Denmark, 2021.
25. Estonia 2035 Strategy 2021. Strategy "Estonia 2035" [Internet]. Republic of Estonia Government. 2021. Available online: https://valitsus.ee/en/node/31?view_instance=0¤t_page=1 (accessed on 22 December 2022).
26. Khan, J.; Johansson, B.; Hildingsson, R. Strategies for Greening the Economy in Three Nordic Countries. *Environ. Policy Gov.* **2021**, *31*, 592–604. [CrossRef]
27. Sundtoft, T. *The Nordic Countries in the Green Transition—More than Just Neighbours*; Nordic Council of Ministers: Copenhagen, Denmark, 2018.
28. Vettik-Leemet, P.; Raudsaar, M.; Kaseorg, M. The Variety of Aspects of Business Models in the High-Growth and High-Tech Enterprises: An Estonian Case. In *Business Models*; Auerbach Publications: Boca Raton, FL, USA, 2020; pp. 49–80.
29. Kütt, A. *Analysis of Estonian Startups in an International Context*; Massachusetts Institute of Technology: Cambridge, MA, USA, 2013.
30. Startup Estonia Startup Estonia. White Paper 2021–2027 2020. Startup Estonia. 2020. Available online: https://media.voog.com/0000/0037/5345/files/SE_Whitepaper_Web%20(1)-1.pdf (accessed on 22 December 2022).
31. Dey, P.K.; Malesios, C.; Chowdhury, S.; Saha, K.; Budhwar, P.; De, D. Adoption of Circular Economy Practices in Small and Medium-Sized Enterprises: Evidence from Europe. *Int. J. Prod. Econ.* **2022**, *248*, 108496. [CrossRef]
32. Houston, J.; Casazza, E.; Briguglio, M.; Spiteri, J. *Stakeholder Views Report. Enablers and Barriers to a Circular Economy*; The R2π Project Consortium: Msida, Malta, 2018.
33. *Is Irish Business Getting Ready for the Circular Economy? A Survey Conducted in Association with the EPA*; Ibec: Ireland, Dublin, 2018.
34. Circular Europe. *How to Successfully Manage the Transition from Linear to a Circular World*; The European House–Ambrosetti and Enel Foundation: Rome, Italy, 2020.
35. PWC PwC EU Green Deal Survey. Are Europe's Businesses Ready for the EU Green Deal? 2022. Available online: https://www.pwc.com/gx/en/tax/publications/assets/eu-green-deal-tax-report.pdf (accessed on 22 December 2022).
36. Hermundsdottir, F.; Aspelund, A. Sustainability Innovations and Firm Competitiveness: A Review. *J. Clean. Prod.* **2021**, *280*, 124715. [CrossRef]
37. Organisation for Economic Cooperation and Development. *Innovation and Business/Market Opportunities Associated with Energy Transitions and a Cleaner Global Environment*; Organisation for Economic Co-operation and Development: Paris, France, 2019.
38. Business Assurance—Viewpoint Survey. *How Are Companies Transitioning towards the Circular Economy?* DNV: Bærum, Norway, 2021.
39. Sardana, D.; Gupta, N.; Kumar, V.; Terziovski, M. CSR 'Sustainability' Practices and Firm Performance in an Emerging Economy. *J. Clean. Prod.* **2020**, *258*, 120766. [CrossRef]
40. Chatzistamoulou, N.; Koundouri, P. Sustainability Transition Through Awareness to Promote Environmental Efficiency. In *Advances in Econometrics, Operational Research, Data Science and Actuarial Studies: Techniques and Theories*; Springer International Publishing: Cham, Switzerland, 2022; pp. 345–362.
41. Bartels, W.; Fogelberg, T.; Hoballah, A.; van der Lugt, C.T. *Carrots & Sticks. Global Trends in Sustainability Reporting Regulation and Policy*; KPMG International, GRI, UNEP, University of Stellenbosch Business School: Cape Town, South Africa, 2016.
42. Sandberg, J.; Alvesson, M. Meanings of Theory: Clarifying Theory through Typification. *J. Manag. Stud.* **2021**, *58*, 487–516. [CrossRef]
43. Krejcie, R.; Morgan, D.W. Determining Sample Size for Research Activities. *Educ. Psychol. Meas.* **1970**, *30*, 607–610. [CrossRef]