CAPITAL LEAVING NO ONE BEHIND? AN EMPIRICAL STUDY OF IMPACT VENTURE CAPITAL INVESTMENTS INTO THE SUSTAINABLE DEVELOPMENT GOALS.

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Dissertation written under the supervision of Professor Lars Norden

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Resumo

Título: Capital que não deixa ninguém para trás? Um estudo empírico dos investimentos de capital de risco de impacto para os Objetivos de Desenvolvimento Sustentável.

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Objetivo: Atingir os Objetivos de Desenvolvimento Sustentável (ODS) requer uma mobilização substancial de recursos do setor privado para superar a lacuna de financiamento anual estimada em $2,5 trilhões. Os estudiosos reconhecem o impacto do investimento como parte dessa solução, mas os estudos empíricos no campo nascente são escassos. Este estudo analisa os padrões de financiamento do capital de risco de impacto em direção aos ODS abordados pelos empreendimentos sociais e os contextualiza geograficamente.

Metodologia: Para entender qual dos ODS recebe o maior/menor financiamento dos investidores, uma amostra de 695 negócios de investimento de impacto entre 2017-2021 é coletada de um banco de dados financeiro. Posteriormente, os empreendimentos são combinados manualmente com seus ODS correspondentes, e modelos de regressão analisam o efeito desses ODS sobre o tamanho do negócio enquanto controlam fatores externos.

Resultados: Torna-se evidente que nem as hipóteses dos ODS nem seus pilares (planeta, pessoas, prosperidade e parcerias) influenciam positivamente o valor do financiamento em escala global. No entanto, alguns dos objetivos recebem significativamente mais/menos atenção financeira dos investidores de impacto em determinadas geografias.

Implicações: Por um lado, os resultados esboçam oportunidades para os investidores de impacto enfrentarem segmentos sub-financiados dos ODS em várias geografias e entenderem como o capital passado foi alocado para moldar a tomada de decisões futuras. Por outro lado, os formuladores de políticas podem utilizar as idéias para identificar quais objetivos recebem menos financiamento e complementar com fundos públicos. Esta dissertação exige mais pesquisas empíricas no campo integrado do investimento de impacto e dos ODS.

Palavras-chave: Investimento Impacto, Objetivos de Desenvolvimento Sustentável, Capital de Risco de Impacto, Empreendedorismo Social, Finanças Sustentáveis

Abstract

Title: Capital leaving no one behind? An empirical study of impact venture capital investments into the Sustainable Development Goals.

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Purpose: Achieving the Sustainable Development Goals (SDGs) requires substantial resource mobilization from the private sector to bridge the estimated annual funding gap of $2.5 trillion. Scholars recognize impact investing as part of that solution, but empirical studies in the nascent field are scarce. This study analyses funding patterns of impact venture capital towards the SDGs addressed by social ventures and contextualizes them geographically.

Design/methodology/approach: To understand which of the SDGs receive the highest/lowest funding amounts from investors, a sample of 695 impact investment deals between 2017-2021 is collected from a leading financial database. Subsequently, the ventures are manually matched with their corresponding SDGs, and multiple regression models analyse the effect of those SDGs on the deal size while controlling for external factors.

Findings: It becomes evident that neither the hypothesized SDGs nor their overarching pillars (planet, people, prosperity, and partnerships) positively influence the funding amount on a global scale. Nevertheless, some of the goals do receive significantly more/less financial attention from impact investors in particular geographies.

Implications: On the one hand, the results outline opportunities for impact investors to tackle underfunded SDG segments across several geographies and understand how past capital was allocated to shape future decision-making. On the other hand, policymakers can utilize the insights to identify which goals receive lower funding and supplement the lack of private capital through blended finance initiatives. This dissertation calls for further empirical research in the integrated field of impact investing and the SDGs.

Keywords: Impact Investing, Sustainable Development Goals, Impact Venture Capital, Social Entrepreneurship, Sustainable Finance

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New people have entered my life – others have left – others have been there forever. I would like to use this opportunity to express my genuine feeling of gratitude towards all of them. Especially so, towards my family, who never even raised a single thought of doubt that I will achieve on my path – wherever that may lead me. And of whom I know, they support me, no matter my choices. Also, towards my friends whom I can always seek out for advice and whom I love and appreciate dearly.

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I come out of this experience with pride and humility, hoping that the challenges ahead offer as much excitement as the previous ones.

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List of Abbreviations

AUM	Assets Under Management
B2B	Business-to-Business
B2C	Business-to-Consumer
ESG	Environmental, Social & Governance
FDI	Foreign Direct Investment
GIIN	Global Impact Investor Network
IMF	International Monetary Fund
IPO	Initial Public Offering
Log	Logarithm
MDG(s)	Millennium Development Goal(s)
OLS	Ordinary Least Squares
R&D	Research & Development
SDG(s)	Sustainable Development Goal(s)
SMEs	Small- and Medium-sized Enterprises
SRI	Socially Responsible Investing
UN	United Nations
USD	US Dollars
VIF	Variance Inflation Factor

1 Introduction

1.1 Contextualization

"There is no Plan B for action, as there is no Planet B."
- Ban Ki-Moon (2014), Former Secretary General United Nations

When the Sustainable Development Goals (SDGs) succeeded the Millennium Development Goals (MDGs) as the dominating agenda for global development in 2015, substantial progress had been achieved, but significant gaps remained (Nanda, 2015). More than five years later, advancement on the goals remains uneven across countries, while the main challenge is channeling sufficient financial resources, especially in developing countries (Barua, 2019). With a current annual funding gap estimated at around $2.5 trillion, there is an undeniable necessity for a broad range of financing instruments to achieve the agenda until 2030 (Barua, 2019; Zhan & Santos Paulino, 2021).

Part of the solution is the comparably recent phenomenon of impact investing, where equity investors provide financial resources to enterprises with the overall aim to create social or environmental impact (or both together) while generating financial returns simultaneously (Santamarta et al., 2021). Thereby, impact investing offers an attractive alternative to the traditional forms of development funding, for example, governmental contributions, corporate grants or philanthropy by charitable foundations (Clarkin & Cangioni, 2016).

In their most recent annual survey, the Global Impact Investor Network (GIIN) sizes the overall impact investing market at $715 billion in assets under management (AUM) among over 1,700 investment organizations and more than 80% of them being headquartered in Europe or North America (GIIN, 2020). After experiencing outstanding growth throughout the past decade, the impact investing industry can significantly contribute to closing the required funding gap towards reaching the Sustainable Development Agenda until 2030.

Supportingly, the 2020 GIIN survey points out that 73% of the 294 surveyed funds utilize the SDGs either for impact measurement or reporting, indicating a clear focus of the organizations towards the 17 goals (GIIN, 2020). Therefore, this research aims to provide a macro perspective on SDG funding for the impact investing ecosystem that investors, entrepreneurs, and policymakers can implement into their decision-making.

It is the objective to identify a connection between the respective SDGs and the amount of capital that impact investors provided to the social ventures. Such insights will help key

stakeholders to understand where impact venture capital has been allocated in the past and, through that, which goals might be over/underfunded. Subsequently, geographical patterns for the phenomenon are explored. Thus, this study is guided by the following research questions:

Research Question 1: *How does a venture's focus on respective SDGs influence the funding sizes of impact venture capital investments?*

Research Question 2: *How do impact venture capital investment funding sizes of the respective SDGs differ geographically?*

To narrowly define the hypotheses and recognize applicable limitations, it is not only important to understand the scope of a study but also define what the research will not focus on, commonly known as delimitations.

Accordingly, this study will solely address financing rounds of private companies and exclude any public equity investing. Limiting the scope to impact venture capital is based on two reasons. Firstly, venture capital funds are at the front of technological innovation and a key player in sustainable market transformations (Holtslag, Chevrollier & Nijhof, 2021). Secondly, private and public capital markets are structurally inherently different and should not be compared in one model. Accordingly, the structure of venture capital investing is elaborated in chapter 2.1 of the literature review.

Furthermore, as further discussed in the *Research Theme* chapter, impact investing should be separated from investments following Environmental, Social & Governance (ESG) criteria. Therefore, only funding rounds led by designated impact funds are considered for the analysis. Additional information on the filtering criteria is provided in section 3.3.2, where the *Search Strategy* of this study is discussed.

According to Höchstädter & Scheck (2015), impact investing specifically targets investments that create environmental or social impact *alongside* financial returns. Therefore, it should be separated from grant funding or venture philanthropy and, consequently, such financing initiatives are excluded from this study. Lastly, to remain a narrow research scope, the connection between the SDGs and the funding amount will be assessed, excluding other indicators, such as the venture's valuation or the net positive impact that the company creates on society through its business operations.

1.2 Research Theme

Sustainable finance has evolved throughout three main stages during the previous decades. First, in the 1970s and 1980s, investors exercised socially responsible investing (SRI), where exclusion criteria were applied to portfolios to avoid funding unethical business operations (Busch et al., 2021). The second phase emerged at the beginning of the 21st century, when investors coined the term ESG, short for environmental, social, and governance, and introduced the concept into the mainstream financial markets (Busch et al., 2021). Thereby, the aim was to prioritize investments into companies, measured through ESG scores, that avoided causing negative harm to their environment. Although the term's precise definition and taxonomy are still undeveloped, impact investing embodies the most recent phase of sustainable finance's transformation (Höchstädter & Scheck, 2015). While the ESG criteria's main objective is avoiding environmental and social harm, impact investments, on the contrary, seek to inherently *solve* social challenges or *mitigate* ecosystem degradation (Höchstädter & Scheck, 2015; Busch et al., 2021).

Therefore, this research is a multidisciplinary approach under the sustainable finance umbrella, uniting the concepts of SDGs, social entrepreneurship, and impact investing.

1.3 Theoretical Relevance

Initial scholarly interest in this form of investing already started in the early 21st century, when Emerson (2003) hypothesized that financial and social returns may not have to be mutually exclusive and, instead of posing a trade-off, blended value between both dimensions can be generated.

A couple of years forward, impact investing is experiencing a significant trend in modern strategy and finance literature, exemplified by Islam (2022) who conducted a systematic literature review on impact investing and discovered a total of 114 relevant research articles published between the years 2000 and 2021. Similarly, Agrawal & Hockerts (2021) compiled a set of 57 papers between 2005 and 2017 throughout their own primer review of literature. Yet, scholars appear to be in a phase of orientation, aiming to place impact investing into a specific bucket, with many studies addressing taxonomy and regulatory challenges of the nascent investing practice (for example: Höchstädter & Scheck, 2015; Busch et al., 2021).

On the one hand, a substantial body of literature addresses the urgent need for private investments into the SDGs to close the prevailing funding gap (Schramade, 2017; Zhan & Santos Paulino, 2021), while highlighting impact investing as a potential part of the solution

(Suehrer, 2019; Kubátová & Kročil, 2020; Santamarta et al., 2021). On the other hand, publications about specific current measures of investors, their investment strategy, and their progress remain scarce.

According to Barua (2019), current reports on SDG-related funding are primarily specific to individual sectors or activities, while no comprehensive overview displays the amount and patterns of private financial flows addressing respective SDGs, clearly highlighting the urge for empirical work. To the best of my knowledge, this study is the first one to examine the relationship between respective SDGs and the funding amounts of impact investments, making it relevant for sustainable finance academia to shed light on private impact capital allocations in a quantitatively unexplored field of investing.

1.4 Managerial Relevance

Publicly acknowledged by the United Nations, effectively engaging the private sector is a critical cornerstone towards achieving the SDGs (van Zanten & van Tulder, 2021). A Harvard Business Review article from 2015, however, emphasizes that the substantial number of fragmented goals and targets solely aggravates a coordinated effort of enterprises towards the SDG agenda (Chakravorti, 2015). In the same vein, as the SDGs are not specifically designed for enterprises but rather for a broad range of societal stakeholders (Rashed & Shad, 2021), private sector organizations and investors frequently encounter difficulties on how to effectively align and engage with the 17 global goals (Mio, Panfilo & Blundo, 2020). Seeking to bridge the knowledge gap between theoretical concepts in the field of sustainable finance and practical application in the form of measurable investment indicators, the findings of this dissertation benefit three distinct managerial groups.

Firstly, impact investors can use the research insights to determine underfunded sectors or geographies to create meaningful impact on respective SDGs while ensuring profitability at the same time. For example, if ventures focusing on clean water and sanitation (SDG 6) hypothetically attracted significant financing rounds in African countries, investors could target geographies across the continent that have not been covered by such initiatives yet.

Secondly, this study may serve social entrepreneurs on a global scale to generate an overview about funding patterns into respective SDGs and, thus, identify underfunded business opportunities. With a lack of finance being considered the “single most significant factor inhibiting the growth of social sector organizations” (Islam, 2022, pp. 2), profoundly

understanding previous funding patterns into the SDGs can be critical for a social venture's financial planning and future fundraising.

Ultimately, managers of public entities or policymakers can utilize the insights gathered to create blended finance initiatives, thereby supplementing the flows of private capital with public and philanthropic funds and create a pool of resources to finance development projects (Barua, 2019). In addition to blended finance, this study may guide policymakers towards SDGs that allegedly do not offer enough economic incentives for impact investors, seeking financial returns alongside creating impact. As a result, public funds can be directed towards the SDGs that do not seem to attract high amounts of impact venture capital from private investors.

1.5 Dissertation Structure

The dissertation is structured the following way: Initially, the topic and underlying research questions are introduced, and its managerial and academic relevance is demonstrated. The subsequent section provides a literature review, discussing academic contributions in applicable fields. The reader is guided through relevant background information regarding venture capital mechanisms, the Sustainable Development Goals themselves, and the impact investing industry. Along the way, based on the reviewed literature, the study's hypotheses are introduced.

After thoroughly describing the methodology, relevant results from the study's regression models are interpreted in the light of the proposed hypotheses and discussed in the context of existent literature. Lastly, managerial implications are offered, and the dissertation concludes with applicable limitations and suggestions for future research.

2 Literature Review & Hypotheses

2.1 Institutional Background of Venture Capital

Considering that impact investing is analysed as a sub-form of traditional venture capital in the context of this study, this chapter sets the scene and briefly guides the reader through fundamental background information of the venture capital industry before later diving into publications about the SDGs and the impact investing ecosystem.

Venture capital financing has a lengthy history, dating back to the 19th century, where private investors financed projects in industries, such as railroad or oil production (Rind, 1981). While modern venture capital typically focuses on funding companies in the technology sector, the initial concept of individuals or a group of investors providing capital to entrepreneurs remains unaltered. In return, the investors receive a share of equity in the business, negotiated contractually between both parties, that offers certain control rights in the venture's strategic decision-making (Gompers, 1995; Kirilenko, 2001). Related investment vehicles for start-ups, also based on exchanging financial resources for company shares, are corporate venture capital, equity crowdfunding, angel investors, growth equity and private equity (Gornall & Strebualev, 2022).

In addition to own financial resources, venture capitalists raise money from outside investors, called limited partners, who invest intending to generate financial returns in the long run (Groh & von Liechtenstein, 2010). Such returns are created through exits, where venture capital investors are financially compensated for their share in the company, either through an initial public offering (IPO), an acquisition by another firm, or through the liquidation of the business in case of bankruptcy (Cumming & Johan, 2010).

The investments themselves often occur at an early stage, where the respective ventures might neither have existing revenues nor a finished product available yet (Kirilenko, 2001), illustrating the underlying risk of such investments (Gornal & Strebualev, 2022). To compensate for systematic or idiosyncratic risks of financial failure, venture capitalists usually accumulate a portfolio of firms (Knill, 2009). Nevertheless, as start-ups often require high up-front investments into research and development (R&D), while potential returns may not be achieved for years, the amount of funding and underlying valuations are usually grounded on potential future growth of the company (Gornal & Strebualev, 2022). Furthermore, due to sequential capital requirements of firms for growth initiatives or product development, funding usually appears throughout multiple stages, also called funding rounds, with increasing amounts of capital supplied (Gornal & Strebualev, 2022).

As the investors own a share of equity in the company and only realize returns in case of an exit situation, they have a high incentive for the venture's success. Therefore, they commonly engage with the entrepreneurs operationally, for instance, by hiring staff, sharing their investor network, or providing industry expertise (Matusik & Fitza, 2011). Knill (2009) points out that venture capital funds can differentiate themselves from competition in various ways. Firstly, they can target specific geographies. Secondly, they can specialize in a particular funding stage, such as seed investors, early-stage investors, or during the company's growth phase. Thirdly, based on their team's experience, they can concentrate on specific industries and provide expertise and valuable connections to the start-ups (Knill, 2009). Such diversification, especially regarding deep knowledge in particular areas, is critical for venture capitalists to attain the most promising deal opportunities (Matusik & Fitza, 2011).

In a nutshell, venture capitalists invest the money of limited partners into a portfolio of companies with the intent to generate financial returns through an exit. The phases of such an investment cycle can be summarized as: (1) fundraising from limited partners, (2) screening & deal generation, (3) valuation & due diligence, (4) deal execution, (5) continuous operational support, (6) optionally, follow-up investment, and finally, (7) investment exit (Wright, 1998; Gompers & Lerner, 2001; Knill, 2009).

2.2 Sustainable Development Goals

Between 2000 and 2015, the Millennium Development Goals (MDGs) shaped global development by providing a framework of eight goals combined with measurable and time-bound objectives (Sachs, 2012). Although progress, especially in its social dimensions, had been notable across developing countries, operational hurdles appeared, for example, unkept financial promises by developed countries towards the Global South (Sachs, 2012). In 2015, the subsequent set of global goals, the SDGs, was officially launched by the United Nations. One hundred sixty-nine targets and 232 corresponding indicators support the 17 goals to track progress towards achievement globally (United Nations, n.d.).

The semantic foundation of the SDGs is formed by the term *sustainable development*, first used in a UN report in 1987, that provides a framework for decision-making across all areas of human development by uniting economic, social, and environmental dimensions into one concept (Nanda, 2015). Under the umbrella leitmotif to *leave no one behind*, the SDGs promised to tackle the world's most pressing issues, "reaching the furthest behind first" and emphasizing the importance of reducing inequalities for discriminated and marginalized

groups (Stuart & Woodroffe, 2016). Summarized within 17 multidisciplinary and interconnected goals, they became the "most universally known and embraced collection of grand challenges worldwide", articulating human progress through coordinated collaboration (George, Howard-Grenville, Joshi & Tihanyi, 2016; Mio, Panfilo & Blundo, 2020).

Constructing a compelling and charismatic narrative around the 17 goals, scholars commonly divide them into three main pillars: *people (societal)*, *planet (environmental)*, and *prosperity (economic)* (Sachs, 2012; Gore, 2015; Dalampira & Nastis, 2019). In addition, the two overarching themes *peace* and *partnerships* highlight how the goals should be implemented on a global scale (Tremblay et al., 2020). It is important to note that the SDGs are a set of interconnected objectives, offering both synergies and trade-offs, that cannot be viewed as separate entities and be placed in one exclusive category (Pradhan et al., 2017; Kroll, Warchold & Pradhan, 2019; Tremblay et al., 2020). While acknowledging this integrative character of the goals, Tremblay et al. (2020) establish a classification of each SDG and its corresponding pillar. Thereby, they determine which SDG, based on a matching of the goal's corresponding targets, has the majority score within a particular pillar. Table 1 below depicts their final allocation, which will be adopted for further analysis throughout this study.

Table 1: SDGs and corresponding pillars (Derived from Tremblay et al., 2020)

Sustainable Development Goal	**Pillar**
SDG 1: No poverty	People
SDG 2: Zero hunger	People
SDG 3: Good health & wellbeing	People
SDG 4: Quality education	People
SDG 5: Gender equality	People
SDG 6: Clean water and sanitation	Planet
SDG 7: Affordable and clean energy	Planet
SDG 8: Decent work and economic growth	Prosperity
SDG 9: Industry, Innovation and Infrastructure	Prosperity
SDG 10: Reduce inequalities	People
SDG 11: Sustainable cities and communities	People
SDG 12: Responsible consumption and production	Planet
SDG 13: Climate action	Planet
SDG 14: Life below water	Planet
SDG 15: Life on land	Planet
SDG 16: Peace, justice and strong institutions	Peace
SDG 17: Partnerships for the goals	Partnerships

Although the united concept of sustainable development aims to counteract this divide, scholars have argued that, historically, countries of the Global North are often primarily focused on environmental protection, while countries of the Global South do not want to sacrifice their development through environmental concerns and, hence, focus on people-related goals instead (Nanda, 2015; Eichler & Schwarz, 2019; Forestier & Kim, 2020). Logically, this statement cannot and should not be generalized on a global level but will serve as an inspiration for this study's first hypothesis:

> ***Hypothesis 1a:*** *Impact venture capital investments in developed economies are higher towards planet goals.*

> ***Hypothesis 1b:*** *Impact venture capital investments in developing economies are higher towards people goals.*

When the SDGs were shaped through multiple conferences prior to 2015, the United Nations also invited the global business community, represented by actors from various sectors, to participate in creating the new development agenda (Redman, 2018). The private sector's importance in pursuing and achieving the SDGs is undeniable. The United Nation's Addis Ababa Action Agenda from 2015, for instance, states that "private business activity, investment and innovation are major drivers of productivity, inclusive economic growth and job creation" (United Nations, 2015, pp. 17). Not only can companies provide the required financing to close the estimated annual funding gap of $2.5 trillion (Barua, 2019), but they also provide specific expertise in various sectors, offer strong managerial enforcement capabilities, and can take higher risks than public entities (Mio, Panfilo & Blundo, 2020). In prior research, both multinational organizations and small- and medium-sized enterprises (SMEs) are acknowledged to contribute in divergent ways. On the one hand, multinational organizations have a large capital availability, international reach, scaling effects, and technological capabilities (Sachs, 2012; Mio, Panfilo & Blundo, 2020). On the other hand, SMEs offer the flexibility and adaptability required to foster agile innovation (Halme & Korpela, 2014).

However, Barua (2019) points out that a large societal impact, generated by private companies and backed by private capital, often materialises unregistered. Thus, the true impact of companies on the SDGs remains blurry. Although a significant global excess of more than $1 trillion in private equity capital could be utilized for SDG investments, the private sector's slow transition towards adopting the goals into corporate strategy and operations causes the

capital to predominantly sit idle (Barua, 2019). Such financial inefficiencies highlight the urgent need for cooperation between private sector enterprises and the global (impact) investing landscape.

2.3 Impact Investing

Following the term's inception by the Rockefeller Foundation at a philanthropic conference in 2007, the field of impact investing has experienced rapidly growing interest among scholars throughout the past 15 years (Agrawal & Hockerts, 2021; Islam, 2022). Although a definite taxonomy is yet to be established, impact investing is commonly defined as investors providing financial resources to enterprises with the overall aim to tackle social issues or mitigate ecological degradation while generating financial returns at the same time (Busch et al., 2021; Santamarta et al., 2021). Such investments can address various issues, ranging from climate change mitigation over gender equality initiatives to poverty alleviation in developing countries (Barber, Morse & Yasuda, 2021).

Santamarta et al. (2021) emphasize that impact funds contain typical characteristics of regular venture capital funds by investing in unlisted and growing companies through minority equity involvement, thereby aiming to achieve market-rate returns. Interestingly, Barber, Morse, and Yasuda (2021) discover in their controlled empirical study that annualized rates of return of impact investors are, on average, 4.7% lower than the returns of traditional venture capital funds. Those findings challenge the impact investing community's common argument that competitive market-rate returns can be achieved while positively contributing to society simultaneously (Brest & Born, 2013).

Increasing environmental concerns are a critical driver for the rise of sustainable investing types such as ESG funds or impact investors. Pioneering publications of Nobel Laureate William Nordhaus in the 1970s advanced the most-recent debate on the interactions between climate change and financial markets (Giglio, Kelly & Stroebel, 2021). While annual investments into climate change mitigation have steadily increased in past years, debates have emerged about associated climate risks and their implications on financial asset prices (Giglio, Kelly & Stroebel, 2021). In a special issue on climate finance from the Review of Financial Studies, Krueger, Sautner, and Starks (2020) discover through an investor survey that only 7% of respondents do *not* manage climate risks in any capacity. In contrast, 39% of the surveyed asset managers actively reduce their portfolios' carbon footprints, often achieved through active engagement with their respective portfolio companies (Krueger, Sautner & Starks,

2020). Supportingly, Alok, Kumar & Wermers (2020) find that asset managers adjust their portfolio allocations based on climate change disasters. Overall, environmental concerns and climate change mitigation have become a pressing priority for ESG and impact investors globally.

Still, several challenges accompany the rapid global surge of impact investing. For instance, scholars critically raise the question how social/environmental impact can effectively and reliably be measured and reported (Reeder, Colantonio, Loder & Rocyn, 2015; GIIN, 2020; Scholda, Vandor, Millner & Meyer, 2021). The discussion about impact measurement and reporting directly links to another controversial topic in academic literature; the issue of impact-washing. Commonly defined as a "dilution of the term impact investing" (Busch et al., 2021, pp. 2), it refers to wrongfully labelling conventional financing as impact investing in attracting larger amounts of capital from limited partners or using the term solely as a marketing tool (Barber, Morse & Yasuda, 2021; Holtslag, Chevrollier & Nijhof, 2021). Jeopardizing market integrity, the problem of impact- or purpose-washing of funds directly hints back to the urgent need for clear definitional boundaries and taxonomy of the term impact investing, combined with a call for stricter regulatory scrutiny by financial authorities (Höchstädter & Scheck, 2015; Roundy, Holzauer & Dai, 2017; Findlay & Moran, 2018).

Leaving definitional disputations behind, impact investments present a significant potential to channel capital towards transformative sustainable change within markets (Clarkin & Cangioni 2015; Holtslag, Chevrollier & Nijhof 2021). In the same vein, impact investments offer much-needed possibilities to advance the Agenda 2030 that can be divided into two main categories. Firstly, investors can provide the required capital to realize projects, especially in developing countries where a high percentage of the population lacks adequate access to funding (Barua, 2019; Zhan & Santos Paulino, 2021). With a long-term potential far beyond the SDG funding gap, Suehrer (2019) proposes that impact investing will inherently shape the future of foreign direct investment (FDI). Secondly, it can foster innovative markets with transformational potential, leading to sustainable market transformations (Holtslag, Chevrollier & Nijhof 2021). Innovation, however, should be viewed beyond just technology. It also applies to introducing new business models that transform entire industries and value chains (Schramade, 2020). Rested on this similarity to traditional venture capital investments into technological advancement, it seems logical that impact venture capital allocations should be substantial towards the SDG that emphasizes innovation and progress, namely SDG 9. As a result, the second hypothesis tests if that prosperity-themed and, thereby, venture capital associated goal receives increased financial attention from impact investors.

Hypothesis 2: *Addressing SDG 9 (Industry, Innovation and Infrastructure) positively influences the amount of impact venture capital received by firms*.

At this point, it is noteworthy that the size of investments examined in this dissertation must not necessarily be congruent with the investors' focus or the absolute number of investments realized into the respective SDGs. In their paper analysing the alignment between impact funds and the SDGs, for instance, Castellas & Ormiston (2018) find that impact investors seem to prioritize social outcomes over environmental objectives. Supportingly, Schramade (2017) claims that private impact investors primarily tend to target social outcomes, inter alia, the elimination of poverty and hunger. Such findings are consistent with the most recent annual GIIN survey; 34% of responding investors exclusively target social challenges, 6% solely focus on environmental issues, and the remaining 60% aim at both segments (GIIN, 2020). On the contrary, the GIIN survey also quantitatively indicates the impact investors' highest capital allocation by sector. They find that the most substantial investments target energy projects associated with SDG 7, Affordable and clean energy (GIIN, 2020). Zhan & Santos-Paulinho (2021) also show that investments in renewable energy projects have increased by 66% since the start of the Coronavirus pandemic. Consequently, the magnitude of investments into SDG 7 is tested through this study's final hypothesis:

Hypothesis 3: *Addressing SDG 7 (Affordable and Clean Energy) positively influences the amount of impact venture capital received by firms.*

3 Methods

3.1 Research Design

A positivistic and epistemological philosophy is adopted for this study to explain and generalize a real-world phenomenon through measurable facts and causal explanations (Saunders, Lewis & Thornhill 2016). However, it should be noted that the manual data collection, further explained in section 3.3, is conducted in a rigorous yet interpretative way by manually matching businesses with respective SDGs. Therefore, the chosen positivistic philosophy additionally embodies a particular pragmatic character throughout the researcher's manual data collection procedure (Saunders, Lewis & Thornhill 2016).

As hypotheses are developed based on existing theory and subsequently tested, providing ground for further research, the study follows a deductive and explanatory approach (Saunders, Lewis & Thornhill 2016). Consequently, a quantitative mono-method in the form of a multiple regression analysis serves to test the imposed hypotheses, ensuring reliable, valid, and generalizable findings (Saunders, Lewis & Thornhill 2016).

3.2 Empirical Context

This chapter outlines the empirical context of both the SDGs and impact venture capital and, finally, elaborates on the appropriateness of combining both fields in an empirical study. The 17 Sustainable Development Goals are further supported by 169 targets and 232 corresponding indicators, intended to provide a clear scope of each goal (United Nations, n.d.). Progress is tracked through frequent reports by the UN's Economic & Social Council. As it would exceed the boundaries of this chapter, the progress of each particular goal is not presented at this point. However, to illustrate a clear example, the Economic & Social Council highlights in their 2021 report that extreme global poverty had fallen from 10.1% in 2015 to 9.5% in 2020 (Economic & Social Council, 2021). Still, more than 4 billion people worldwide are living without social protection. The Council concludes that considering the triple hazard of Covid-19, global conflicts, and climate change, the achievement of SDG 1 until 2030 is practically unrealistic (Economic & Social Council, 2021). To make as much progress as possible in upcoming years, public, private, or blended funds need to be mobilized and channelled towards initiatives that contribute to goal achievement on a global scale (United Nations, 2021).

On the other hand, as briefly discussed throughout the literature review, impact investing is a sub-form of traditional venture capital financing. As a nascent field, no clear

taxonomy is existent until today, outlining the need for critical and empirical research (Agrawal & Hockerts, 2019). As a rapidly growing field, the impact investor landscape is constantly evolving, exemplified by the rising number of new investors and AUM within the industry. While the 2019 GIIN survey estimated the global market at around $502 billion, the most recent version from 2020 reports an increase to $715 billion (GIIN, 2019; GIIN, 2020).

Unlike public funds, for instance, private investments into the SDGs are frequently subject to tracking failures, as they do not carry a specific SDG tag (Barua, 2019). Nevertheless, impact investors evidently identify with their contribution towards the 17 goals, exemplified by the fact that 73% of participants in the annual GIIN survey indicated that they use the SDGs for either measurement or impact reporting.

In a nutshell, the SDGs face a significant funding gap that cannot be achieved without private sector contribution. Impact investing, as a form of venture capital, can be part of that solution. Based on that, linking impact investments to particular SDGs offers meaningful potential to contribute to a missing body of empirical research in this novel field of sustainable finance.

3.3 Data Collection

3.3.1 Variables

Dependent Variable

As the aim of the research is to examine the influence of particular SDGs on the funding amount of impact venture capital investments, the deal size is studied as the dependent variable. Precisely, the individual funding amounts of global impact investments over the past five years are analysed. As it displays a particular value of money, the variable is continuous and is measured in million US dollars. It is worth noting that observations are counted as separate financing rounds. Thus, several ventures may appear various times in the data set as separate observations when they have raised subsequent funding rounds throughout the observed years.

Independent Variables

With the intended objective to measure the causal effect of the SDGs on the funding amount, the 17 goals serve as independent (dummy) variables of the model. As SDG 16, *Peace, Justice and Strong Institutions,* does not offer any observed firm-level applicability (Forestier & Kim, 2020), it is included but does not display matches with any of the ventures. With no existing dataset that pairs the applicable ventures with the respective SDG(s) they tackle, the

researcher conducted a manual matching for all 741 observations. For that, 17 dummies are created, and, as a venture can address multiple SDGs simultaneously, multiple selections are possible. The matching is based on public information about the ventures' mission and core business operations, thereby maintaining a moderately high level of analysis without profoundly considering the company's entire value chain. A comparable, equally pragmatic method of tagging companies' core business with respective SDGs has been conducted by Schramade (2017).

Control Variables

Including moderating variables into the model allows the researcher to control for additional factors that might concurrently influence the dependent variable (Wooldridge, 2015). Concretely for this study, elements that might also explain the amount of funding that a venture receives, separate from the SDGs, serve as control variables. Therefore, a set of such factors was derived from similar studies and briefly explained henceforth. The control variables cover external effects from six distinct areas, namely (1) the general deal structure, (2) possible firm-specific effects, (3) industry-specific effects, (4) investor-induced effects, (5) country characteristics, and (6) year effects.

Deal stage: The first control variable is the stage of the analysed deal, ranging from (pre-)seed over early- to later-stage funding rounds. Logically, financing of later stages is higher than early-stage deals, as more capital is required for product development, employee growth, and international expansion investments (Gompers, 1995; Heughebaert & Manigart, 2012; Gou, Lou & Pérez Castrillo, 2015).

Age of the start-up: Similar to the deal stage, older companies might require higher funding amounts due to employee salaries and other legacy costs they might carry. Therefore, the age of the start-up is computed by subtracting the founding date from the date the deal was conducted (Gompers, 1995; Heughebaert & Manigart, 2012; Schoonmaker, Solomon & Rau, 2017; Hidayat et al., 2021).

Previously raised capital: As an additional proxy to account for the venture's size, the previously raised capital is computed by subtracting the deal amount from the *capital raised to date*, which includes all funding the firm received up to the point of observation.

Industry: Seven distinct dummies for the primary industry sectors are created to control possible differences between industries. The rationale is that some industries, for example, Information Technology, might be more capital intensive than others and, thus, naturally require higher investment amounts (Gou, Lou & Pérez Castrillo, 2015).

Investor syndication: Hypothetically, a larger number of participating investors, known as syndicate deals, leads to more combined assets under management available and a reduced risk for the individual investors. Several related studies control for the effect of deal syndication. Accordingly, the absolute number of participating investors is included in the regression model (Heughebaert & Manigart, 2012; Gou, Lou & Pérez Castrillo, 2015; Que & Zhang, 2021).

Investor location: As prominent investment funds are often concentrated in financial hubs around the world, the headquarters location of the investor might influence the size of the investment. Consequently, a dummy variable for cross-border investments is created, taking on the value of zero if the deal's lead investor is domestic and one if the investor is from another country than the venture (Heughebaert & Manigart, 2012; Que & Zhang, 2021).

Economy classification: To control for country-specific economic effects that might influence the amount of capital required, a dummy variable is included based on the International Monetary Fund's (IMF) economic groupings (International Monetary Fund, 2021). The three categories, used in the IMF's fiscal monitor, are developing economies, emerging- and middle-market economies, as well as advanced economies.

Year effects: A final external factor that might impact the deal size is the year when the transaction occurred. As a solution, year dummies control for time-specific macroeconomic effects, political trends, or other changes to the overall market environment (Wooldridge, 2015).

3.3.2 Sources & Search Strategy

The dataset of impact venture deals was extracted using the platform PitchBook, a commercial database focusing on venture capital, private equity, and mergers & acquisitions. While several other prominent databases exist among finance scholars, for example, Bloomberg or Thomson ONE, they usually emphasize public financial markets and have a

limited capacity in venture capital financing. Alternatives with a private market focus are S&P's Capital IQ and VentureSource. While the former does not allow filtering for impact investments, the latter mainly focuses on transactions in the United States. Consequently, PitchBook is selected for this study to source the data on impact deals.

The deal screening was conducted in a straightforward approach that consisted of the following steps: Firstly, filtering for deals of the past five years to ensure a manageable number of observations. Secondly, as deal size is the dependent variable, all transactions without existing data in that category were excluded. Thirdly, all financing stages of venture capital were selected. Finally, to ensure that only actual impact investments are included in the sample, the investor type was set to "Impact Investors" with the sub-option to solely include deals where the lead investor was an impact investor. Otherwise, the dataset would consider deals led by conventional venture capital firms, where an impact fund or a development bank solely contributed as a supporting investor.

After realizing the described search criteria, the dataset includes 741 observations. Lastly, as described in section 3.3.1, the economic classifications from the IMF are merged manually into the dataset using Microsoft Excel.

3.4 Study Assumptions

This study's main objective is to understand where impact venture capital has been allocated in the past and, through that, which SDGs might be over/underfunded, highlighted in a geographical context. With the funding amount serving as the dependent variable, it is logically assumed that the capital available to a venture is a leading indicator of its impact on advancing the SDG agenda. Correspondingly, it is hypothesized that the companies perceive raising more financial resources from investors as advantageous and desired. It is further assumed that businesses actually contribute to the goals if a clear match between their vision, mission, or business model and the respective SDGs can be identified through public resources, minimizing the possibility of false allocations as much as possible from this analysis.

Aligned with the chosen method of a multiple linear regression, the underlying model is based on the five *Gauss-Markov* assumptions: (1) linearity between the dependent and independent variables, (2) random sampling, (3) no perfect collinearity, (4) zero conditional mean of the error term, and finally (5) homoskedasticity (Wooldridge, 2015).

3.5 Statistical Analysis

3.5.1 Sample Modification

After exporting the raw data set with 741 observations from PitchBook, it was further edited in Microsoft Excel, before it could be imported into R Studio for subsequent statistical analysis. This section elaborates how the sample was modified.

Initially, additional columns for the 17 SDGs and their corresponding pillars were added to prepare for the manual matching. Secondly, as PitchBook did not contain all relevant information for control variables, columns were appended regarding the economy classification, the venture's continent, and the investor's location. As further described in section 3.3.1, the economy classification was added manually for every country, using the IMF's fiscal monitor, the applicable continent was supplemented by hand, utilizing Excel's filter option, and the lead investor's location was researched through PitchBook and included accordingly under the dummy variable *cross-border*.

Thirdly, a column for the venture's age was added and computed by subtracting the year of funding from the year the enterprise was founded. Previously raised capital was subsequently measured by subtracting the current deal size from PitchBook's information of overall *capital raised to date*.

Fourthly, the natural logarithm was applied in Microsoft Excel to three continuous numeric variables, namely the dependent variable deal size, previously raised capital, and the company's age, to ensure a normal distribution without skewness (Wooldridge, 2015). As a next step, the data was checked for outliers. Although some deal sizes were considerably higher than others, explained by venture capital's nature of multiple increasing funding rounds, none of the observations appeared conspicuously unrealistic. Therefore, no outliers were removed from the data set.

Lastly, following the manual matching between the ventures and the applicable SDGs, 46 observations were removed from the sample, as the companies either did not offer an evident positive social/environmental impact or because they could not be matched with any of the 17 SDGs. The final sample consequently consists of 695 observations. Appendix A offers an overview of all variables that are exercised throughout the data analysis and their derivation.

3.5.2 Empirical Methodology

To test the proposed hypotheses, ten distinct regression models are deployed, exploring various aspects of the data set. Initially, *Model 1* displays a multiple regression, run solely with the 17 SDGs as independent variables without applying any controlling factors to determine the variables' isolated explanatory power. *Model 2* builds upon this analysis by highlighting a regression only with the available control variables to test the relevance and impact of the controls on the dependent variable. *Model 3*, this study's main regression model, indicates the 17 SDGs' influence on the deal size, including all relevant control variables.

Models 4 - 6 continue by linking the overarching SDG pillars with the three economy types, namely developing, emerging, and developed. This is achieved by creating three sub-sets with the intention to test this study's first hypothesis.

Finally, the *Models 7 - 10* offer a geographical analysis for the 17 SDGs, thereby aiming at the second research question to explore geographical patterns regarding the investment into different SDGs. The continent sub-samples are divided as North America (*Model 7)*, Europe (*Model 8*), Asia (*Model 9*) and Africa (*Model 10*). Australia and South America did not offer a sufficient sub-sample size for a separate analysis.

$$\textbf{Model (1)} \quad Deal\ size_i = \beta_0 + \beta_1\, SDGs_i + \varepsilon$$

$$\textbf{Model (2)} \quad Deal\ size_i = \beta_0 + \beta_2\, Controls_i + \varepsilon$$

$$\textbf{Model (3)} \quad Deal\ size_i = \beta_0 + \beta_1\, SDGs_i + \beta_2\, Controls_i + \varepsilon$$

$$\textbf{Model (4) - (6)} \quad Deal\ size_i = \beta_0 + \beta_3\, Pillars_i + \beta_2\, Controls_i + \varepsilon$$

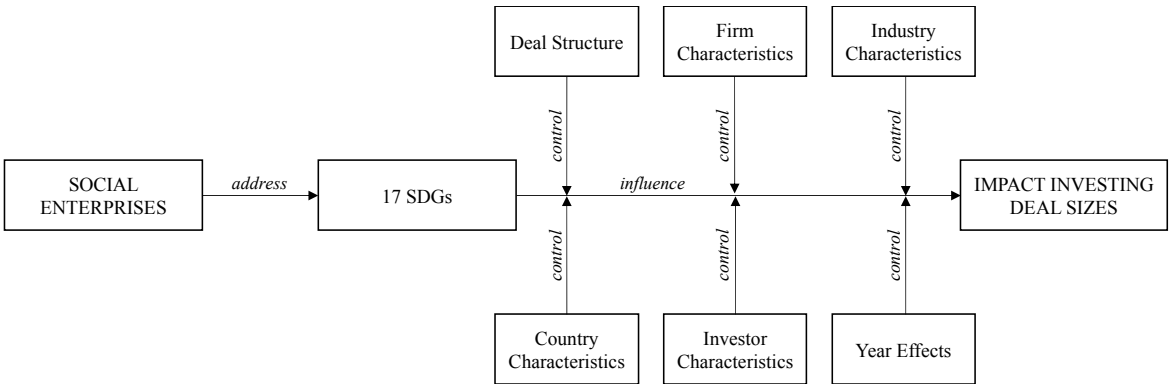
$$\textbf{Model (7) - (10)} \quad Deal\ size_i = \beta_0 + \beta_1\, SDGs_i + \beta_2\, Controls_i + \varepsilon$$

Throughout the equations above, the dependent variable *Deal size* is continuous. Therefore, a regular ordinary least squares (OLS) regression is used to investigate the effect of individual variables onto a numeric outcome (Wooldridge, 2015). To avoid possible skewness, the natural logarithmic form of the *Deal size* is used. β_1 and β_3 indicate the direct effect of the independent variables, namely the SDGs as well as their overarching pillars, on the deal size. Consequently, the control variable vector is labelled as β_2. Finally, the models' intercept is denoted by β_0 and the error term ε covers all unobserved effects, for instance caused by potentially omitted variables.

In a nutshell, this study aims to measure the impact of social enterprises, which address varying SDGs, onto the overall funding round size that is deployed by impact investors, while

controlling for several external factors. Figure 1 below further visualizes the variables' interaction.

Figure 1: Empirical framework



3.5.3 Descriptive Statistics

An initial review of the numeric variables used throughout the regression models (Table 2) reveals that the dependent variable, deal size, ranges from 0.1 million US dollars up to a maximum funding round of 400 million. The average round size balances at 13.64 million dollars. Previously raised capital logically starts at zero dollars, when the corresponding funding is the first financing the firm received. On average, the funded companies are around 5.5 years old when they receive the funding at observation, and 3.6 investors participate. It is noteworthy that the maximum number of syndicating investors reaches up to 36 entities. Lastly, determined by the dummy variable cross border, 36% of lead investors on the deals are domestic, while 64% of them invest in companies abroad.

Table 2: Descriptive statistics

Variable		Mean	Std. Dev.	Min.	Max.
(1)	Deal size (in million USD)	13.64	36.77	.10	400
(2)	Previously raised capital (in million USD)	10.80	39.11	0	539
(3)	Company age (in full years)	5.55	4.75	0	37
(4)	Number of participating investors	3.56	4.01	1	36
(5)	Cross border investment dummy: 1 = cross border investment, 0 = otherwise	.36	0.48	0	1

Figure 2 and Figure 3 outline the development of average deal sizes and the overall funding amounts over the five studied years, respectively. Although the average round sizes had two slight decreases in 2018 and 2020, the absolute funding amounts of impact venture capital have steadily increased over the years, clearly highlighting the need to include year dummies in the regressions to control for year-specific effects.

Figure 2: Average deal sizes (million USD)

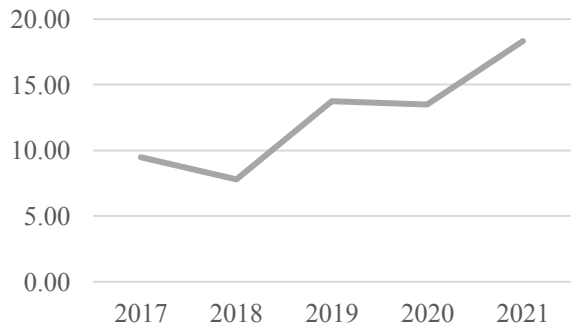
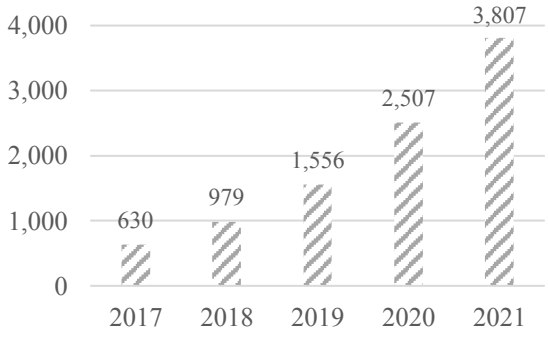
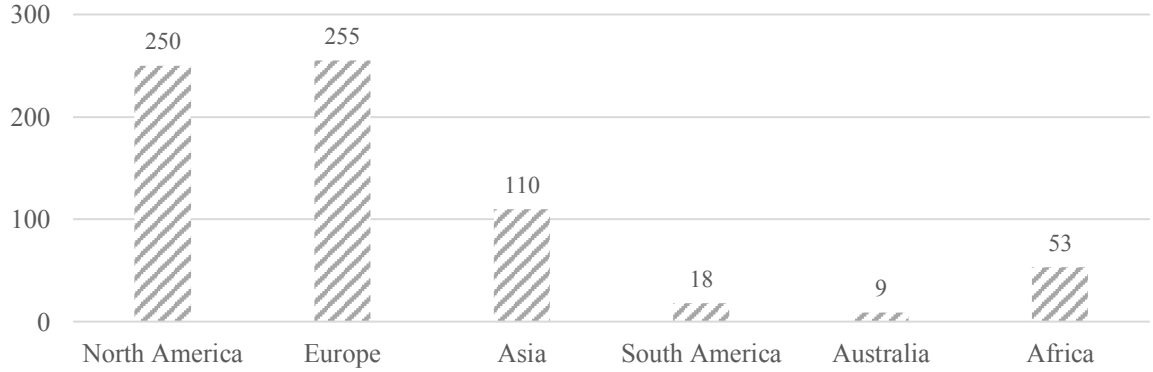


Figure 3: Overall funding amounts (million USD)



As the study is conducted on a global scale, it should be highlighted that North American and European deals evidently dominate the observed data set at almost equal amounts of impact fundings. Asia amounts to 110 observations, followed by 53 fundings in Africa. Interestingly, South American fundings only account for 18 observations and Australian deals are remarkably rare with only 9 in total. As already hinted in the *Empirical Methodology*, limited observations in the latter two continents, unfortunately, result in an inability to explore geographical patterns through sub-set regression models.

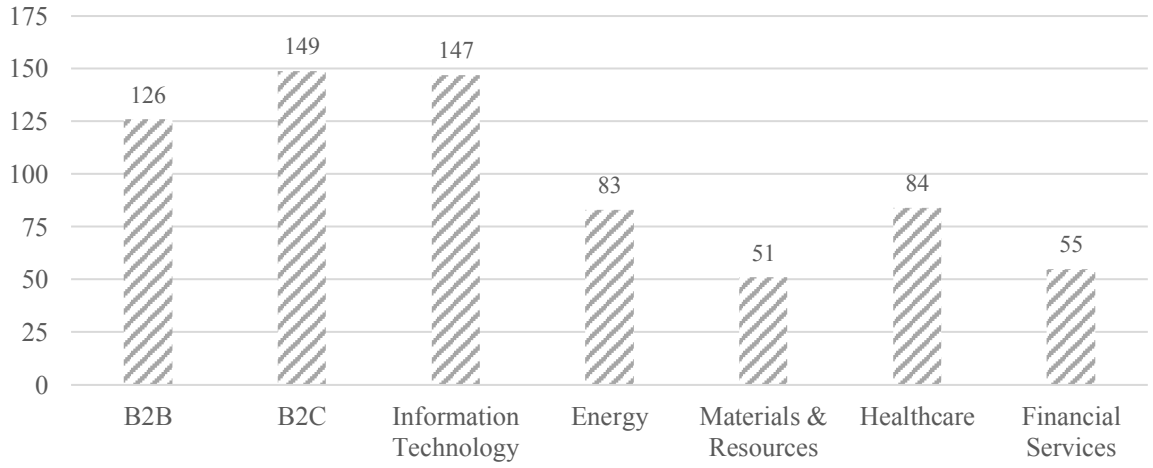
Figure 4: Number of deals per continent



Examining the industry distribution among the 695 overall deals in Figure 5, one can conclude that the deals are distributed relatively equal. While companies in the business-to-

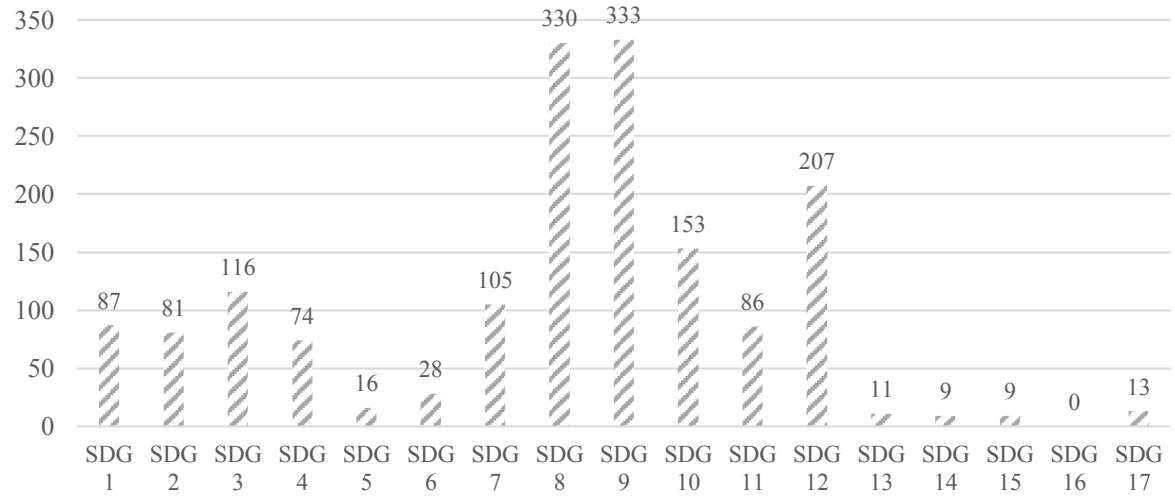
consumer (B2C) and Information Technology industries slightly dominate the data set, firms active in Materials & Resources as well as Financial Services offer the fewest data points.

Figure 5: Number of deals per industry



Lastly, Figure 6 depicts the overall presence of tackled SDGs by the studied social ventures. It should be noted that the overall number exceeds 695 observations, as a firm can logically address multiple SDGs through their business operations. Most frequently present are the prosperity-oriented SDGs 8 (Decent Work and Economic Growth) and 9 (Industry, Innovation and Infrastructure) with 330 and 333 data points, respectively. Their dominance is mainly caused by their corresponding indicators in the areas of technological upgrading and innovation, financial inclusion and (environmental) resource efficiency in development and production (United Nations, n.d.). The second and third most observations occur among SDG 12 (Responsible Consumption and Production), as well as SDG 7 (Affordable and Clean Energy). SDG 14 (Life below Water) and 15 (Life on Land) have the fewest observation, only undercut by SDG 16 that, as previously mentioned, is not sufficiently addressed by any of the analysed ventures.

Figure 6: SDGs addressed by the ventures



Note: For reference, the full names of the goals are depicted below:

Table 3: Sustainable Development Goals

SDG 1: No poverty
SDG 2: Zero hunger
SDG 3: Good health & wellbeing
SDG 4: Quality education
SDG 5: Gender equality
SDG 6: Clean water and sanitation
SDG 7: Affordable and clean energy
SDG 8: Decent work and economic growth
SDG 9: Industry, Innovation and Infrastructure
SDG 10: Reduce inequalities
SDG 11: Sustainable cities and communities
SDG 12: Responsible consumption and production
SDG 13: Climate action
SDG 14: Life below water
SDG 15: Life on land
SDG 16: Peace, justice and strong institutions
SDG 17: Partnerships for the goals

4 Results

Following the initial data screening through descriptive statistics, this chapter presents an overview of the regression results through the lens of the proposed hypotheses.

Multicollinearity was examined among all models in a pre-check through a Variance Inflation Factor (VIF) test, depicted in Appendix B. For the first six models, no result reached a critical threshold, frequently defined above 5 or 10. *Models 7* to *10*, on the contrary, presented some elevated VIF scores of independent variables. A reason for that is the similarity between several industry dummies and SDGs, for example Healthcare and corresponding SDG 3 (Good Health and Wellbeing) or Energy and SDG 7 (Affordable and Clean Energy). To eliminate any arising multicollinearity concerns, the industry dummies are not included in the geographic analysis (*Models 7 - 10*). Consequently, no values exceed a critical threshold. A Breusch-Pagan test found the presence of heteroscedasticity with a p-value below 0.05. Therefore, all ten regression models, illustrated at the end of this chapter, are displayed with heteroscedasticity-corrected robust standard errors (Wooldridge, 2015).

As explained in the *Empirical Methodology*, the first model depicts the 17 SDGs' isolated effect without any control variables, each in the form of a dummy and the first goal being dropped as a reference. SDG 16 (Peace, Justice, and Strong Institutions) is included for completeness but does not offer any observations due to its firm-level inapplicability. While entailing a comparably low explanatory power with an adjusted R-square value of 0.033, several statistically significant results can be observed in *Model 1* (Table 3). Briefly noted, those significant results are observed across SDG 2 (Zero Hunger), SDG 7 (Affordable and Clean Energy), SDG 10 (Reduced Inequalities), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals). Finally, SDG 9 (Industry, Innovation, and Infrastructure) offers a slightly significant positive influence on the deal amount (with $p<0.1$), hinting towards initial support for Hypothesis 2.

However, as the model's explanatory power is comparably low on its own, control variables are subsequently added. To illustrate their baseline effects and verify if the variables seem legitimate in a real-world setting. *Model 2* (Table 3) reveals the control variables' isolated impact, most of them being strongly significant. Logically, deal sizes seem to increase with later stages, and higher previously raised capital increases the current funding round. Furthermore, emerging and developed economies suggest higher deals than the dropped dummy for developing economies. Cross-border investments seem to attract higher overall capital. While a larger number of participating investors also leads to increased deal sizes, the

company's age does not seem to have a significant effect. Finally, 2021 has seen significantly higher financing than the previous years, and both the Financial Services industry and companies operating within Materials & Resources have raised higher rounds than the omitted business-to-business (B2B) industry. Depicted by the adjusted R-square, the control variables together explain around 47% of the overall effects on the dependent variable, implying a sound selection of controlling factors.

Progressively, *Model 3* (Table 4) combines the SDGs on a global scale with the highlighted control variables, leading to a drop in statistical significance for most of the observed effects. Two of the SDGs remain highly relevant ($p<0.05$). Firstly, SDG 10 (Reduced Inequalities) persistently attracts lower financing, predominantly caused by substantial negative results in both Asia and Africa (*Models 9* and *10*). Secondly, *Model 3* exhibits comparably low investor appetite for SDG 15 (Life on Land), primarily rooted in small deal sizes by investors in North America and Europe. The underlying meaning of those results is profoundly interpreted in the *Discussion*, together with several intriguing ancillary insights from the models. Hereafter, this chapter concludes by presenting the results of this study's proposed hypotheses.

SDG pillars within developing and developed economies – Hypothesis 1

As a further step in the analysis, *Model 4 - 6* (Table 5) study the overarching SDG pillars, namely planet, people, prosperity, and partnerships, as outlined in chapter 2.3 of the literature review. Testing this study's first hypothesis, an analysis is conducted among subsets of the three economic types; developing, emerging, and developed. In a pre-analysis, an initial regression on the entire data set indicated no statistically significant results for any of the three pillars relative to the omitted reference category partnerships. Similarly, none of the pillars among the sub-sets in either *Model 4* or *6* offers statistical substance with a p-value below 0.1. As a result, no sufficient support for Hypothesis 1 can be established.

SDG 9 positively influences the deal size – Hypothesis 2

Although *Model 1* indicates a positive trend towards the influence of SDG 9 (Industry, Innovation, and Infrastructure) on the deal size, this effect disappears after adding control variables to the regression in *Model 3*. Solely in the European subset, depicted in *Model 8*, this goal seems to attract higher investments. As only one of the subsets across all relevant models indicates positive results regarding SDG 9, no sufficient support can be found to accept Hypothesis 2.

SDG 7 positively influences the deal size – Hypothesis 3

Hypothesis 3 suggests that addressing SDG 7 (Affordable and Clean Energy) would positively influence the amount of capital ventures receive from impact investors. Neither the overall analysis (*Model 3*), nor any of the geographic sub-samples (*Model 7 - 10*) do indicate any substantial impact of SDG 7 on the dependent variable. Similar to the previous two hypotheses, none of the regression models offers sufficient evidence to support this final hypothesis.

In a nutshell, the regression results do not convey adequate evidence to support any of the three hypotheses proposed by this study. Possible reasons for the rejected hypotheses are further explored in the following *Discussion*.

Table 4: Regression results SDGs

	Dependent Variable = Deal Size (natural log)		
	Model (1) SDGs Only	Model (2) Controls Only	Model (3) SDGs Global Scale
Sustainable Development Goals			
SDG 2	-0.509*		-0.102
	(0.263)		(0.180)
SDG 3	0.061		-0.196
	(0.251)		(0.296)
SDG 4	0.0001		-0.066
	(0.245)		(0.215)
SDG 5	-0.319		-0.107
	(0.445)		(0.417)
SDG 6	0.928*		0.310
	(0.509)		(0.402)
SDG 7	-0.593**		-0.258
	(0.240)		(0.254)
SDG 8	0.009		-0.181
	(0.176)		(0.134)
SDG 9	0.361*		0.217
	(0.188)		(0.147)
SDG 10	-0.690***		-0.432**
	(0.209)		(0.169)
SDG 11	-0.476*		-0.316
	(0.271)		(0.213)
SDG 12	-0.187		-0.130
	(0.198)		(0.161)
SDG 13	1.453***		0.388
	(0.545)		(0.683)
SDG 14	-0.307		-0.441
	(0.626)		(0.529)
SDG 15	-0.606		-0.955**
	(0.614)		(0.377)
SDG 16			
SDG 17	-1.270***		-0.401
	(0.424)		(0.408)
Control Variables			
Early Stage Dummy		0.831***	0.873***
		(0.144)	(0.147)
Later Stage Dummy		1.507***	1.532***
		(0.195)	(0.196)
Previously Raised (natural log)		0.060***	0.056***
		(0.010)	(0.009)
Company age (natural log)		0.027	0.050
		(0.126)	(0.129)
Emerging Economy Dummy		0.961***	0.847***
		(0.270)	(0.272)
Developed Economy Dummy		1.295***	1.080***
		(0.254)	(0.263)
Number of investors		0.183***	0.184***
		(0.028)	(0.028)
Cross Border Dummy		0.268**	0.241*
		(0.130)	(0.133)
Year Dummy Controls			
2018		0.135	0.173
		(0.243)	(0.248)
2019		0.232	0.231
		(0.250)	(0.254)
2020		0.015	0.059
		(0.245)	(0.254)
2021		0.642***	0.644***
		(0.228)	(0.235)
Industry Dummy Controls			
Industry B2C		-0.012	0.108
		(0.192)	(0.201)
Industry Energy		0.354	0.429
		(0.219)	(0.288)
Industry Materials & Resources		0.442*	0.440
		(0.259)	(0.271)
Industry Financial Services		0.752***	0.965***
		(0.226)	(0.252)
Industry Healthcare		0.249	0.386
		(0.215)	(0.341)
Industry Information Technology		-0.088	0.018
		(0.173)	(0.186)
Constant	14.940***	10.960***	11.275***
	(0.200)	(0.403)	(0.435)
Observations	695	695	695
R2	0.054	0.480	0.495
Adjusted R2	0.033	0.466	0.470

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Regression results pillars

	Dependent Variable = Deal Size (natural log)		
	Model (4) Pillars Developing	Model (5) Pillars Emerging	Model (6) Pillars Developed
Pillars			
Planet	0.056 (1.226)	-0.573 (0.542)	0.025 (0.165)
People	-1.225 (1.014)	-0.764* (0.403)	0.049 (0.150)
Prosperity	-0.719 (1.371)	-0.019 (0.575)	-0.017 (0.165)
Control Variables			
Early Stage Dummy	1.133 (1.090)	1.170*** (0.412)	0.739*** (0.161)
Later Stage Dummy	3.140* (1.698)	1.838*** (0.513)	1.219*** (0.210)
Previously Raised (natural log)	0.042 (0.053)	0.062** (0.031)	0.061*** (0.010)
Company age (natural log)	-0.033 (0.688)	0.017 (0.339)	0.069 (0.150)
Number of investors	0.313** (0.151)	0.089 (0.159)	0.197*** (0.017)
Cross Border Dummy	-0.150 (1.246)	0.475* (0.285)	0.229 (0.149)
Year Dummy Controls			
2018	-1.952 (1.680)	-0.054 (0.481)	0.352 (0.291)
2019	-0.798 (2.001)	-0.251 (0.518)	0.381 (0.295)
2020	-1.817 (1.775)	-0.087 (0.502)	0.289 (0.291)
2021	-0.253 (1.821)	0.369 (0.433)	0.857*** (0.277)
Industry Dummy Controls			
Industry B2C	-0.469 (1.251)	0.976 (0.658)	-0.230 (0.217)
Industry Energy	-0.468 (1.464)	1.946*** (0.650)	0.058 (0.251)
Industry Materials & Resources	-0.859 (1.444)	0.875 (1.354)	0.401 (0.289)
Industry Financial Services	-0.224 (1.041)	1.851*** (0.559)	0.265 (0.297)
Industry Healthcare	1.240 (1.453)	0.751 (1.055)	0.038 (0.284)
Industry Information Technology	-0.377 (1.168)	0.762 (0.569)	-0.256 (0.199)
Constant	14.087*** (2.613)	12.020*** (1.428)	12.220*** (0.418)
Observations	52	141	502
R2	0.689	0.490	0.484
Adjusted R2	0.504	0.410	0.464

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Regression results geographical analysis

	Dependent Variable = Deal Size (natural log)			
	Model (7) North America	Model (8) Europe	Model (9) Asia	Model (10) Africa
Sustainable Development Goals				
SDG 2	0.210	0.345	-2.103***	-0.367
	(0.282)	(0.276)	(0.433)	(0.590)
SDG 3	-0.141	-0.005	0.483	-0.474
	(0.269)	(0.305)	(0.518)	(0.752)
SDG 4	-0.434	0.163	-0.168	
	(0.329)	(0.297)	(0.468)	
SDG 5	-0.986	0.384	0.194	0.235
	(0.882)	(0.551)	(0.366)	(0.818)
SDG 6	0.695	-0.015	-0.942	-0.751
	(0.483)	(0.466)	(0.678)	(1.552)
SDG 7	-0.334	-0.042	-0.027	0.642
	(0.385)	(0.225)	(0.438)	(0.553)
SDG 8	0.039	-0.331**	0.579	-0.104
	(0.204)	(0.165)	(0.357)	(0.687)
SDG 9	0.160	0.578***	0.270	-0.710
	(0.239)	(0.209)	(0.294)	(0.491)
SDG 10	-0.159	-0.062	-0.483*	-1.314***
	(0.320)	(0.246)	(0.281)	(0.384)
SDG 11	-0.562	-0.215	-0.846*	-0.364
	(0.394)	(0.296)	(0.463)	(0.596)
SDG 12	-0.266	0.115	0.103	-2.185**
	(0.258)	(0.183)	(0.352)	(0.832)
SDG 13	0.142	0.817*	0.217	
	(1.154)	(0.451)	(1.367)	
SDG 14	-0.598*	0.279	-0.261	
	(0.341)	(0.650)	(0.484)	
SDG 15	-1.759**	-0.646**		-0.598
	(0.741)	(0.287)		(0.571)
SDG 16				
SDG 17	-1.038*	-0.626	1.975	2.692***
	(0.533)	(0.430)	(1.411)	(0.837)
Control Variables				
Early Stage Dummy	0.957***	0.938***	1.539***	0.883*
	(0.268)	(0.211)	(0.384)	(0.462)
Later Stage Dummy	1.397***	1.095***	2.295***	2.311***
	(0.296)	(0.273)	(0.440)	(0.599)
Previously Raised (natural log)	0.061***	0.037***	0.049**	-0.005
	(0.016)	(0.012)	(0.020)	(0.032)
Company age (natural log)	-0.116	0.191	-0.159	0.214
	(0.211)	(0.185)	(0.269)	(0.374)
Economy Emerging Dummy			0.247	-0.075
			(0.311)	(0.482)
Economy Developed Dummy	0.669	0.793**	-0.731	-0.868
	(0.638)	(0.380)	(0.529)	(0.999)
Number of investors	0.168***	0.263***	0.026	0.381***
	(0.020)	(0.030)	(0.031)	(0.063)
Cross Border Dummy	0.289	0.353**	0.007	0.472
	(0.285)	(0.173)	(0.300)	(0.549)
Year Dummy Controls				
2018	1.094***	-0.214	-0.073	-0.729
	(0.377)	(0.373)	(0.396)	(0.861)
2019	0.707*	-0.076	-0.520	-1.019
	(0.383)	(0.388)	(0.535)	(0.946)
2020	0.919**	-0.253	-0.242	-1.957*
	(0.368)	(0.359)	(0.468)	(1.038)
2021	1.439***	0.132	0.290	-0.808
	(0.340)	(0.374)	(0.375)	(0.899)
Constant	11.765***	11.216***	12.738***	13.602***
	(0.712)	(0.590)	(0.623)	(1.222)
Observations	250	255	110	53
R2	0.512	0.490	0.519	0.784
Adjusted R2	0.455	0.417	0.368	0.599

Note: *p<0.1; **p<0.05; ***p<0.01

5 Discussion & Managerial Implications

Through multiple regression models, this research empirically examines the deployment of impact venture capital towards individual SDGs and their overarching pillars, guided by the objective to identify (geographical) patterns of impact capital flows.

Inspired by the results of Forestier and Kim (2020), the first hypothesis investigates if impact investors in developing and developed countries favour a particular SDG category. The hypothesis is grounded on the argument that developing countries prioritize solving people-related challenges next to achieving economic growth. In contrast, developed countries have the financial liberty to concentrate on environmental concerns, as hinted by Nanda (2016). The obtained results do not confirm this hypothesis. Only slight evidence suggests that impact investors in emerging economies might provide less funding to companies addressing goals within the people category. Therefore, it appears that private impact investors do not financially favour a particular SDG pillar but instead invest across planet, people, prosperity, and partnerships alike.

Regarding investments into specific SDGs, a recently published paper by Paetzold, Butz, Utz, and Kellers (2022) offers an insightful perspective on this study's findings. In their empirical analysis, the authors link capital allocations of private impact investors to preferences for specific SDGs and expected financial returns. By that, they find investor preferences are most substantial for SDGs that are associated with high financial returns. As they point out, examples of such economically-oriented goals are, among others, SDG 6, SDG 7, and SDG 9, in line with this research's hypotheses 2 and 3. Accordingly, based on higher expected financial returns of their initially invested capital, investors' allocations are higher for such goals compared to SDGs where no distinctive business opportunity can be identified. The importance of a venture's solid "business case" to determine the investment amount is also highlighted by Roundy, Holzauer & Dai (2017, p. 25).

In another study, Kollenda (2021) empirically confirms claims that magnified financial returns (one percent increase in the rate of return) significantly enhance both investment probability and funding amount of impact investors. Conversely, the expected social impact solely affects investors' perception without influencing the quantitative decision-making. Such findings suggest once again that expected financial returns may be of higher importance in determining the funding amount than the specific cause or impact served by the investment.

On the one hand, the scholars' findings are aligned with the results presented in this study, where *Model 3* shows significantly lower financing towards SDG 10 (Reduced

Inequalities) and SDG 15 (Life on Land), arguably goals with limited expected financial returns for investors. On the other hand, this study does not find sufficient support regarding a positive deal size influence of addressing SDG 7 (Affordable and Clean Energy) or SDG 9 (Industry, Innovation, and Infrastructure). A possible explanation could be that Paetzold et al. (2022) study the total capital allocation within impact investors' portfolios, which could potentially also consist of numerous small equity stakes in companies addressing goals with high expected financial returns. This research, on the contrary, focuses on individual deals instead of an overall investment portfolio.

An alternative explanation for missing support regarding the second hypothesis could be the data set's nature itself. As depicted in Figure 6, SDG 9 is present in 333 of the 695 observations. Specifically, target 9.4 contributes to the goal's applicability to a vast range of businesses by aspiring to "upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes" (United Nations, n.d.). The wide pertinence for deals of likely, all sizes might explain the regression's inability to conclude statistically significant higher investments.

Finally, the lack of significantly positive SDGs, leading to a rejection of the final two hypotheses, could be attributed to a misguided empirical framework. Although various studies point out the 17 goals' importance for impact investors (GIIN, 2020; Paetzold et al., 2022; Santamarta et al., 2021), other factors might be of higher prominence for investors in determining the invested amount of capital. Islam (2022) identifies several examples of such investment criteria by reviewing prominent impact investing literature. The criteria include, among others, the social entrepreneur's accountability and vision, the venture's commercial capabilities, and the investor's sectoral expertise. An overall compelling statistical significance of utilized control variables in this study and the low R-square of *Model 1* support the claim that additional factors beyond the SDGs might be of greater importance in determining the impact investment deal size. Therefore, it appears that the impact created by the venture, in this case through addressing the SDGs, influences the investor's decision to invest into the company in the first place, as also argued by Block, Hirschmann & Fisch (2021). The deal size itself, however, only seems to be influenced by the SDGs to a limited extent.

Nevertheless, this research clearly identifies two SDGs that obtain substantially lower investments on a global scale, namely SDG 10 and SDG 15 in *Model 3*. Scholars suggest that underfunded goals, receiving less attention from private investors, could be particularly interesting for blended finance projects, where public resources support a lack of private capital

flows towards specific causes (Barua, 2019; Paetzold et al., 2022). Based on the presented results, SDG 4 (Quality Education) could also be a suitable candidate for such initiatives, especially in Africa, where this particular goal seems considerably underfunded. Surprisingly, the education-focused SDG has not received a single investment in the observed five-year horizon, a partially alarming result, given the importance of education for the development of countries from the Global South. Governments and non-governmental organizations (NGOs) could compensate for such missing private sector interest and capital flows to accelerate global development through blended finance.

At least in the African subset, investments into SDG 17 (Partnerships for the Goals) offer encouraging results. Generally, the goal aims to facilitate FDI, knowledge, and technology transfers towards low- and middle-income countries and "enhance North-South, South-South, and triangular regional and international cooperation" (United Nations, n.d.). It is a positive signal to witness – presumably foreign – investors supplying high private investments into bridging the North-South gap through science and technology. However, investments into SDG 17 require careful execution and frequently imply private-public governance and accountability challenges (Türkelli, 2021).

How can managers benefit from the findings?

The discussed findings offer practical relevance among at least three distinct managerial groups. Firstly, impact investors can utilize them as a guideline to identify possible SDG segments that are underfunded and, thus, potentially enter under-priced impact segments. As a result, they could achieve additionality effects, where *additional* impact is created that would not have been attained without that specific investment (Paetzold, 2022). Furthermore, investing in under-priced segments might lead to the investor's ability to acquire a higher equity stake in the venture through the same amount of capital, ultimately increasing control power (Kirilenko, 2001). Targeting SDG 11 (Sustainable Cities and Communities) in Asia or SDG 12 (Responsible Consumption and Production) in Africa could be examples for such opportunities, as depicted in *Model 9* and *10*. Similarly, goals that generally attract high funding in a broader territory, for example SDG 9 (Industry, Innovation and Infrastructure) or SDG 13 (Climate Action) in Europe, could be targeted in specific European countries where those goals have not received high investments yet. Interestingly, this study is not able to find support for a globally positive influence of SDG 7 (Affordable and Clean Energy) or SDG 9 (Industry, Innovation and Infrastructure) on the deal size. Such unexpected results might offer

a possibility for reflection among impact investors if such goals, associated with elevated financial returns on investment, should be offered higher financing than presently.

Secondly, social entrepreneurs can benefit, similar to investors, by identifying underfunded opportunities to create meaningful impact. Based on the results, possibilities include tackling SDG 2 (Zero Hunger) in Asia, a goal also covering sustainable agriculture, or SDG 10 (Reduced Inequalities) in both Asia or Africa. By addressing such financially overlooked segments, entrepreneurs could potentially increase investor attention. That strategy could further be enhanced by combining SDGs with little investor attentiveness to create even more impact on local communities, for instance addressing both SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities) in Africa through a joint business model. Moreover, it might be more effective to conduct fundraising in countries that already indicate elevated investor attention for a specific goal. Concretely, a South American start-up, focused on climate action, could seek out European capital, where this particular goal (SDG 13) has already demonstrated substantial investor appetite. In the same vein, the control variable cross-border investments could offer valuable insights for founders, to determine where foreign investment leads to higher deal sizes and direct their fundraising efforts towards those regions.

Thirdly, policymakers can use this study to launch blended finance initiatives where a lack of private capital, for instance regarding goals with lower expected returns, is supplemented with public resources (Barua, 2019; Paetzold, 2022). In addition to such projects, other incentives can be created to make investments into specific SDGs more attractive in a certain region, for example SDG 15 (Life on Land) in North America or Europe. This could involve lowering entry-barriers for foreign impact venture capital investors. Lastly, the findings prove that investor syndication increases the deal size in almost every model. This research may trigger a dialogue on possible governmental incentives, for example tax advantages, to foster (international) investor collaboration on impact deals.

Overall, managers can use the insights from this study to reflect on past capital allocations of impact venture capital across several geographies to optimize future decision-making and achieve effective capital allocation.

6 Conclusion

Since 2015, the SDGs shape global development through a collection of 17 multidisciplinary and interrelated goals. Despite progress in some dimensions, financing demonstrates to be a main challenge in the achievement with an estimated annual funding gap of $2.5 trillion (Barua, 2019). While several papers highlight the potential of impact investing as a partial contribution to goal achievement (Suehrer, 2019; Santamarta et al., 2021), this study empirically sheds light on past capital allocations of impact venture capital towards the SDG Agenda. In particular, the effect of individual SDGs on the deal size of impact venture capital investments is examined and contextualized geographically.

For that, impact deals of the past five years are collected from the leading commercial database PitchBook, and the ventures are manually matched with their corresponding SDGs. Ten multiple regression models analyse the sample through the lens of three hypotheses, derived from the literature.

The models yield ambiguous results. Despite some support in individual subsets, no sufficient evidence can be established to support any of the hypotheses with adequate confidence. Consequently, none of the overarching SDG pillars (planet, people, prosperity & partnerships) seems to attract higher capital allocations in either developing or developed countries. Further, neither SDG 7 (Affordable and Clean Energy), nor SDG 9 (Industry, Infrastructure and Innovation) positively influence the funding amount on a global scale, as it had initially been hypothesized. In spite of a lack of proof regarding a positive effect towards expected SDGs, several of the goals indicate significantly *lower* investor appetite. On a global scale, those include SDG 10 (Reduced Inequalities) and SDG 15 (Life on Land). However, especially in some distinctly analysed geographies, additional significant results can be observed. Such insights identify attractive financing opportunities for impact investors globally as well as the possibility for policymakers to supplement a lack of private capital through blended finance initiatives.

Although the researcher is committed to applying a rigorous research approach, the study is subject to several limitations regarding methodology, results and subsequent interpretation. Firstly, the data set itself is subject to a number of considerations. For instance, the sample might contain outliers or false observations not identified throughout the conducted random checks. Furthermore, the observations in the dataset are relatively balanced in North America and Europe. It is, therefore, possible that impact deals from developing countries are only partially present in PitchBook's database due to the venture's size, the investor's

prominence, or merely incomplete regional financial market coverage. Another complication in the data collection process is the manual matching between the ventures and the respective SDGs which are addressed through their business operations. Although the manual method is unavoidable because a similar study, from which insights could be utilized, has never been conducted, it poses the risk of mismatched or undiscovered SDGs within the scope of the venture. The researcher attempts to mitigate this risk by applying a strict matching methodology based on the SDG targets and indicators. Yet, a certain degree of pragmatism in the matching process cannot be prevented. As a further complication, the firms could misreport details regarding their true social or environmental impact, leading to potential SDG-washing in the dataset (Redman, 2018) and a biased SDG allocation by the researcher.

Secondly, it is important to note that this dataset is limited to investments on the intensive margin, where only observations with a successfully closed investment round are included. Also considering investments on the extensive margin, where investors choose to engage in the investment in the first place, might alter the obtained results, as argued by Kollenda (2022). This focus on successful projects only should therefore be kept in mind when interpreting the results.

Thirdly, as suggested by prominent venture capital literature, a vast number of control variables regarding firm-, industry- or country-specific factors is taken into consideration. Despite including a diverse set of 10 control variables in the models, achieving a comparably high R-square value, the possibility of uncaptured external effects remains, commonly known as omitted variable bias (Wooldridge, 2015). Consequently, only when sufficient other determinants can be held fixed (*ceteris paribus*), causal inference of respective SDGs on higher funding amounts can successfully be concluded (Wooldridge, 2015). As this study focuses on private companies, several potential control variables were not publicly available to a sufficient extent, for example, the firms' revenues, net income, or ownership structure.

Lastly, it should be noted that this study solely focuses on the dependent variable deal size to identify individual funding patterns. As addressed in the *Discussion*, the absolute funding amount into specific SDGs may vary largely, as particular goals, for example SDG 9, are present in a vast number of observations. This should be kept in mind when concluding potential over/underfunding from the results.

Various alleys for future research arise from the findings of this study. It would be interesting to widen the scope and include deals in the private equity or public market landscape to facilitate a comparison between the investor appetite towards specific SDGs across multiple asset classes. Furthermore, this study only places the ventures themselves into a geographic

context, while controlling for the possibility of cross-border investments. Upcoming papers could dive deeper into the investor locations and how SDG preferences and fundings sizes differ among impact investors from different geographies. Ultimately, as the ambiguous results indicate, the SDGs addressed by the venture may only partially explain how the deal size is derived. Qualitative insights in the form of interviews, similar to the approach of Paetzold et al. (2022), may be useful to understand the underlying investment decision-making process of investors when evaluating impact opportunities.

In summary, this study contributes to the nascent field of impact investing literature under the broader sustainable finance umbrella. Thereby, it empirically highlights investor preferences and capital flows into specific SDG segments. Understanding patterns of the past can help to drive future decision-making and achieve effective capital allocation, ultimately leading to genuine impact creation towards the achievement of the SDGs.

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Appendix

Appendix A: Variable Overview

Table 7: Variable overview

Variable name	***Variable name coded***	***Source***
Deal size (natural log)	*deal_size_log*	*PitchBook*
SDG 1 – 17 (SDG 1 omitted)	*sdg_1 etc.*	*Manual matching*
Planet	*planet*	*Manual matching*
People	*people*	*Manual matching*
Prosperity	*prosperity*	*Manual matching*
Partnerships (omitted)	*partnerships*	*Manual matching*
Company Country	*company_country*	*PitchBook*
Company Continent	*company_continent*	*Manual allocation in Excel*
Seed Dummy (omitted)	*seed*	*PitchBook*
Early Stage Dummy	*early_stage*	*PitchBook*
Later Stage Dummy	*later_stage*	*PitchBook*
Previously raised (natural log)	*previously_raised_log*	*PitchBook, manipulated in Excel*
Company age (natural log)	*company_age_log*	*PitchBook, manipulated in Excel*
Developing Economy (omitted)	*developing*	*IMF Fiscal Monitor*
Emerging Economy	*emerging*	*IMF Fiscal Monitor*
Developed Economy	*developed*	*IMF Fiscal Monitor*
Number of Investors	*number_investors*	*PitchBook*
Cross Border Dummy	*cross_border*	*PitchBook, manual research*
2017 Dummy (omitted)	*2017*	*PitchBook*
2018 Dummy	*2018*	*PitchBook*
2019 Dummy	*2019*	*PitchBook*
2020 Dummy	*2020*	*PitchBook*
2021 Dummy	*2021*	*PitchBook*
Industry B2B Dummy (omitted)	*industry_b2b*	*PitchBook*
Industry B2C Dummy	*industry_b2c*	*PitchBook*
Industry Energy Dummy	*industry_energy*	*PitchBook*
Industry Materials & Resources	*industry_materials_resources*	*PitchBook*
Industry Financial Services	*industry_financial_services*	*PitchBook*
Industry Healthcare	*industry_healthcare*	*PitchBook*
Industry Information Technology	*industry_information_technology*	*PitchBook*

Appendix B: VIF Tests

Figure 7: VIF test model 1

sdg_2	sdg_3	sdg_4	sdg_5	sdg_6	sdg_7	sdg_8	sdg_9	sdg_10	sdg_11	sdg_12	sdg_13	sdg_14
1.164977	1.538745	1.243674	1.044313	1.089148	1.359782	1.357937	1.552863	1.254896	1.130980	1.451247	1.124217	1.043592
sdg_15	sdg_17											
1.059563	1.084374											

Figure 8: VIF test model 2

early_stage	later_stage	previously_raised_log
1.545106	2.594800	1.333191
company_age_log	emerging	developed
2.041412	3.155799	3.515922
number_investors	cross_border	year_2018
1.129033	1.234300	2.409091
year_2019	year_2020	year_2021
2.277199	2.764856	2.973532
industry_b2c	industry_energy	industry_materials_resources
1.731626	1.487415	1.333686
industry_financial_services	industry_healthcare	industry_information_technology
1.457408	1.491715	1.795445

Figure 9: VIF test model 3

sdg_2	sdg_3	sdg_4
1.295829	3.498118	1.358095
sdg_5	sdg_6	sdg_7
1.080824	1.160996	2.406392
sdg_8	sdg_9	sdg_10
1.491603	1.699530	1.540054
sdg_11	sdg_12	sdg_13
1.216831	1.686806	1.192970
sdg_14	sdg_15	sdg_17
1.086138	1.102556	1.111714
early_stage	later_stage	previously_raised_log
1.576465	2.663737	1.386139
company_age_log	number_investors	emerging
2.125643	1.196420	3.339613
developed	cross_border	year_2018
3.987600	1.284320	2.437924
year_2019	year_2020	year_2021
2.308145	2.824791	3.058449
industry_b2c	industry_energy	industry_materials_resources
2.096457	2.475783	1.528394
industry_financial_services	industry_healthcare	industry_information_technology
1.709511	3.896264	2.115229

Figure 10: VIF test model 4

planet	people	prosperity
2.628490	1.564918	2.720417
early_stage	later_stage	previously_raised_log
2.287318	4.265162	1.887536
company_age_log	number_investors	cross_border
2.509131	1.811929	1.229152
year_2018	year_2019	year_2020
4.296635	5.010735	6.176373
year_2021	industry_b2c	industry_energy
6.327503	3.655056	3.785317
industry_materials_resources	industry_financial_services	industry_healthcare
3.017227	2.739342	3.609667
industry_information_technology		
3.149605		

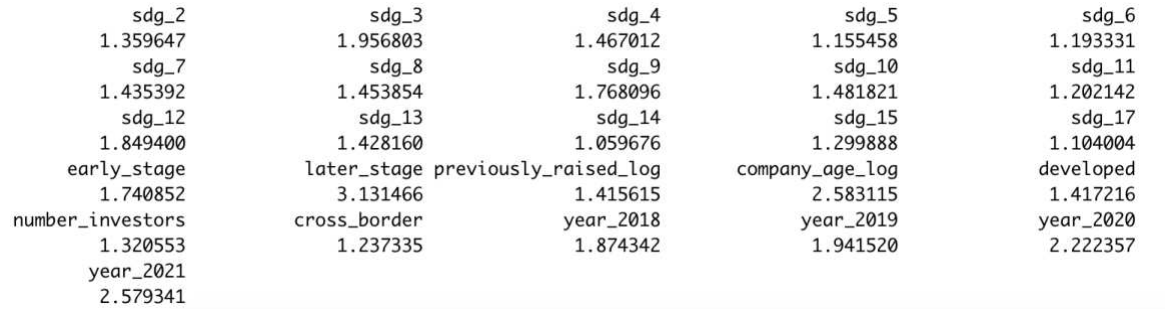
Figure 11: VIF test model 5

planet	people	prosperity
1.787539	1.334099	1.739939
early_stage	later_stage	previously_raised_log
1.744711	3.067699	1.618517
company_age_log	number_investors	cross_border
2.286589	1.285258	1.127945
year_2018	year_2019	year_2020
2.501744	1.970757	2.775459
year_2021	industry_b2c	industry_energy
2.682168	2.349510	1.507468
industry_materials_resources	industry_financial_services	industry_healthcare
1.294560	2.606194	2.133678
industry_information_technology		
2.776581		

Figure 12: VIF test model 6

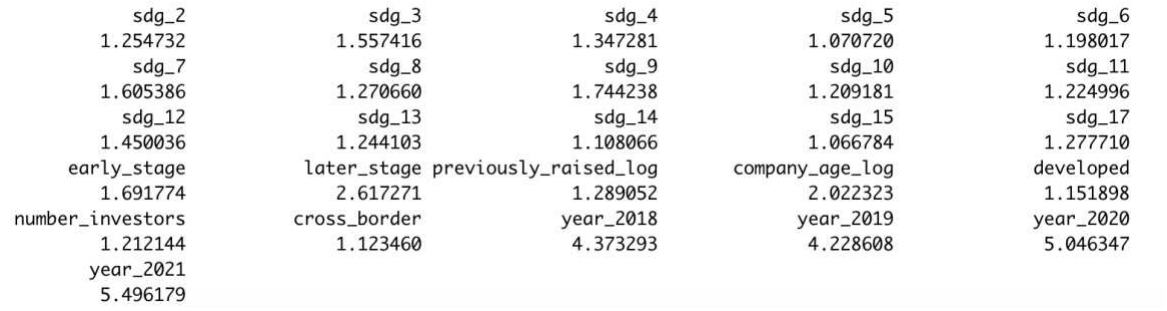
planet	people	prosperity
1.708351	1.377080	1.586925
early_stage	later_stage	previously_raised_log
1.596916	2.695099	1.339538
company_age_log	number_investors	cross_border
2.133726	1.150226	1.042915
year_2018	year_2019	year_2020
2.457697	2.458069	2.877179
year_2021	industry_b2c	industry_energy
3.205873	1.895629	1.556836
industry_materials_resources	industry_financial_services	industry_healthcare
1.385007	1.196985	2.261274
industry_information_technology		
1.789601		

Figure 13: VIF test model 7



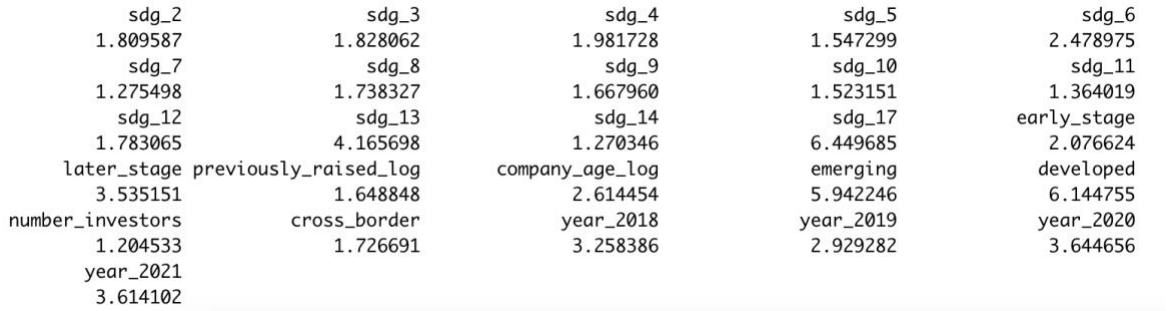
sdg_2	sdg_3	sdg_4	sdg_5	sdg_6
1.359647	1.956803	1.467012	1.155458	1.193331
sdg_7	sdg_8	sdg_9	sdg_10	sdg_11
1.435392	1.453854	1.768096	1.481821	1.202142
sdg_12	sdg_13	sdg_14	sdg_15	sdg_17
1.849400	1.428160	1.059676	1.299888	1.104004
early_stage	later_stage	previously_raised_log	company_age_log	developed
1.740852	3.131466	1.415615	2.583115	1.417216
number_investors	cross_border	year_2018	year_2019	year_2020
1.320553	1.237335	1.874342	1.941520	2.222357
year_2021				
2.579341				

Figure 14: VIF test model 8



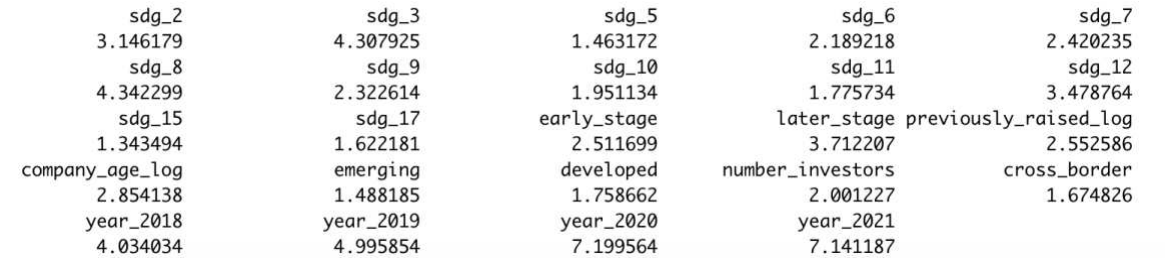
sdg_2	sdg_3	sdg_4	sdg_5	sdg_6
1.254732	1.557416	1.347281	1.070720	1.198017
sdg_7	sdg_8	sdg_9	sdg_10	sdg_11
1.605386	1.270660	1.744238	1.209181	1.224996
sdg_12	sdg_13	sdg_14	sdg_15	sdg_17
1.450036	1.244103	1.108066	1.066784	1.277710
early_stage	later_stage	previously_raised_log	company_age_log	developed
1.691774	2.617271	1.289052	2.022323	1.151898
number_investors	cross_border	year_2018	year_2019	year_2020
1.212144	1.123460	4.373293	4.228608	5.046347
year_2021				
5.496179				

Figure 15: VIF test model 9



sdg_2	sdg_3	sdg_4	sdg_5	sdg_6
1.809587	1.828062	1.981728	1.547299	2.478975
sdg_7	sdg_8	sdg_9	sdg_10	sdg_11
1.275498	1.738327	1.667960	1.523151	1.364019
sdg_12	sdg_13	sdg_14	sdg_17	early_stage
1.783065	4.165698	1.270346	6.449685	2.076624
later_stage	previously_raised_log	company_age_log	emerging	developed
3.535151	1.648848	2.614454	5.942246	6.144755
number_investors	cross_border	year_2018	year_2019	year_2020
1.204533	1.726691	3.258386	2.929282	3.644656
year_2021				
3.614102				

Figure 16: VIF test model 10



sdg_2	sdg_3	sdg_5	sdg_6	sdg_7
3.146179	4.307925	1.463172	2.189218	2.420235
sdg_8	sdg_9	sdg_10	sdg_11	sdg_12
4.342299	2.322614	1.951134	1.775734	3.478764
sdg_15	sdg_17	early_stage	later_stage	previously_raised_log
1.343494	1.622181	2.511699	3.712207	2.552586
company_age_log	emerging	developed	number_investors	cross_border
2.854138	1.488185	1.758662	2.001227	1.674826
year_2018	year_2019	year_2020	year_2021	
4.034034	4.995854	7.199564	7.141187	

Appendix C: Breusch-Pagan Test

Figure 17: Breusch-Pagan test result model 3

BP = 59.495, df = 33, p-value = 0.003147

Note: Due to the detected heteroskedasticity in Model 3, all discussed models are precautionally presented with robust standard errors.