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目　次

巻頭言

特集：「Real Options in Global Perspectives」

査読論文

<Prefatory Note>

In Pursuit of Wisdom for Sustainability

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I was part of the group that founded the Japan Association of Real Options and Strategy (JAROS) in 2006. During the phenomenal era of Japanese economic growth in the 1990s, our financial circles matured tremendously and recognized the sophisticated technologies of derivative assets. We were particularly attracted to the options that are now present in almost every risk-hedging arrangement. We believed that the principles underlying such financial instruments could be applied to assess risk and value involving real or tangible assets such as real estate, investment projects, and even corporate assets. Real options analysis essentially addresses the valuation of business opportunities that harbor uncertain and risky outcomes. Risk and uncertainty present a challenge to all human endeavors, especially when it comes to investment, a basic human activity that involves deferring the pleasure of today for the potential security and benefits of tomorrow. We have called for the positive valuation of the choices that may arise as an enterprise evolves, instead of being held back by opacity.

Our association has been fortunate enough to be supported by corporate members of good standing and repute. Starting in 2016, the "Innovation and Strategy for Value" study group has held monthly seminars in which top executives from various sectors gave an in-depth talk on their corporate experiences and strategic outlooks for their future direction. Articles outlining these valuable discussions are documented in this journal.

Looking back at the past 15 eventful and turbulent years, the sub-prime crisis precipitated by the fall of Lehman Brothers in 2008 stood out as one of the most damaging incidents to the world economy. The East Japan Earthquake and the subsequent nuclear accident in 2011 not only devastated Japan but also prompted serious soul-searching regarding our nation's energy security. The COVID-19 catastrophe is also another stark reminder of how vulnerable and helpless we are to viral infections. Combined, these calamitous developments have clearly shown us that society and humanity are severely threatened by systemic risks that any individual, corporation, or country cannot hope to cope with alone. Today, the most uncertain issue we confront is whether mankind can overcome such systemic and global crises.

The problems we face, including poverty, inequality, climate change, and environmental failure, are an adverse legacy of the 20th century capitalistic, market-based economics. Even though we owe our prosperity today to this paradigm, we must still be held accountable for the problems and threats it has left behind. It is thus encouraging that the world is now in the process of redressing the pitfalls of old capitalism. For example, the recent call for environmental, social, and governance (ESG) is a promising initiative for companies to be examined not just by their financial performance, but also their sustainability measures such as emissions, water, and energy consumption. With sustainability becoming an increasingly important aspect for investors, the worldwide campaign for Sustainable Development Goals (SDGs) will hopefully gather enough momentum to end poverty, address inequality, and save our planet.

I believe our original aspiration for wisdom to create value is still valid, with the added caveat of now being aligned with the on-going effort to make our planet more sustainable.

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Real Options and the Design of Global Public Policy Interventions

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Abstract: Global public policy is an unexplored, but very promising area for the application of real options. Global public policy interventions could be valued through the use of real options, like an investment. This assessment could be deployed strategically such as in case of making interventions more attractive for the potential participants or to pre-assess the effectiveness of different policy measures. These possibilities have been already recognized and accepted in the literature of public policy, but not very well-known to the field of global public policy. In this paper it is demonstrated why real options is very suitable for global public policy and this is demonstrated on the basis of three specific domains: global warming, migration and privacy.

Keywords：global public policy; global public policy networks; real options; strategy

1. Introduction

One crucial aspect of new global governance structures is the ascendancy of economic modes of thinking within the policy process (Kennett, 2008). An example of this investment thinking is the widespread embrace of cost-benefit analysis (CBA) as decision making tool in policy. CBA is the practical use of welfare economics to assess potential projects (Rosen and Gayer, 2010). This tool compares the costs and benefits of global public policy projects and projects where the benefits exceed the costs should be carried out. In practice, CBA is mainly performed by using net present value (NPV) and internal rate of return (IRR). Global organizations such as the World Bank used to heavily rely on traditional valuation approaches, such as the NPV, for the evaluation of investment decisions (IEG World Bank, 2010). However, nowadays the World Bank is reconsidering the policy towards the traditional cost and benefit analysis and seeking for alternatives. Traditional models, such as NPV and IRR do not capture the value of flexibility to adapt and revise future investment decisions to respond to this uncertainty. In contrast, Real Options Analysis (ROA) acknowledges the fact that many projects contain embedded options and provides adequate tooling to incorporate and correctly value these options.

It is not surprising that there is a lot of literature available on the application of real options to public policy (e.g. Chen et al., 2012). However, it is surprising to a certain extent that there is little literature available on the combination of real options and global public policy (GPP). Public policy can be defined as purposive action that is ostensibly in the public interest and has been legitimated by governments or quasi-governmental organizations (Farazmand, 2018). This refers to domestic policy that attempts to achieve public goals, such as safety, health and social protection. At global level policy relates to issues that transcend national borders, such as climate change, trade, terrorism, financial markets and human development. Even more than within public policy, there is a high uncertainty within the global arena. The complexity increases, there are more factors and actors that have to be dealt with and there is less enforceability present. The aforementioned factors are referring to some differences between public and global. Consequently, even more than on public policy, real options is a powerful tool for global public policy interventions.

In this paper, we will further elaborate on this idea. It is demonstrated how real options are used on the field of public policy and how real options valuation could be deployed with regards to global public policy making. It is shown that the use of real options is particularly promising for strategic matters. This is illustrated on the basis of the topics privacy, migration and global warming, while the modelling itself is subject to future research. The rationale behind this is to first conceptualize the idea without drowning into the technical details, as has often happened before, which could deter potential users from using real options. This is based on the fact that practitioners often find it difficult to understand and implement real options due to the complex mathematics involved (He, 2007). Section 2 describes public policy instruments and in section 3 it is illustrated how real options is applied to commonly used public-private partnerships. Section 4 shows the difference between public policy and global public policy and section 5 explores the applications for policy makers on the fields of global warming, migration and privacy. Section 6 provides some concluding remarks.

2. Public Policy Instruments

From an economic point of view, market failure is the most important justification for public policy interventions (Dollery and Worthington, 1996). Bator (1958) describes market failure as the failure of the price-market system ‘to sustain "desirable" activities or to estop "undesirable" activities’ (p. 351), where activity is referring to all consumption and production and the ‘desirability’ of an activity is determined by its relative share in solving a maximum-welfare problem. An important case of market failure are externalities with global warming as a standard example. We speak of externalities when there is a discrepancy between private and social costs and/or between private and social benefits (Kennett, 2008).

Policy makers have two types of instruments at their disposal: economic instruments and command-and-control instruments (Hepburn, 2006). Economic instruments consist of price-based instruments, such as taxes and subsidies, and quantity-based instruments, such as cap-and-trade. Command-and-control instruments focus on the enforcement of compliance of firms or individuals to certain standards, such as environmental standards. High-quality information, such as on the consequences for firms and individuals, is needed for command-and-control instruments. In case this information is missing, it would be better for a policy maker to leave the determination of the equilibrium to the market forces and monitor the price by using economic instruments.

The way in which some of these public policy instruments are implemented, and then in particular on the field of public infrastructure, is more and more through public-private partnerships (PPP) (Osei-Kyei and Chan, 2015). Within a PPP, public and private sectors are working together on large-scale projects (Chen et al., 2012). A key characteristic of PPP is the risk allocation and risk sharing (Osei-Kyei and Chan, 2015). The starting point here is that the party who is best capable of managing risks is also going to bear them (Shan et al., 2010). However, there are enough problems with PPPs (Chen et al., 2012). PPP projects often have a long duration, which is accompanied by a lot of uncertainty. Poor risk management and unrealistic projections often lead to the failure of PPP projects. In addition, the management of PPPs are hampered, because PPP arrangements can contain either explicit contractual options or implicit options not stated in the contract (Krüger, 2012).

3. Using Real Options for Public-Private Partnerships

In situations where there is a lot of uncertainties and a lot of operational flexibility present, such as in the context of PPPs, real option analysis is a very suitable tool (e.g. Brach, 2003; Copeland and Antikarov, 2000). Real options analysis is a valuation method that is based on financial option theory. Real options approach acknowledges the fact that many projects contain embedded options and provides adequate tooling to incorporate and correctly value these options (Dixit and Pindyck, 1994; Peters, 2016). There is a problem with traditional valuation approaches, such as in the case of Net Present Value. These methods do not consider the options in the decision-making process, and therefore underestimate flexibility of projects. They assume that the results of these projects are static and that decisions of these projects are irreversible. In contrast to the traditional valuation approaches, real options analysis does capture the value of managerial flexibility to adapt and revise decisions in response to unexpected market decisions (Trigeorgis, 1996). And therefore real options analysis maximizes potential gains and minimizes downside losses.

In the literature, ROA is often used to value PPPs (e.g. Alonso-Code et al., 2007; Brandao and Saraiva, 2008; Shan et al., 2010). Incentives, such as guarantees and subsides, that are used in PPPs could be interpreted as options (Chen et al., 2012; Cheah and Liu, 2006). ROA provides a way of modeling the flexibility-type incentives for PPP projects and is able to optimize the functionality of the incentives. Furthermore, the context of PPP proves to be suitable for the use of ROA, because of the high uncertainty, the complexity, the different stages together with their related risks and the interdependence of the variables (Alonso-Conde et al., 2007).

A real option gives the right, but not the obligation, to buy (call-option) or sell (put-option) the real underlying asset (stock) at an agreed price (strike price or exercise price) during a specific period or at a predetermined expiration date. As an example Cheah and Liu (2006) explain that a minimum revenue guarantee effectively is a put option and that a revenue cap could be regarded as a call option. Chen et al (2012) provide an overview on the use of different type of options. In case of PPP, primarily combinations of simple call and simple put options are

used. For example, Shan et al. (2010) use collar options. In case of a collar option the concessionaire buys a floor (a put option) from the underwriter to receive the protection against revenue below the floor, and simultaneously sells a cap (a call option) to the underwriter to defray the cost of the floor.

Alongside the valuation of PPP, real options are also useful regarding the design of the PPP incentive itself. By employing real options strategically, the design of PPPs could be significantly improved (Chen et al., 2012). Different (combinations of) incentives could be valued with the use of real options, and the (combination of) incentives that results in the highest value proves to be the best PPP arrangement. We will notice that this strategic function becomes more and more important as soon as we make the transition from public policy within a nation state to public policy at a global level.

4. Going Global

Reinicke (1997) describes globalization as 'the integration of a cross-national dimension into the very nature of the organizational structure and strategic behavior of individual companies' (p. 127). This micro-economic process will go well beyond just the interdependence of sovereign states at macro-economic level and, among other things, means that certain policy problems will have to be solved at global level (Farazmand, 2018). The crucial difference between policy at nation state level and at global level is the lack of an authority (Detomasi, 2007), i.e. there is only 'soft law' (Stone, 2008). There is no global sovereign that has both the authority and the means to enforce policy compliance. This means a changing role for the policy maker, where the policy arena consists of an increasing number of terrains and actors. In addition, the boundaries between public and private spheres are less precise and there is the transition from government to governance (Kennett, 2008). Governance refers to a way to make policies and to exercise power. This could be performed by a government, but could also be done by multiple parties. Therefore, governance has a much wider application than in case of governments. Globalisation leads to a situation where governments no longer have the full power, but where governance is shared among multiple parties.

We could notice that uncertainty is increasing due to globalization. At global level, policy makers do not have the same power as in the nation state, since the internal sovereignty is missing (Reinicke, 1997). Therefore, the success of global public policy is dependent upon compliance and good international citizenship (Stone, 2008). However, it is expected that 'interests and concerns will vary and cooperation will not be easy to achieve due in part to differences in policy priorities and other preferences—perhaps often simply due to lack of information and mutual understanding and trust' (Kaul et al. (2003), p.15). Furthermore, global public policy making could take a long time, sometimes several decades (Soroos, 1986). In summary, processes within global public policy demonstrate a high level of complexity, contingency and ambiguity (Farazmand, 2018).

At the same time the extent of flexibility changes as well. Due to the fact that policy makers have to seek cooperation with people, governments, companies and nongovernment organizations across and between local, national, and international levels, other actors are given more flexibility by policy makers within the policy instruments. Participation in policy instruments could be stimulated by providing different options to participants, such as the freedom to start or exit a project whenever they feel is necessary. For this reason, the flexibility of policy makers is reduced, while the flexibility of other actors increases.

Through Global Public Policy Networks (GPPNs), policy makers have found a way to deal with global public policy problems that are characterized by the global scope, speed and multidisciplinarity (Reinicke, 1999). Streck (2002) describes GPPNs 'as multisectoral partnerships linking different sectors and levels of governance and bringing together governments, international organizations, corporations, and civil society' (p. 3). Their particular strength is inclusiveness (Detomasi, 2007) and three different types of networks are distinguished: negotiation networks, coordination networks, implementation networks (Benner et al., 2002). An example of a GPPN is the Clean Development Mechanism (CDM) (Streck, 2002). CDM is one of the three market-based instruments under the Kyoto protocol that came into effect in 2005. CDM is a mechanism that should act as a carrot to incentivize developing countries to invest in climate mitigation projects. This market-based offset mechanism enables industrial countries, in addition to the emission reductions in their own country, to reduce the emission of CO_2 by investing in sustainable projects in developing countries.

Globalization and participation in GPPNs also has consequences for public administrators. Since the role of the state is transforming from a welfare state to a corporate

state (Farazmand, 1999) and because more and more cooperation is required with international businesses, investment thinking becomes more and more important (Kaul and Conceicao, 2006). Investment thinking is not only necessary to speak the language of the corporate sector, but also to convince them to participate in GPPNs. Therefore, an attractive and reliable financial picture is of vital importance.

The motivations of the use of real options with regard to PPPs could be extrapolated to GPPNs. ROA is very useful to provide justification for investments under high uncertainty and high flexibility and therefore very suitable for the valuation of participation in GPPNs. In case of GPPNs, the strategic use of real options is of vital importance. With the use of ROA, different flexibilities of policy instruments are valued under high uncertainty. Accurate valuations result in more reliable predictions of the financial impact for companies and governments, which reduces the barrier to participate in GPPNs.

However, ROA is little applied to global public policy interventions. For example, CDM has been a subject of interest to ROA scholars (e.g. Lee et al., 2013), but is treated as a regular investment without providing attention to the global aspect of CDM. This could be due to the fact that GPP processes can be highly abstract and vague (Soroos, 1986) and investment valuations are only becoming relevant as soon as policies become clearer. Initially, ROA seems to do well with implementation networks, and to a lesser extent in case of negotiation networks or coordination networks.

However, it is clear that many global public policy mechanisms consist of different phases. And indeed, these mechanisms provide participants the possibility to make their own decisions regarding when to enter or to exit the project. The Brucellosis Vaccine Prize a $30 million financial instrument with the objective to incentivize animal health companies to develop a vaccine against *Brucella melitensis*. The Brucellosis Vaccine Prize has a multistage character and a company has the possibility to start at different phase of vaccine development, therefore the pharmaceutical company has the flexibility to obtain an optimal result[1]. Some companies that already have a vaccine on the shelf could possibly start at another phase in comparison to companies who have not developed a vaccine yet. Other companies might even skip an intermediate stage, because they do not want to show what they have done so far, and compete only for the Final Prize. Because of this sequential design, a sequential option, such as in case of a compound option, is a suitable option with respect to GPP interventions. A second feature that is observed in case of GPP interventions is the competition-element for which there are also specific real options models present, which for example make use of game theory (Azevedo and Paxson, 2014). An example of a competition element concerning a GPP intervention mechanism is the Brucellosis Vaccine Prize competition where companies compete for obtaining a prize when they have successfully delivered a vaccine that meets the requirements of the competition. The more companies participate in the competition, the less likely it is to be eligible for winning a prize. However, at the same time more competitors increase the probability of finding a working vaccine.

5. Exploring three applications of ROA to GPP

In this paper we would like to explore GPP as a new application for real options. However, we do not want to experience the same pitfalls as has been encountered before with the use of real options. There are several criticisms on real options (Peters, 2016). The first criticism on real option analysis comes from practitioners who often find real options difficult to understand and to implement due to the complex mathematics involved. Managers simply feel confused by implementing a method they perceive as a black box, and why should they use tools they do not fully understand? Related criticism arises from the fact that ROA is a heuristic based on the logic of financial options. The assumptions that are applicable to financial option valuation do not necessarily apply to real options. A consequence of this is that these models tend to reflect perfection rather than economic reality (Triantis, 2005), which creates a gap between theory and practice. Sanders et al. (2013) argues for example that even though a deferral option is a preferred solution in theory, in practice this is not always the case, taking in account projects where investors need to compete in order to obtain a project, such as a tender. The wait-and-see approach might not be the most optimal solution, since timing is crucial in these kinds of situations. In these situations there is not always time to wait, because a competitor might act faster and in that case the opportunity of obtaining a profitable project might be

1 https://brucellosisvaccine.org/assets/Uploads/1Brucellosis-Competition-Rules-18Nov16-0020.pdf

lost. Furthermore, gathering information could require such a huge investment that doesn't add any value to gather more information again.

Since we would like to explore a new field of application for real options, and at the same time do not want to increase the gap between theory and practice, an illustration regarding the added value of real options is provided on the basis of three applications. We avoid the use of complex mathematical models, but instead provide an indication on how real options could be applied on the field of GPP. In this manner, we attempt to elaborate the application of real options to GPP interventions without scaring practitioners away or losing credibility by making unrealistic assumptions. Furthermore, on the field of GPP, we often have to deal with the lack of reliable and integral sources of competitive information. Instead of worrying about data as input for complicated real options models, we explore the possibilities of application of real options to GPP.

5.1 Global warming

Global warming is a textbook example of a global public bad (Arrow, 2007). Emissions of CO_2 and other trace gases almost irreversible. Emissions today also have implications for humanity in the distant future. Also, the scale of the externality is truly global. This means that nation-states are limited in their individual power and international cooperation is needed.

In 1997 the Kyoto Protocol was adopted, where 37 industrialized countries and the European Community committed themselves to reducing emissions of carbon dioxide and other greenhouse gases. A number of possible instruments have been considered and many of them have been discarded (Molle, 2013). Regulation was considered as politically infeasible and taxation wasn't an option for countries as they are unwilling to give up their sovereignty in matters of taxation. In the end, it was decided to use market type instruments, compromising the setting of maximum pollution levels and the trading of emission rights. The Clean Development Mechanism (CDM) is one of the three flexible mechanisms of the Kyoto Protocol that allows global public-private networks to develop, execute, finance, and supervise projects (Streck, 2002). This market-based offset mechanism allows developing countries to earn certified emission reduction (CER) credits, each equivalent to one ton of CO_2, by investing in voluntary emission reduction projects. These CERs can be traded and sold to industrialized countries to offset their emission reduction targets under the Kyoto Protocol. Since the end of 2012, Clean Development Mechanism market is not performing as was expected. After remaining around €10 –15 per metric ton for most of 2009, 2010, and the first half of 2011, CDM prices fell steadily to less than €1 in November and December 2012. (Newell et al., 2013).

The project cycle of a CDM project from project design to CER issuance can be broken down into five main steps. As a consequence, we can identify the CDM project cycle as a sequential, multi-staged project, in which, at each stage, a cost is paid to enter the stage, and the successful completion of one stage (which is not guaranteed) provides the investor with the opportunity to move to the next stage, again at a particular cost. Only successful completion of the final stage will provide the investor with an uncertain stream of future revenues, depending on the CER market price at that moment. This multi-staged process can be characterized as a compound options, i.e. a chain of options on options. Starting a CDM project provides a compound option on generating CER revenues. In this entire process there are two major types of risks that influence the value of this project. The first one is the probability, in each stage, that stage will not be completed successfully, and the investor will not be able to move to the next stage of the process. The other major risk, is the uncertainty related to the amount of revenues, mainly due to uncertainty about future CER prices.

The start of a CDM project could be valued as a compound option, such as with a closed-form solution (e.g. Cassimon et al., 2011) or through the use of a binomial option pricing model (e.g. Lynch and Shockley, 2016). At the same time, real options could also be used for strategic purposes by policy makers. Real options provide policy makers the possibility to value the participation into different designs of a mechanism such as CDM and provide an estimation of the attractiveness and risks of such a mechanism. Possibly, another design, such as the one that is proposed by Lee et al. (2013), could have tempered the impact regarding the drop in the CER price.

5.2 Migration

A crucial element of globalization is movements of people and a major cause of migration is the growing inequality in incomes and human security between more- and less-developed countries (Castles, 2013). Sjaastad (1962) was the first to acknowledge that migration could be viewed as an investment and Burda (1993, 1995) was the first to model migration as a real option. His work

found that when a migration decision is postponed, it generates a positive value if there is uncertainty about future wage differences. Locher (2001) explores the same concept as Burda (1995) in a two-period framework, using data on ethnic German migration from CIS countries (Russian Commonwealth). Khwaja (2002) has extended the framework of Burda (1993, 1995) by describing the role of uncertainty in the migration decision. Bayer and Juessen (2012) model internal migration decisions in the United States.

Most literature models a migration decision as a simple call option, where the migrant has the possibility, but does not have the obligation to migrate. The migrant has the option to wait if relevant information can be expected to reveal itself over time. It could for example be profitable to postpone the migration decision, because the migrant is expecting 'bad news', or because the opportunity cost could be decreasing. These models, however, do not meet the requirements to model the decision-making process of *mixed migrants*. This flow of migrants consists of a variety of migrants such as asylum seekers, migrants and economic migrants, moving to more-developed countries through authorized as well as irregular channels for various reasons, such as during the European migrant crisis of 2015.

In 2015 the European migrant crisis began when the flow of migrants had increased dramatically, from 153 thousand in 2008 to more than one million in 2015. This was mainly due to the growing number of Syrians, Iraqis, Libyans, Afghans and Eritreans fleeing war, ethnic conflict or economic hardship, who entered Europe through different routes. Migrants have to make a careful deliberation whether or not to make the crossing, at which time it happens, in what way, according to which route etc. In order to do so migrants keep themselves informed of the developments that could have an impact on their journey and adjust their decisions on a real-time basis (Malakooti, 2015). Their journey contains a mix between involuntary and voluntary decisions, involves multiple legs, through several countries, proceed either through regular or irregular channels or both, where at each stage the migrant has to make a trade-off between the costs and benefits, uncertainty and duration, in order to choose the best route for reaching the desired destination. In contrast to the simple option model, where the journey consists of only one leg, the journey during the European migrant crisis consists of multiple legs, which is referred to as transit migration. In addition there is also technical risk, such as the probability of arrival for each leg and uncertainty of benefits at the final destination. These characteristics demand for a more complex real options model, i.e. a multiphase real option model.

Suppose that the migrant has already decided to migrate, but has to choose between different routes through which to migrate to a desired destination. A multiphase real options framework could be used in order to model each route, where a leg of a route is a phase of the model. A journey is then a sequential option on the benefits in the desired destination. The choice for the best route between alternative routes by the migrant is analogous to making a selection between several investments under uncertainty, where uncertainty amongst others is caused by the changing political situation in the desired destination.

Through the valuation of a route, we are able to quantify the popularity of that route. The migration route with the highest option value would be the best choice and the most appealing route for the migrant, so in this specific case we are not so much interested in the absolute value as in the relative value between the multiple routes. Policy makers could use this information to forecast which route migrants are going to take given the current situation, but also prior to the implementation of policy measures. They have the ability to calculate different possible scenarios and on the basis of that analysis to take most effective measure. For example, is setting a daily cap on the number of asylum seekers, as was the case with Austria, a meaningful way to address the migration influx? Does this measure have a meaningful impact or does Austria remain a favored transit country even after such a measure? The most effective measure will depend on the policy maker. In case of the European migrant crisis, we could notice that nation states took their own measures to cease the migrant flow. From a European point of view, rather the objective is to equally distribute the influx among the different nation states.

5.3 Privacy

Because of the technological developments and the digitalization of the economy, an increase in the demand for consumers' personal information has occurred, which for example enables sectors leveraging personal data to leap ahead of the rest of the economy and produce €1 trillion in corporate profits in Europe by 2020. (Spiekermann et al., 2015). In response to this, privacy and its protection is rapidly emerging as one of the most significant public policy issues (Acquisti et al., 2016). Since the issue of privacy protection is a global challenge, a global response is required, where governments,

businesses, and civil society together are achieving data protection (Doneda and Almeida, 2015).

In 2016, the European Commission and the United States adopted the Privacy Shield, a new framework for transatlantic exchange of personal data, as a substitute for the Safe Harbour framework (Monteleone and Puccio, 2018). The Privacy Shield allows personal data to be transferred from the EU to a company in the United States, provided that the company processes (e.g. uses, stores and further transfers) personal data according to a strong set of data protection rules and safeguards (European Commission, 2016). Already existing transfer tools, such as the binding corporate rules (BCR) or standard contractual clauses (SCC), still apply. Furthermore, a company has the possibility to select one of the available options (Privacy Shield, BCR or SCC) to access privacy data. BCRs are sets of good business practice guidelines adopted by companies voluntarily and applied throughout their branches, regardless of where the branches are located (Kulesza, 2011). In addition, the EU adopted a set of standard contractual clauses for accepted transfers from an EU data exporter to a non-EU data importer (Bender and Ponemon, 2006). In summary, an international company has the possibility to choose from at least three different options to transfer personal data from the EU to the United States.

If the Privacy Shield is used, U.S. companies must first sign up to this framework with the U.S. Department of Commerce (European Commission, 2016). This Department is responsible for managing and administering the Privacy Shield and ensuring that companies live up to their commitments. In order to be able to certify, companies must have a privacy policy in line with the Privacy Shield Principles, a detailed set of requirements based on privacy principles such as notice, choice, access, and accountability for onward transfer. They must re-certify to the Privacy Shield on an annual basis. The costs consist of a one-time contribution to the Privacy Shield Arbitral Fund and annual costs for Privacy Shield Certification. Finally, there is also an annual enrollment fee in one of the Privacy Shield dispute resolution programs.

A company could obtain approval for a binding corporate rule in five steps[2]. The advantage here is that a company is allowed to design its own BCRs and therefore has the flexibility to optimize the design as much as possible. The problem is that approval from one national data protection commissioner is not binding on other national data ombudsmen, leaving a company to struggle through difficult and costly international administrative procedures. In order to simplify these procedures, a mutual recognition procedure has been agreed between 21 EU countries. Under this procedure, once the lead authority considers that binding corporate rules meet the requirements, the data protection authorities under mutual recognition accept this opinion as sufficient basis for providing their own national permit or authorization. A straightforward application will take up to twelve months and the process does require significant investment up front (both in terms of finance and resourcing) (Allen & Overy, 2016).

Standard contractual clauses were meant to simplify the process of crafting data transfer agreements (Schwartz, 2012). Rather than use attorneys to draft contracts from scratch, a company can use the pre-approved SCCs and their "off-the-rack" language. Therefore, no license is needed for the use of SCCs. A disadvantage is that large companies have to add many clauses, which results in high costs and maintenance.

Through The Privacy Shield, BCRs or SCCs an international company receives the authorization to access privacy data. This could be interpreted as a (call) option on privacy data. It could be noticed that The Privacy Shield, BCRs and SCCs have different structures. BCRs contain a phased approval process, but after that BCRs are free to be used. Participation in a Privacy Shield has to be renewed annually, with the risk that it will not be extended. In both cases the structure of a compound option could be recognized. SCCs are the simple options. They are more straightforward and for occasional use, but could result in very high costs afterwards, which reduces the profitability of privacy data. Furthermore, the value of privacy data itself is also uncertain. Personal data could become obsolete or irrelevant.

By regarding Privacy Shield, BCRs and SCCs as options on privacy data, real options could be used for its valuation. This provides policy makers insight in which type of access to privacy data is the most attractive for companies. It gives policy makers also the possibility to influence the choices through the so-called value drivers of real option valuation.Value drivers are the input variables, which

2 https://ec.europa.eu/info/law/law-topic/data-protection/international-dimension-data-protection/binding-corporate-rules-bcr_en

determine the value of an option, such as costs, benefits, uncertainties, etc. By influencing one or more drivers of a data access program, a policy maker is able to influence the value of such a program and therefore the attractiveness of that particular program. For example, policy makers have the ability to increase the cost of BCRs and evaluate its impact on the attractiveness of BCRs. For this reason, real options could support the policy makers as such in a strategic way by directing companies to the desired variant.

Also other options could be recognized. Some companies could for example already have BCRs or SCCs. Would it be still attractive for them to switch to The Privacy Shield (*switching option*)? And finally, there might also be companies that are willing to use personal data, but who are not willing to take the official route. This could be regarded as a *criminal option* (Engelen, 2004). Generally speaking there are more than sufficient possibilities for the application of real options to privacy policy.

6. Conclusion

We have demonstrated that GPP is a promising field of application for real options. Investment thinking, high uncertainty and high complexity come together in the context of GPP, which is caused by the large playing field and the lack of enforcement. Real options could be brought to its full potential here, as well as for valuations and strategic considerations. Consecutively, we have explored the application of real options to three GPP matters. On the field of global warming, real options could be deployed to verify whether or not a market-based instrument, such as Clean Development Mechanism, is profitable for potential participants, and when this is not the case, which measures could be taken for making it profitable. In case of migration, we have explored how real options could be used to quantify the relative attractiveness of a given migration route. On the basis of this information, policy makers have the ability to assess which routes will become more attractive, even prior to taking policy measures. Finally, we have demonstrated that real options are very suitable on the field of privacy and could be employed to assess which of the possible frameworks a company will use in order to have access to personal data. Policy makers have the opportunity to influence the value drivers of the different frameworks in order to direct the company to the intended variant. Currently, we have focused to explore the possible applications of real options within GPP. It is subject to future research to sophisticate these ideas into usable real options models and to raise GPP to a new and fully-fledged area of application for real options.

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An Event Study of the Impact of Corporate Social Responsibility on the Corporate Values: A Case of Kao Corporation

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Abstract: The purpose of this research is to examine how awards and indexes related to Corporate Social Responsibility (CSR) affect the corporate values of Kao, which is one of the biggest chemical manufacturer in Japan. We conduct event study to validate that an abnormal return occurs on the day Kao wins awards or Kao's stock is designated as investment indexes. We extract all information related to CSR awards and indexes as much as we could search on Kao's web site. In case that Kao won awards and designations in a row, we conduct a retrospective review of the award history. We conduct comprehensively event study on 38 items including domestic and foreign investment indexes, commendation by Japanese and international organizations, and internal evaluation such as Kao's CSR reports. As a result, out of 105 of the event study, we find two statistically significant abnormal returns. One is positive in FTSE4Good 2011, and one is negative in Kao's CSR report 2018. It is more natural to think that the two significant abnormal results are observed coincidentaly as we set the significance level as 5%. Two events out of 105 events could show the statistically significant result at 5% coincidentally. We could not conclude that CSR activities positively affect the corporate values of Kao. In the future, it is also necessary to verify CSR activities from the reduction of risk and the improvement of brand values through the increase in reputation.

Keywords： CSR, ESG, Event Study, Corporate Values, Kao corporation

1. Introduction

1.1 Research objectives

The purpose of this research is to examine how awards and indexes related to Corporate Social Responsibility (CSR) affect the corporate values of Kao, one of the major chemical companies in Japan. This research aims to gauge the impact of CSR on corporate values comprehensively, so event studies are conducted on internal and external evaluations of Kao's CSR activities.

Our event studies are divided into different categories, such as the registration days of indicators--Environment, Social and Governance (ESG) investment; the registration days of brands by the Japanese government[1]; and the days Kao won CSR awards which were selected by Japanese and foreign organizations. As for the internal evaluation of Kao's CSR, we also conduct event studies on the publication day of Kao's CSR reports. Note that because Kao changed their name of CSR report four times since 2001, we use “Kao’s CSR report” for all titles for convenience.

By conducting event studies on multilateral and comprehensive evaluations, we clarify whether CSR activities have effects on the corporate values of Kao. If we figure out the significant result of event studies, we can say CSR has effects on the corporate values of Kao.

1.2 Background of the study

Kao is one of the major chemical companies in Japan. Kao has four business fields: Cosmetics, Skin Care & Hair Care, Human Health Care, and Fabric & Home Care. Kao conducts business in Japan, Asia, the Americas, Europe, and other parts of the world. Kao positions ESG activities as an investment in the future and is a company actively engaged in CSR activities. Kao positions ESG activities as an investment in the future. Kao is a company actively engaged in CSR activities and plans to further accelerate efforts to achieve a global presence by 2030.

1.3 Research questions

We focus on Kao, and comprehensively examine whether evaluations of CSR activities affect corporate values. We conduct event studies on CSR-related awards and index registrations as long as we find them on Kao's CSR PR news page. We comprehensively examine the impact of CSR activities on corporate values of Kao, and not restricted to the content of CSR activities. As far as we can check all information on the Kao's website, we find 38 awards or indexes which are related to CSR activities. Since some of the awards or indexes are

1 Japanese government and the Tokyo Stock Exchange (TSE) jointly selected listed enterprises that are outstanding by category: such as encouraging the empowerment of women in the workplace (Nadeshiko brand), and strategically focusing on employee health management from a managerial perspective.

selected every year, we also research all historical information. We include the years when Kao missed awards or was not chosen for our event study because we consider that investors might pay attention more to the case of missing awards or indexes than the fact of winning awards or indexes continuously. Then, we clarify the impact of CSR on the corporate values of Kao by categories: the investment indexes in Japan and overseas, the award by the Japanese government, commendation in Japan, commendation from foreign institutions, and the internal evaluation of Kao. We use Kao's CSR reports as internal evaluation. we examine whether CSR activities are affecting corporate values positively or negatively. If we figure out significant results, we try to analyze what kind of CSR activities Kao needs to focus on.

1.4 Significance of the study

Kao is a very large global company, and we comprehensively examine the impact of social assessment on corporate values. In the stock market, we believe that registration and awarding related to CSR generates important investment factors for investors. If this statement is true, after the news related to CSR, stock prices could increase significantly. In other words, CSR related activities might improve corporate values. If the stock price does not change or if it falls, it implies investors do not pay full attention to CSR activities, nor CSR related activities affect corporate values. In our paper, we would like to discuss whether evaluations related to CSR activities have effects on the corporate values or not. If we can figure out that CSR related activities improve the corporate values, we can say that our research leads to motivation significantly to do CSR activities for Japanese companies.

2. LITERATURE REVIEW

The previous papers which analyze the relationship between CSR and corporate values show mixed results. For example, Peloza (2009) reviews previous studies on the relationship between CSR and Corporate Social Performance (CSP), which is defined as accounting-based performance, market-based performance, operational performance, perceptual performance, growth metrics, risk measures, and the performance of ESG portfolios. He finds that 59% of the previous studies show positive relationship between CSR and CSP, 27% a negative correlation, and the remaining 14% mixed correlations.

In Japan, there are fewer studies of CSR activities from the perspective of corporate profit in Japan compared to the United States. As far as we know, the results of research about the relationship between CSR and corporate values in Japan are also mixed. For researching the relationship between CSR efforts and economic performance, Sudo, Mashiko, and Wakazono (2006) select companies which include four significant Socially Responsible Investment (SRI) indexes and compared their performances with non-SRI corporate groups. Although the result is not statistically significant, companies with a clear CSR policy generally show less volatility in earnings and higher market value. On the other hand, Sudo, Mashiko, and Wakazono point out that CSR activities which aimed at reducing reputation risk may gain profitability.

Endo (2013) tries to measure the effects on corporate values for the 147 manufacturing companies listed on the Tokyo Stock Exchange by using the overall score of Environmental Management Survey conducted by Nihon Keizai Shimbun as Corporate Social Performance (CSP) indexes. Endo confirms a positive relationship between CSP and corporate values, but the statistical significance of his studies was low. He could not conclude that CSP is enhancing corporate values.

As far as we know, we could not find any research focusing on one company in particular and mentioning the impact of index registration on a corporate value in Japan. Our study is unique in this sense.

3. METHODOLOGY

3.1 Data collection and objectives of study

Based on the announcements posted on Kao's CSR news page, we extract all information related to CSR awards and indexes as much as we could find on Kao's web site. We aim to exhaustively verify how CSR activities have effects on the corporate values of Kao. In case that Kao won awards and designations in a row, we conduct a retrospective review of the award history as much as possible.

As a result, we choose 38 items meaning that the number of titles, indexes, or awards which we choose for this report. Then we categorize them as follows: (1) Domestic ESG investment indexes, (2) Foreign investment indexes, (3) Awards by Japanese government, (4) Commendation in Japan, (5) Commendation from foreign institutions, (6) Internal evaluation in Kao. Table

1 shows all event studies in this paper by category. In addition, we collect adjusted stock price of Kao and Tokyo Stock Price Index (TOPIX[2]) from Yahoo finance. We also use Kao's financial data, market capital, liabilities, and cash flow from Datastream.

Table 1: All event studies in this paper by category

Category	Number of items	Number of event studies
(1) Domestic ESG investment indexes	4	8
(2) Foreign investment indexes	5	29
(3) Awards by Japanese government	6	14
(4) Commendation in Japan	7	18
(5) Commendation from foreign institutions	15	33
(6) Internal evaluation in Kao	1	3
Total	38	105

Note: items means the number of title of indexes or awards which we choose for this report.

3.2 The period of estimation window and event window

In this paper, we call the event day when Kao won awards related to CSR activity, or was designated as investment indexes, as "day 0". We also call the one day before the event day as "day -1", and the day after “day 0” as "day 1". The event window, which represents the window of days surrounding of “day 0”, is set from day -5 to day 5 (11 days in total), to measure change in the short term. The estimation window; the window of days significantly prior to “day 0”, is used as a basis to measure long term change compared to “day 0” and its event window, from the day -200 to day -51 (150 days in total). We calculate on business day basis.

3.3 Methods of event study

We perform a regression analysis of Kao's stock prices on TOPIX during the estimation window. First, we calculate the daily-basis-change-rate of TOPIX and Kao's stock prices during the estimation window, respectively. After performing the regression, we calculate abnormal returns by a stock return of Kao relative to its expected stock return. Expected return is given by equation (1). We multiply the coefficient of Kao and the coefficient of TOPIX and add the change rate of TOPIX to calculate expected return an event window (1). We also estimate an abnormal return (2).

$$Expected\ return = \alpha + \beta \times TOPIX\ return \quad (1)$$

$$Abnormal\ return = Actual\ stock\ return\ of\ Kao - Expected\ Return \quad (2)$$

Equation (3) shows that the abnormal returns from day -5 to day 5 (11 days in total) as a cumulative abnormal return (CAR).

$$CAR = \sum_{t=-5}^{d} AR \quad (3)$$

where, d is the duration of event window and AR is abnormal returns. After derivation of the CARs, we perform a two-tailed t-test of the statistical significance of each CAR.

$$The\ values\ following\ t-distribution = \frac{CAR}{\sqrt{S^2 * d}} \quad (4)$$

where, s is the standard error, and d is the duration of event window. We also assume that the sampling distribution follows the *t*-distribution after applying the formula. The Equation (4) converts CAR to a value following to the *t*-distribution. According to the results of the t-test, we use the degree of freedom (148, which is derived from 150 – 2: 150 as number of days for estimate window: 2 as parameters estimated in Equation (4)). Finally, we calculate two-tailed probability of CAR by using Excel sheet. Before conducting event studies, we set 5% at two-tailed probability of CAR as the significance level. The alternative hypothesis is that two-tailed probability of CAR is different from 0.05, and the null hypothesis is that the two-tailed probability of CAR is not different from 0.05.

4. DATA ANALYSIS AND RESULT

In our paper, we conduct 105 event studies on 38 items meaning that the number of titles, indexes, or awards included are comprehensive. As a result, only FTSE4Good 2011 and Kao's CSR report 2018 in which two-tailed probability of CAR show statistically significant results at 5% level. We consider that abnormal results might happen incidentally because we set the significance level at 5%. The two-tailed probability of CAR of FTSE4GOOD in 2011 shows abnormal return with significant level at 0.042. Kao has been awarded FTSE4Good continuously since 2008 and has not been able to show a clear reason to respond significantly only in 2011. In 2008, when Kao was elected to FTSE4 GOOD for the first time, the number

2 TOPIX is a stock price quantified by a fixed calculation method. It covers multiple stock prices, such as an entire exchange or a series of stocks, rather than individual company’s stock price. By looking at TOPIX, it is possible to comprehensively read the movements of the stock market as a whole.

of registered companies was 707 in total, of which 195 were Japanese companies[3]. In 2018, Kao was registered FTSE4GOOD index for 10 years in a row. However, based on the results of our event study, there is no characteristic response in 2008 and 2018.

4.1 Abnormal return on FTSE4Good in 2011

The announced day was May 10, 2011, and Table 2 shows the daily results of FTSE4Good in 2011. Actually, two-tailed probability of CAR is less than 0.05 only on May 5, 2011, which is Day -4, and May 15, 2011, which is Day 5. The value of two-tailed probability of CAR from day -3 to day 5 is not significant. We cannot prove CSR has an effect on the corporate values of Kao from only this result. It seems to be more natural to think that it just happens to be this way.

Table 2: The result for FTSE4Good 2011

Day	AR	CAR	t_CAR	p_CAR
-5	0.009	0.009	1.094	0.354
-4	0.033	0.042	3.521	0.039 **
-3	-0.018	0.024	1.666	0.194
-2	-0.001	0.023	1.381	0.261
-1	0.030	0.053	2.813	0.067
0	-0.010	0.043	2.065	0.131
1	-0.015	0.028	1.247	0.301
2	0.016	0.044	1.851	0.161
3	-0.011	0.034	1.320	0.278
4	0.022	0.055	2.069	0.130
5	0.041	0.096	3.421	0.042 **

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S =standard error. p_CAR is the two-tailed probability of CAR. ** and * indicate 5% and 1% level of significance, respectively.

4.2 Abnormal return on Sustainability report in 2018

The two-tailed probability of Sustainability Report in 2018 shows abnormal return with significant level as 0.05 We compare the material of Kao's CSR report 2018 to other year versions, but as far as we checked we could not figure out any significant difference between the 2018 version and different year versions. We also presume that investors can collect information related CSR at stockholders' general meeting before publishing CSR report. Kao has received the 2016 Grand Prize for the Corporate Value Improvement Award, implemented by the Tokyo Stock Exchange. This award commends listed companies carrying out management with a strong focus on investors.

Aoki (2017) appreciates the Kao's Sustainability Report and uses Kao's reports as one of the examples to introduce how Japanese companies disclose non-financial information. Kao was not able to get Corporate Value Improvement Award 2018, but it is natural for investors because Tokyo Stock Exchange chooses different companies every year. According to the criteria of Corporate Value Improvement Award, there is no regulation to exclude the previous winning company. However, we can assume that investors understand that the previous winning company will not reserve next year based on the historical information which is available since 2016 on the Tokyo Stock Exchange web site.

Table 3: The result for Kao's CSR report in 2018

Day	AR	CAR	t_CAR	p_CAR
-5	-0.040	-0.040	-3.685	0.035 **
-4	-0.041	-0.081	-5.227	0.014 **
-3	0.012	-0.069	-3.649	0.036 **
-2	-0.018	-0.087	-3.991	0.028 **
-1	0.006	-0.081	-3.313	0.045 **
0	0.013	-0.068	-2.547	0.084 *
1	-0.013	-0.081	-2.792	0.068 *
2	-0.012	-0.093	-3.011	0.057 *
3	0.005	-0.088	-2.683	0.075 *
4	-0.012	-0.100	-2.886	0.063 *
5	-0.017	-0.117	-3.231	0.048 **

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $\mathrm{t\_CAR} = \frac{\mathrm{CAR}}{\sqrt{S^2 * d}}$, S =standard error. p_CAR is the two-tailed probability of CAR. ** and * indicate 5% and 1% level of significance, respectively.

Table 3 shows the result for the Sustainability

3 Available at FTSE4 GOOD Web site, https://www.ftse.com/products/downloads/ftse-russell-esg-presentation-for-jp.pdf

Report in 2018. Looking at the two-tailed probability of CAR, only Day 5 to Day 1 and Day 5 show 0.05 or less. Abnormal return did not occur five days from Day 0 to Day 4. And CAR value shows minus during the event window. Abnormal return occurred before publishing the CSR report in 2018. We believe that the CSR report does not have a negative impact on the corporate values of Kao.

5. CONCLUSION

In this paper, we conduct comprehensively the event study on 38 items including domestic and foreign investment indexes, commendation by Japanese and international organizations, and internal evaluation as Kao's CSR reports. The oldest data used in our event study is from July 2003, when Kao was registered as Morningstar Socially Responsible Investment Index[4]. And the latest data used in our event study until the day when Kao was selected as supplier engagement leader by Carbon Disclosure Project (CDP[5]) in February 2019. Appendix shows all 105 events which we examined.

As a result, two-tailed probability of CAR showed less than 0.05 only in FTSE4Good 2011 and Kao's CSR report 2018 of 105 event studies. These abnormal results which happened unexpectedly may be due to the fact that we set the significance level at 5%. The result of our event studies supports Endo (2013), who concluded that there is insufficient evidence to prove that CSR activities increase corporate values.

In our event studies, we set the event window as 11 days from Day-5 to Day5 and the estimate window as 150 days from Day-200 to Day-51. Since Kao has received numerous CSR-related awards, we consider that changing this date setting might be a good idea.

In addition, our study only examined only the changes in stock prices for the winning award or index registration from 2003 to 2019. This paper may seem to analyze only the movement of the stock prices several days after CSR activities, the concept of Corporate Value is inclusive, and is essentially the same as the “reduction of risk and the improvement of brand values regarding reputation”. On this note, it would be necessary to verify the above in future research. Finally, we targeted only one company for this paper, but it would be necessary to carry out verification in different industries too.

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4 Morningstar is a company that provides analysts and other global financial and economic information to institutional and semi-professional individual investors, focusing on rating evaluation of mutual funds. https://www.morningstar.com/

5 CDP is an NGO established in the UK in 2000 and operates a global information disclosure system for investors, businesses, cities, countries and regions to manage environmental impacts. https://www.cdp.net/en

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APPENDIX

Within this section are several tables that hold too much information and/or data to place within the text without distracting or burdening the reader. Below, one will find that many of the tables are complete lists in regards to the results of event studies in this paper by category, which are included as they could be thought to be related or correlated with Corporate Social Responsibility.

Table A.1: Result of event studies for domestic ESG investment indexes

Name	Year	CAR	t_CAR	p_CAR
FTSE Blossom Japan Index	2018	0.016	0.351	0.749
		0.000	0.000	1.000
	2017	0.021	0.690	0.540
		-0.012	-0.298	0.785
MSCI Japan Empowering Women Select Index	2018	-0.042	-0.886	0.441
MSCI Japan ESG Select Leaders Index	2017	-0.054	-1.169	0.327
S&P/JPX Carbon Efficient Index	2018	-0.022	-0.488	0.659
Morningstar Socially Responsible Investment Index	2003	-0.028	-0.676	0.548

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $\text{t\_CAR} = \frac{\text{CAR}}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is two-tailed probability of CAR.

Table A.2: Result of event studies for foreign investment indexes

Name	Year	CAR	t_CAR	p_CAR
DJSI World	2018*	-0.056	-1.215	0.311
	2017	-0.031	-0.936	0.419
	2016	0.027	0.689	0.540
	2015	-0.040	-0.812	0.476
	2014	-0.062	-1.727	0.183
FTSE4Good	2018	-0.012	-0.262	0.810
		0.000	0.000	1.000
	2017	0.052	1.738	0.181
		-0.017	-0.411	0.709
	2016	0.044	1.002	0.390
		0.045	0.980	0.399
	2015	-0.019	-0.405	0.713
		0.048	1.025	0.381
	2014	-0.063	-1.759	0.177
		-0.029	-0.643	0.566
	2013	-0.019	-0.462	0.675
		0.054	1.678	0.192
	2012	-0.033	-1.098	0.353
		0.004	0.098	0.928
	2011	0.096	3.421	0.042 **
		-0.002	-0.065	0.952
	2010	0.002	0.040	0.971
		-0.031	-0.585	0.600
	2009	-0.036	-0.522	0.638
		0.009	0.120	0.912
	2008	-0.107	-2.081	0.129
		-0.095	-2.422	0.094
Bloomberg Gender-Equality Index	2019	-0.093	-2.032	0.135
ECPI Ethical Index	2016	-0.021	-0.490	0.658

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is the two-tailed probability of CAR. We out * on the year which Kao was excluded from registrations, and ** on the result which is lower than 0.05.

Table A.3: Result of event studies for awards by Japanese government

Name	Year	CAR	t_CAR	p_CAR
Cabinet Office Special Ministers' Commendation	2018	0.031	0.531	0.531
Health Management Excellent Corporation-White 500	2018	-0.016	-0.416	0.706
	2017	-0.016	-0.430	0.696
The 100 Diversity Management Companies	2013	0.046	1.411	0.253
Offensive IT Management Brand	2016	0.044	0.975	0.401
Health Management brand	2018	-0.016	-0.416	0.706
	2017	0.022	0.475	0.667
	2016	0.099	1.975	0.143
	2015	-0.031	-0.757	0.504
Nadeshiko Brand	2017	0.054	1.497	0.231
	2016*	0.062	1.382	0.261
	2015	0.024	0.527	0.635
	2014*	0.032	0.703	0.533
	2013	0.030	0.924	0.424

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is the two-tailed probability of CAR. We put * on the year which Kao missed the awards or designations.

Table A.4: Result of event studies for commendation in Japan

Name	Year	CAR	t_CAR	p_CAR
Corporate Value Improvement Award	2016	0.094	2.055	0.132
CSR ranking by Toyo Keizai	2019 3rd place	0.034	0.781	0.492
	2018 5th place	-0.003	-0.080	0.941
	2017 9th place	0.053	1.172	0.326
	2016 18th place	-0.060	-1.239	0.304
	2015 27th place	0.063	1.548	0.219
	2014 42nd place	0.048	1.104	0.350
	2013 46th place	-0.050	-1.519	0.226
	2012 37th place	0.000	0.009	0.994
	2011 32nd place	-0.003	-0.093	0.932
	2010 38th place	-0.059	-1.111	0.348
	2009 33rd place	0.034	0.398	0.717
The 50th Ichimura Industrial Award Contribution Award	2018	-0.083	-2.284	0.107
The 49th Japan Chemical Industry Association Technology Award	2017	0.040	0.930	0.421
Special award of DBJ Health Management Rating	2017	0.048	1.064	0.366
	2012	0.045	1.400	0.256
Excellent Award at HR Award 2014 by I-Q Co., Ltd.	2014	-0.029	-0.777	0.494
BEST 100 companies that women play an active part by Nikkei WOMAN	2017	0.087	1.979	0.142

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is the two-tailed probability of CAR.

Table A.5: Result of event studies for commendation from foreign institutions

Name	Year	CAR	t_CAR	p_CAR
CDP A list of water security	2016	-0.074	-1.639	0.200
CDP supplier engagement leader	2019	0.042	0.942	0.416
	2018	0.063	1.784	0.172
Corporate Knights, Global 100 Most Sustainable Corporations in the World	2007	0.000	0.003	0.998
EcoVadis, Gold class	2018	-0.024	-0.667	0.553
Ethisphere Institute, World's Most Ethical Companies	2019	-0.004	-0.082	0.940
World's Most Ethical Companies	2019	0.026	0.577	0.605
	2018	-0.003	-0.080	0.941
	2016	-0.047	-0.978	0.400
	2017	0.026	0.585	0.600
	2016	-0.025	-0.527	0.635
	2015	0.063	1.548	0.219
	2014	0.088	1.968	0.144
	2013	0.037	1.133	0.340
	2012	0.002	0.041	0.970
	2011	-0.001	-0.016	0.988
Ethisphere Institute, World's Most Ethical Companies	2010	-0.009	-0.144	0.895
	2009	0.060	0.753	0.506
	2008	0.018	0.377	0.731
Industrial Estate Authority of Thailand (IEAT), Amata Best Waste Management Awards 2017	2017	0.022	0.475	0.667
Intellectual.Asset.Management (IAM) Asia.IP.Elite	2015	0.027	0.689	0.540
	2014	-0.044	-1.158	0.331
	2013	0.022	0.481	0.664
Ministry of Industry of Thailand Eco Factory Award	2017	-0.050	-1.547	0.220
Oekom research, Prime class	2006	-0.021	-0.578	0.604
Pentaward 2017, Bronze Pentaward 2017	2017	-0.061	-1.877	0.157
Responsible Care Management Committee of Thailand(RCMCT), Responsible Care Silver Award	2017	0.022	0.475	0.667
RobecoSAM, Gold class at CSR ranking	2018	0.074	2.068	0.131
	2017	0.040	0.868	0.449
	2015	0.067	1.879	0.157
RobecoSAM Industry Leader at Personal Products	2015	0.068	1.403	0.255
Thomson Reuters Diversity & Inclusion Index	2018	0.001	0.017	0.988
Thomson Reuters Top100 Global Innovator 2014	2014	-0.050	-1.026	0.380

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is the two-tailed probability of CAR.

Table A.6: Result of event studies for internal evaluation in Kao

Name	Year	CAR	t_CAR	p_CAR
Sustainability Report	2018	-0.117	-3.231	0.048 **
	2017	0.053	1.172	0.326
	2016	0.011	0.257	0.813

Note: $CAR = \sum_{t=-5}^{d} AR$, d = the duration of event window, and AR = abnormal return. $t\_CAR = \frac{CAR}{\sqrt{S^2 * d}}$, S=standard error. p_CAR is the two-tailed probability of CAR. We put ** on the result which is lower than 0.05 as a significant result.

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Small Businesses' Awareness, Experience and Attitude towards Microfinance in Asmara, Eritrea

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Abstract: It is universally accepted that Micro Finance Institutions (MFIs) have a significant contribution in supporting Small and Medium Enterprises (SMEs) and buttressing the economy of developing countries. This study attempts to identify the problems that small businesses in Eritrea face while also measuring their awareness and attitudes towards microfinance. We collected data through questionnaires from 145 small business owners, classified into beneficiaries and non-beneficiaries of MFI loans. We find that there is considerable lack of awareness about and positive attitude from the beneficiaries towards MFI. The biggest challenge facing SMEs is financial constraints. We find that MFI is helpful in addressing the financial limitations faced by the beneficiaries. These findings underline the need to ramp up sensitization efforts and to increase access to loans for SMEs by privatizing and proliferating MFIs in Eritrea.

Keywords: Eritrea, Microfinance Institutions (MFIs), Saving and Micro Credit Program (SMCP), Small businesses, Impact, Awareness, Positive Attitude.

1. Introduction

This research attempts to investigate the general awareness and attitude of small business owners towards MFI in Eritrea. Attitude in this context mean 'The belief of small businesses in the importance of MFIs to the growth of their Business.' The study is highly expected to contribute valuable information to the government and microfinance in Eritrea on how to develop awareness in SME owners about Microfinance in Eritrea and to make recommendations to allow and encourage private investors in Microfinance. Available evidence indicates that small businesses played a major role in the growth and development of all leading economies. And there is no doubt that most developing countries depend on their small businesses in driving their economies forward. However, most of these small businesses struggle with getting financing. Thanks to the modern microfinance's existence, small businesses can access and receive adequate finance and increase their working capital. However, in Eritrea most small businesses are not accessing MFI. One of the reasons is their lack of awareness of the existence of MFI and its services. However, even if they know about MFIs, they may not get the access due to several reasons.

In this study we incorporate a statistical regression analysis to identify the factors that affect small businesses' awareness of MFIs and whether they become beneficiaries.

Small businesses constitute the lifeblood of any growing economy. Not only do they boost the national economy, but they also allow a significant segment of the population, who would have remained idle or relatively less productive, to engage in the business world. In addition to that, many small businesses are the big business organizations of tomorrow.

However, despite the potential merits of small business both at the individual and national level, the reality of launching and running it presents its own challenges. One of the main problems is the lack of awareness among small business owners with regards to the existence and activities of financial institutions. In many corners of the globe, where MFIs are available, they are not properly utilized as expected. And usually the main reason for this is the lack of adequate knowledge about MFIs.

Entrepreneurs in the SME sector have revealed that there is great reliance on credit as a tool for business growth and development. However, most entrepreneurs asserted the fact that they are still faced with the challenge of inadequate capital in their businesses and this inhibits their growth. From another perspective, MFIs believe that credit obtained by entrepreneurs is misappropriated. Another constraint to most SMEs is the lack of managerial and business skills. There is a glaring need to build these capacities in addition to opening access to financial resources in order to achieve growth. The smallness of loans and savings, the absence of asset-based collateral and the simplicity of operations are the three distinctive characteristics of the financial services provided by MFIs.

Eritrea is a small country in the eastern part of Africa, along the Red Sea coast line. Despite the strategic importance of the country's geographic location and the business opportunities that this presents, extraordinarily little has been done. In Eritrea, the history of small business shows a track record of financial affliction resulting from different problems not unlike small businesses throughout the world. In addition to this, the political instability of Eritrea (i.e. colonialism) had a debilitating role in Eritrean small business firms. Since the

Eritrean economy was at its lowest level there was no availability of financial sources especially for small firms. Owing to this problem and other external factors many individuals were hindered from starting their own business.

The state of small business in Eritrea has not been as bad over the past 26 years of independence when compared to the previous decades. Small businesses have been gearing forward as a development vehicle in providing job opportunities to the underprivileged such as women and the poor. In Eritrea one way of encouraging small business has been through the Savings and Micro Credit Program (SMCP). The SMCP is an MFI operating throughout the State of Eritrea. Most of the Eritrean population does not have access to the conventional financial institutions basically due to lack of collateral and financial records. Moreover, the Eritrean financial sector is small and underdeveloped offering only a limited range of financial services. SMCP was, therefore, established in 1996 as part of the Eritrean Community Development Fund and it provides savings and micro credit services to the poor section of the population, which the conventional financial institutions have failed to serve. The institution enables its beneficiaries to successfully deal with environmental hazards, economic failures as well as personal and family problems. According to many studies, challenges faced by SMEs may emanate from financial challenges, management or marketing limits. Small Businesses fail either at the start-up stage or at their early phases of operation. Even after the SMCP is established, most of the small business owners' knowledge falls beneath expectations.

1.1. Importance of the Study

Small business has been the backbone of almost any economy, particularly in a small and young country like Eritrea, its importance remains to be contested. In Eritrea, a few decades ago, farming was the primary income of the nationals. Nowadays, however, it is no more, because the Sahara Desert keeps extending into the young nation. For this, small business has almost become the only option where people can turn. Consequently, there is an urgent need to understand the attitude of the people, who were initially immersed in traditional farming activities, towards small businesses and the microfinance institutions available. Secondly, the next critical focus to be addressed is the awareness of the society about the availability and operations of those microfinance institutions. Unfortunately, due to many confounding factors, these basic concepts had never been studied scientifically. The above-mentioned points became the purpose of my research.

Considering the current state of affairs in Eritrea, it is almost impossible to find adequate economic data. Therefore, this being the first scientific research to be conducted in this field, the study continues to be appreciated by all three stakeholders of small businesses in Eritrea, namely the society, the government, and the microfinance institutions. The research work dug out significant findings that would help both the government of the state of Eritrea and the microfinance institutions not only to amend their policies but also to come up with new strategies that would, in a way, tackle the problems identified in the research. On top of that, the study will inevitably be referenced by small business owners and microfinance institutions that might be launched subsequently in Eritrea.

In addition to the merits previously mentioned, the research work would ignite other researchers to conduct similar research in other parts of the country and in other related issues that need to be addressed scientifically. Besides, the work will serve as a pioneer reference to be used by other researchers in future studies.

Most importantly, the research revealed and clearly stated problems that small businesses face both in launching and running their business, especially in the line of finances. For this, the study came up with research-based recommendations that both the government of the state of Eritrea and microfinance institutions could use as alternative strategies to bring the general knowledge and awareness of the society up to the desired level.

1.2. Research questions of the study

1) What are the factors that determine the awareness of SMEs about MFIs?
2) What are the factors that determine an SME becoming a beneficiary?
3) Do MFI fulfill beneficiaries' expectations?
4) Do MFI increase beneficiaries' business capital?

1.3. Objectives of the Study

The general objective of the study is to make suggestions to the government regarding the policy of privatization of microfinance institutions in Eritrea.

Specific Objectives:

1. To identify the difficulties small businesses face when launching their business.
2. To evaluate the awareness of small business owners about micro finance institutions in Asmara, Eritrea.
3. To identify the relationship between small business owner's knowledge about and utilizations of microfinance institution in Asmara, Eritrea.
4. To assess the attitude of small business owners towards microfinance institutions in Asmara, Eritrea.
5. To identify the role/contribution of micro finance institutions on small business in Eritrea.

To achieve the above objectives, 4 research hypotheses were formulated:

1) The nature of the business, challenges faced during the start of the business, the objectives for establishment, method of financing, the type of loan requirements needed,

and whether they have adequate capital for the business can significantly determine whether a small business becomes a beneficiary of an MFI.

2) The nature of the business, challenges faced during the start of the business, the objectives for establishment, method of financing, the type of loan requirements needed, and whether they have adequate capital for the business can significantly determine whether a small business will know about MFIs.
3) Beneficiaries of MFI do not believe MFIs fulfill their expectation (there is no positive attitudes)
4) Beneficiaries of MFI do not believe MFIs increase their business capital.

2. Literature Review

Microfinance allows people to safely take on reasonable small business loans in a manner that is consistent with ethical lending practices. Although they exist all around the world, the majority of microfinancing operations occur in developing nations. Micro lending starts in small villages where family and friends get together in money sharing groups. These have their own names. For example, in West Africa, they were called ‘‘tontines’’, in Bolivia, ‘‘pasanaku’’, in Latin America, ‘‘tandas,’’ in Africa and the Caribbean, ‘‘Susu’’ and in Eritrea, ‘‘Eukub.’’ While the concept has been used globally for centuries, The 2006 Nobel Prize winner Dr. Muhammad Yunus, the founder of the modern microfinance, has helped to push the industry further into the spotlight.

Ashamu [2014] noted that the operations of MFIs have grown in the recent years in Nigeria. Providing funds to emerging micro and small scale enterprises has been the engine of growth. In spite of challenges of different kinds regarding policy implementation framework and an urgent need for approval, the number of MFI branches and their employees increased five and ten folds respectively, whereas their asset base and clients increased six and sixty seven folds respectively. Growth is defined in relation to changes in micro credit, and training provided by MFIs assures that microfinance services had a strong positive impact on the growth of SMEs. The research was based on two hypotheses, namely whether there is a difference between beneficiaries and non-beneficiaries and also the effect of microfinance on poverty alleviation.

Mewl, which is equivalent to Bangladesh’s Grameen Bank, was started six years after Eritrean independence, in 1996. At the beginning its purpose was to help interested Diaspora returnees, War veterans and women to launch their own businesses and also to help rebuild Eritrea’s war-devastated infrastructure. Eritrean microfinance is called SMCP [Mehrteab 2005]. The main aim of the SMCP or Mewl is to provide financial services to the vulnerable groups in both rural and urban areas of the country who have no access to commercial banks. A corollary to this would be the promotion of the private sector by encouraging the development and expansion of small business, assisting individuals to increase their income generating ability and to improve their earning and the prosperity of their communities and the nation as a whole.

To achieve its objectives SMCP has three operational strategies. The first strategy is to provide access to saving and credit to individuals. The second is to strengthen community representative structures, from village to higher levels, and to involve communities in the development and sustainability of the program. Lastly, to establish a legal, regulatory and judicial framework for the microfinance sector of Eritrea so that SMCP can be a sustainable autonomous financial institution. SMCP targets any citizen that has limited or no access to credit from a formal financial institution, provided they agree to comply with the required terms of credit. SMCP is grassroots-oriented; it is a group-based lending program that substitutes collateral with joint liability principles. Small business firms constitute the bulk of business activities in the country. Thus, it is no wonder that securing the well-being of these small business firms and financing them would be of great interest.

In Eritrea too, many researchers have focused their studies on the topic of microfinance. SMCP has a significant effect on the livelihood of households in the rural areas. Rural livelihoods have the effect of reducing rural-urban migration and relieves the urban area’s pressure. Micro financial resources in rural areas promote development and socio-economic justice in Eritrea and other developing countries according to [Habte et al. 2017: 73-107].

Asgedom and Muturi [2014] focused on the repayment performance of the SMCP loans in Eritrea. They found that there is no significant relationship between the socio-economic factors and the repayment performance. But in general there is a high level of repayment performance. Lensink and Mehrteab [2003] addressed Risk behavior and Group formation in Microcredit groups in Eritrea. And they find evidence that borrowers in large groups will take more risk than borrowers in smaller groups.

Yet, for SMEs to identify potential suppliers of financial services, there must be an information flow to small business owners. Information asymmetries are actually concerned with the two players in the financial market. Given two projects with equal expected value, the lender prefers the safest one and the borrower the riskiest. This is because the borrowers know more about their business and find it easy to hide the true nature of their project to exploit the lender’s lack of information. It entails the lack of timely, accurate, and complete information regarding the ability of the applicants to repay back the loan and to access financial products from the banking institutions. [Postle, P. 2005: 136–8.]

Sharma and Deshmukh [2013] studied MFIs facilities and the awareness of people about MFIs. Poor married

women are the target consumers. Two hypotheses underpinned the data analysis of the research. First, Urban Poor people are aware of the concept of micro finance, and the second is that People of Nagpur city are Aware about various schemes under micro finance. The analysis yielded the following result.

They provide loans during their starting or existing business, for the purchase of commercial vehicles and personal two wheelers. In the study most of the poor people of Nagapur city are aware about micro saving schemes. Out of 552 respondents 473 respondents, which is 90.6% stated that they were aware about microfinance. Regarding the awareness about micro-credit, insurance, saving and employment schemes, 17.2%, 9.2%, 55% and 18.6% of the respondents have an awareness about the mentioned schemes respectively. The high level of awareness has been proved in the paper.

Most of the research on Eritrea focused on the roles and activities of Microfinance Institutions and their impact on small businesses. To mention some:

- Asgedom and Muturi [2014] focused on the repayment performance of the SMCP loans in Eritrea.
- Lensink and Mehrteab [2003] addressed Risk behavior and Group formation in Microcredit groups in Eritrea.
- [Habte et al. 2017: 73-107] studied the SMCP effect on the livelihood of households in the rural areas of Eritrea.

None of them has attempted to study the awareness of small business owners towards SMCP in Eritrea. Filling this gap is the ultimate purpose of the research.

3. Methodology

3.1. Study Population

The target population for the study comprised all registered small and Medium Scale Enterprises in Asmara. Asmara is located in the Maekel Region near the center of Eritrea. Asmara is the capital city and largest settlement in Eritrea with a population of around 649,000 inhabitants making it the largest city in Eritrea. As the capital city and largest settlement of Eritrea, most Eritrean businesses have their headquarters in Asmara.

The city was once a factory town. During the colonial period, it was an administrative and commercial center of Italian East Africa. When the British entered the country in 1941, many businesses were closed down or relocated outside of the city. This trend continued under Ethiopian occupation. Textile clothing, footwear, processed meat, beer, soft drinks, and ceramics are Asmara's major industrial products. The city is a marketplace for agricultural products, and a center for tanning hides. The Eritrean economy is largely based on agriculture, which employs 80 percent of the population but contributes little percent to gross domestic product. Agricultural exports include cotton, fruits and vegetables, hides, and meat, but farmers are largely dependent on rain-fed agriculture, and growth in this and other sectors is hampered by lack of a dependable water supply. Asmara is known for its well-preserved colonial Italian modernist architecture. The

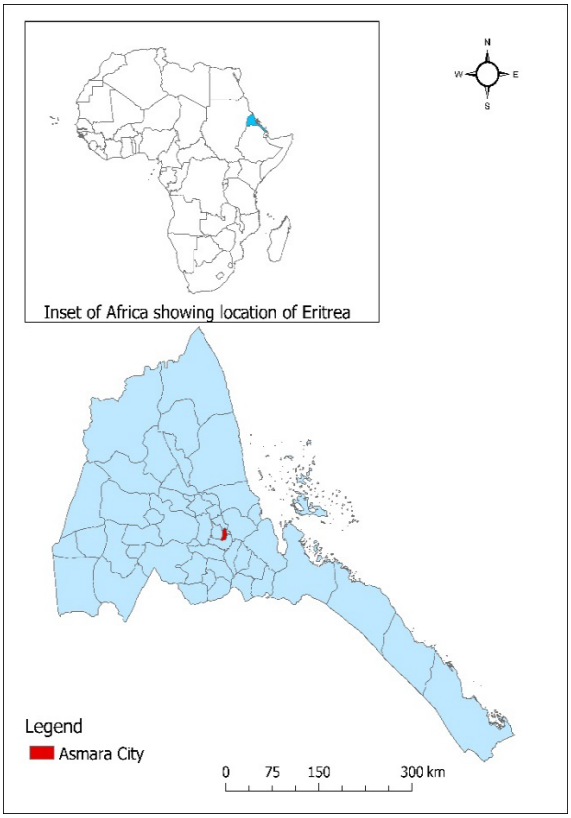

Figure 1. Map of Eritrea.

official currency of Eritrea is the Nakfa. In the city of Asmara there are many SMEs of all kind the poor and rich alike, compared to other cities and they can be a look to the SMEs in other cities.

3.2. Data Collection Tools and Sampling Technique

After developing the research proposal and the reliable data-collecting tool that passed through rigorous statistical procedures, we successfully incorporated all the stakeholders, and data was collected firsthand. I traveled to Eritrea to collect the required data directly from the study participants. The data was collected at Asmara, which is the capital of Eritrea. The study participants were small business owners of various economic and social strata. These included experienced business owners, young people who just launched small businesses, and individuals who sold a few items on the streets of Asmara.

The main tool for collecting primary data in this study was questionnaire. In order to draw the samples randomly, stratified random sampling technique has been used. The two strata are beneficiaries and non-beneficiaries of loans from MFIs. The sampling frame for SMEs was taken from the Ministry of Trade and Industry and SMCP in Asmara

Eritrea. The number of businesses samples were taken proportionally according to the number of SMEs. After compensating for non-responses, the final sample size calculated was 145. Out of 145 only 141 replied positively to our questionnaires and the rest 4 were not responsive.

3.3. Data Analysis

Most of the survey variables were categorical and frequency distributions were used to describe variables of interest. Chi-square goodness of Fit Test was also used to calculate the attitude of the respondents, and its subsequent impact on utilization of loans from MFIs. To know the factors that determine whether being a beneficiary or not and whether non-beneficiaries know about MFI or not, this study made further use of two models of Logistic Regression Analysis:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 x_{1,i} + \cdots + \beta_k x_{k,i},$$
$$p_i = \Pr\,(Y_i = 1),$$

where Y is the dependent variable indicating whether a respondent was a beneficiary or not (Beneficiary=1 / Non-Beneficiary=0 or whether non beneficiary was knowledgeable of MFI=1 or Not knowledgeable =0), β_k is a coefficient associated with the independent variable x_k.

In the first model, if the coefficient is positive (negative), the corresponding variable supports he is beneficiary (non-beneficiary). In the second model, if the coefficient is positive (negative), the corresponding variable supports that the non-beneficiary knows (does not know) MFI.

4. Data Presentation and Analysis

4.1. Socio-economic Characteristics of SMEs in Asmara, Eritrea.

The data collected for this study indicates that the majority of beneficiaries of Microfinance are male (55%) as compared to females (45%).

On the contrary, the majority of non-beneficiaries were female (58.4%) as compared to males (41.6%), which indicates that more needs to be done to make credit available to female entrepreneurs for equitable development.

The study also found that the age of the greater majority of beneficiaries was in the range of 46-60 (55%) followed by those in the age group 31-45 (35%). Meanwhile, young adults aged 18-30 were very few comprising 2.5%. The non-beneficiaries were also mostly between the age of 46 and 60 (41.6%), followed by the 31-45 age group (27.7%).

The study found that 35% of beneficiaries were farmers, 47.5% were ordinary citizens, 15% were post-war victims while the rest 2.5% were orphanages.

Glancing at the business activities, we find that the majority of beneficiaries were involved in commerce (33%) and services (43%). Manufacturing, which has a high potential to create more employment opportunities was lower in proportion at 7%. The study found that the majority of non-beneficiaries were active in commerce (64.4%) and services (25.7%) and active in farming was very low at 4%.

Table 1: Socio-economic Characteristics of the SMEs in Asmara, Eritrea.

Socio-economic variable	Non-Beneficiaries n (%)	Beneficiaries n (%)
Gender		
Male	42(41.6)	22(55.0)
Female	59(58.4)	18(45.0)
Age Category		
18-30	14(13.9)	14(35.0)
31-45	28(27.7)	21(52.5)
46-60	42(41.6)	4(10.0)
Above 60	17(16.8)	22(55.0)
Level of Education		
Illiterate	2(2.0)	1(2.5)
Elementary	22(21.8)	8(20.0)
Junior and High School	60(59.4)	26(65.0)
Diploma Level	9(8.9)	4(10.0)
Degree Level	6(5.9)	1(2.5)
Above Masters	2(2.0)	-
Subject's Background		
Farmer	4(4.0)	14(35.0)
Orphanage	-	1(2.5)
Post-war victim	13(12.9)	6(15.0)
Ordinary	84(83.2)	19(47.5)
Nature of Business		
Manufacturing	9(8.9)	3(7.5)
Commerce	65(64.4)	13(32.5)
Service	26(25.7)	17(42.5)
Others	1(1.0)	7(17.5)

N.B. 145 questionnaires distributed and 141 received. (101= Non-Beneficiaries and 40= Beneficiaries)

4.2. Case studies of SMEs in Asmara, Eritrea

The data collected indicates that 75% of beneficiaries had faced financial challenges. Meanwhile, 12.5% of the beneficiaries of MFI faced social challenges, 15% faced business location challenges, while 5% faced challenges related to rules and regulations. It is clear that the challenges faced by SMEs are mainly financial in nature. Similarly, non-beneficiaries of MFI were also

faced with financial challenges-- a majority of 61.4% stated that the main challenge to start their business was financial. Social, business location, regulatory challenges accounted for 9.9%, 25.7% and 10.9% respectively. Another 12.9% of the respondents stated that they faced no challenges at all.

Also, 35% of SMEs benefiting from MFI indicated that they started business through self-finance compared to 30% who commenced with credit from MFI. 51.5% and 44.6% of non-beneficiaries commenced their business from self-finance and family and Colleagues respectively.

Table 2: Case-studies of the SMEs in Asmara, Eritrea

Variables	Non-Beneficiaries, n (%)	Beneficiaries, n (%)
Challenges in starting business		
Social	10 (9.9)	5 (12.5)
Financial	62 (61.4)	30 (75.0)
Location	26 (25.7)	6 (15.0)
Rules and regulations	11 (10.9)	2 (5.0)
Others	13 (12.9)	4 (10.0)
Objectives for establishment		
Generate income	68(67.3)	26(65)
Create employment opportunities	9(8.9)	1(2.5)
Self-employment	21(20.8)	7(17.5)
Serve Community	2(2.0)	1(2.5)
Growth in Economy	21(20.8)	6(15)
Source of Finance at start		
Self-Finance	52(51.5)	14(35.0)
Family and Colleagues	45(44.6)	10(25.0)
Partnership	-	2(5.0)
Loans from banks and finance institutions	6(5.9)	2(5.0)
MFI	-	12(30.0)
Others	3(3.0)	4(10.0)
Requirements of getting loans from Bank		
Collateral Security	65(64.4)	21(52.5)
Good will	2(2.0)	3(7.5)
License	28(27.7)	10(25.0)
Others	10(9.9)	6(15.0)
Possession of Adequate Capital		
Yes	22(21.8)	14(35.0)
No	79(78.2)	26(65.0)

N.B. 145 questionnaires distributed and 141 received. (101=Non-Beneficiaries and 40=Beneficiaries)
Multiple response allowed and percentages represent a proportion of cases

65% of beneficiaries followed by 67.3% of non-beneficiaries started their business for the purpose of generating income to help their family. 52.5% of beneficiaries and 64.4% of non-beneficiaries said the requirements of getting loans from Bank is Collateral Security. This is very true and that is one of the main reasons MFI existed, to help those small businesses who could not provide collateral.

Table 3: The Contribution of MFIs in the operations of SMEs' in Asmara, Eritrea

Non-Beneficiaries Knowledge and Beneficiaries Expectation about MFI		
Variables	**Non-Beneficiaries, n (%)**	**Beneficiaries, n (%)**
Yes	30(29.7)	38(95.0)
No	71(70.3)	2(5.0)
Ever applied for credit (Non-Beneficiaries) and Increase in Capital from loan (Beneficiaries)		
Yes	1(1.0)	37(92.5)
No	100(99.0)	3(7.5)

N.B. 145 questionnaires distributed and 141 received. (101=Non-Beneficiaries and 40=Beneficiaries)

In contrast, 70.3% of non-beneficiaries had no knowledge about MFI operations at all when compared to 29.7% who stated otherwise. An overwhelming 95% of all beneficiaries stated that MFI fulfilled their expectations, while the rest (5%) found that the MFI did not meet their expectations.

Beneficiaries were queried if they saw an increase in their capital as a result of the loans and a large majority of beneficiaries (92.5%) stated that they saw an increase in their capital as a result of the loans compared to a meager 7.5% who observed no increase in capital.

4.3. Small Businesses Challenges at the Start-up and factors that determine being a beneficial or not

We conducted multivariable logistic regression analysis to estimate coefficients associated with MFI's socioeconomic profile and the answer of the case study, where the independent variable is whether a respondent was a beneficiary (1) or not (0). Table 4 shows the result of analysis (see Table A1 at the last of this paper for detail questionnaire). In order to avoid multicollinearity problem, we eliminated one variable of each pair that has over ± 0.4 correlation coefficient. As we can see McFadden's Pseudo $R2 = 0.49855$, the result is rather effective.

In order to determine the efficacy of MFI in the business operations of SMEs, it is imperative to identify the main challenges that confront these enterprises from the start. All SME owners participating in the study, who constitute beneficiaries and non-beneficiaries of MFI, were queried on the challenges they faced in starting and running their business. According to the data collected from both beneficiaries and non-beneficiaries of MFI,

four major factors have been identified as challenges during the setting up of their businesses. These variables are: financial, social, location and regulatory.

Financial challenges mean the inability of the small businesses to have enough finance. This finding echoed what the World Bank Enterprise Survey (2013) stated that financial limitation as the primary barrier to the growth and development of small businesses. Next to the financial problem is the social problem. Moving from a traditional lifestyle such as farming that has been practiced for many centuries to business is not welcomed by many. In societies like Eritrean where the approval of the family and the community at large has a great impact in every move an individual member, diverting from the traditional way of living to launching and running small business leaves many small businesses to social pressures such as rejection, discouragement, and so on. Another problem people face when they start their business is lack of getting a strategic business location; meaning that either by not having any place at all or a place that doesn't suit the business type. In addition to that sometimes the government doesn't let some type of businesses to establish in a location where the owners preferred. Last but not least one of the identified challenges is regulatory obstacles. By regulatory obstacles means any sort of governmental regulations that somehow negatively affect the small business. These obstacles include prolonged time to get legal permit to start a business, and this is usually due to long bureaucratic procedures.

Table 4: Logistic Regression Analysis of factors associated with being a beneficiary or not. (In order to avoid multicollinearity problem, we eliminated one variable of each pair that has over ±0.4 correlation coefficient.)

Variable		Coefficient	Std. Error	Z-value	Pr(>|Z|)
Socioeconomic Profile					
B11	Manufacturing	1.31820	1.19679	1.101	0.27070
B13	Services	2.08664	0.76430	2.730	0.00633***
B2	Gender	0.99528	0.70638	1.409	0.15884
B31	Age (18-30)	-1.82834	1.36670	-1.338	0.18097
B33	Age (45-60)	-0.47479	0.75674	-0.627	0.53039
B41	Illiterate	0.07160	2.04715	0.035	0.97210
B42	Elementary	0.62567	0.94882	0.659	0.50963
B44	Diploma	1.15597	1.10074	1.050	0.29364
B45	Degree	-0.73637	1.50164	-0.490	0.62386
B51	Farmer	2.39825	1.22031	1.965	0.04938**
B52	Orphanage	20.32975	6522.63877	0.003	0.99751
B53	Post-war	0.21489	0.87286	0.246	0.80553
Case Study of Selected SMEs					
A1	Business duration	-0.01867	0.02419	-0.772	0.44028
A21	Societal challenges	0.20116	1.04279	0.193	0.84704
A23	Location challenges	-0.77097	0.86873	-0.887	0.37483
A24	Regulation challenges	0.02859	1.00748	0.028	0.97736
A25	Other challenges	-0.19443	0.99759	-0.195	0.84547
A31	Family	0.26085	0.74703	0.349	0.72695
A32	Employment	0.74606	1.21863	0.612	0.54040
A34	Community	0.80053	1.68059	0.476	0.63383
A4	People employed	-0.39264	0.21836	-1.798	0.07216*
A52	Friends & relatives	-0.75255	0.65769	-1.144	0.25253
A53	Partnership	18.78651	4153.08491	0.005	0.99639
A54	Banks	-0.63014	1.29610	-0.486	0.62684
A55	MFI	21.29206	1523.48593	0.014	0.98885
A62	Good will	1.70728	1.52973	1.116	0.26440
A63	License	-1.16889	1.01641	-1.150	0.25014
A64	Other requirements	0.33886	1.15054	0.295	0.76836
A7	Adequate capital	1.69144	0.71349	2.371	0.01776**
Criteria					
	Number of observations	141			
	AIC	144.34			
	McFadden's Pseudo R^2	0.49855			

*Significance codes: '***' 0.01 '**' 0.05 '*' 0.1*

As we can see earlier the foremost challenge faced by both beneficiaries (75%) and non-beneficiaries (61.4%) of MFIs is financial. The data acquired found that 10.9% of non-beneficiaries found that rules and regulations was a

challenge, while 5% of beneficiaries listed regulation as a challenge. Equally challenging to non-beneficiaries was the location of the business (25.7) but only 15% of beneficiaries identified this as a challenge. On the contrary, 12.5% of beneficiaries faced social challenges to starting their business compared to just 9.9% of non-beneficiaries.

Table 5: Logistic Regression Analysis of factors associated with whether non-beneficiaries know about MFI or not. (In order to avoid multicollinearity problem, we eliminated one variable of each pair that has over ±0.4 correlation coefficient.)

Variable		Coefficient	Std. Error	Z-value	Pr(>|Z|)
Socioeconomic Profile					
B11	Manufacturing	2.36876	1.26456	1.873	0.06104*
B13	Services	0.10487	0.91738	0.114	0.90899
B2	Gender	0.18783	0.80920	0.232	0.81644
B31	Age (18-30)	0.02211	1.23295	0.018	0.98569
B33	Age (45-60)	0.54889	0.81956	0.670	0.50303
B41	Illiterate	-15.75758	1546.29763	-0.010	0.99187
B43	Junior high	1.00209	1.04573	0.958	0.33793
B44	Diploma	-0.34995	1.92391	-0.182	0.85567
B45	Degree	3.38398	1.68552	2.008	0.04468**
B51	Farmer	1.19571	2.65400	0.451	0.65233
Case Study of Selected SMEs					
A1	Business duration	0.04493	0.02432	1.847	0.06471*
A21	Societal challenges	-4.30483	4.55128	-0.946	0.34422
A23	Location challenges	-0.46727	0.91814	-0.509	0.61080
A24	Regulation challenges	2.47246	1.03768	2.383	0.01719**
A25	Other challenges	0.31363	1.06194	0.295	0.76774
A32	Employment	1.04354	1.20707	0.865	0.38730
A33	Self employed	0.03061	1.14328	0.027	0.97864
A34	Community	1.43228	4.62153	0.310	0.75663
A35	Growth of economy	-2.15635	1.13088	-1.907	0.05655*
A4	People employed	0.45891	0.24613	1.864	0.06225*
A52	Friends & relatives	0.31664	0.78670	0.402	0.68732
A54	Banks	3.29156	1.68443	1.954	0.05069*
A56	Others	-0.05296	1.26576	-0.042	0.96662
A62	Good will	-0.22678	3.76780	-0.060	0.95200
A63	License	0.75234	0.88830	0.847	0.39703
A64	Other requirements	-2.21374	1.59639	-1.387	0.16553
A7	Adequate capital	2.09217	0.98357	2.127	0.03341**
Criteria					
	Number of observations	101			
	AIC	125.1			
	McFadden's Pseudo R^2	0.43768			

*Significance codes: '***' 0.01 '**' 0.05 '*' 0.1*

While all challenges faced during the start of the business (A21-A25) are not statistically significant, we can find that some other factors have significant impact on whether a respondent was a beneficiary or not. Those who has background as a farmer (B51; β=2.39825**), whose business nature is service (B13; β=2.08664***) are more likely to be beneficiaries. Next, those who have more employee (A4; β=-0.39264*) are less likely to be beneficiaries, that is, those who have large employment seem not to have necessity for MFI's help. Lastly, those who have adequate capital for your business (A4; β=1.69144**) are more likely to be beneficiaries. This result echoes the existence of MFI to minimize the SMEs financial distress.

Hypothesis 1 was partially accepted because the results provide evidence that only nature of the business and having adequate funds for daily activities can determine whether a small business will become a beneficiary of an MFI, none of the other stated factors were statistically significant.

4.4. Awareness of non-beneficiaries about MFI and factors that determine their knowledge:

Indeed, it would be obsolete to talk about the awareness of non-beneficiaries about MFIs. As we can see from table 2, they were asked whether they had knowledge about microfinance prior to the study. When we look at the figures regarding non-beneficiaries, we observe that the majority (n=71, 70.3%) have no awareness of MFIs when compared to those who do.

To determine the factors associated whether they significantly affect non-beneficiaries to know about MFI or

not we incorporate logistic regression analysis in the same way as the previous section.

According to the result derived from Table 5, those whose nature of business is manufacturing (B11; β=2.36876*) and whose education is degree level (B45; β=3.38398**) are significantly more likely to know about MFI. So, the nature of the business could determine whether a small business knew about MFI.

Next, those who had regulation challenges at the start of their business (A24; β=2.47246**) were significantly more likely to know about MFI. Those who started their business to serve growth economy (A35; β=-2.15635*) were less likely to know about MFI.

The method of financing at the start of the business could determine whether a small business knew about MFI. Those who used banks (A54; β=3.29156*) were significantly more likely to know MFI. Lastly, those who had adequate capital (A7; β=2.09217**) were significantly more likely to know about MFI.

Hypothesis 2 was fully accepted except for the type of loan requirements needed because the results in each category provide evidence that is statistically significant. The nature of the business, the challenges faced during the start of the business, the objectives for establishment, method of financing, and whether they have adequate capital for the business are all factors that can significantly determine a small business' awareness about MFI.

4.5. Attitude towards MFIs:

We have already seen that the level of awareness about MFIs among non-beneficiaries is comparatively low. But it can be said that the attitude of non-beneficiaries about the impact of prospective loans on their businesses was relatively proportional with 55.4% of respondents having a positive attitude and 44.6% giving negative responses. On the other hand, the majority of beneficiaries (95%) said that MFIs fulfilled their expectations. Contextual meaning of attitude is 'The belief of small businesses towards the importance of MFIs to the growth of their business. And when we say positive attitude it means when beneficiaries are satisfied with the services and products of MFI.

To know the attitude of SMEs towards MFIs different questions were asked to beneficiaries and non-beneficiaries. Beneficiaries were asked whether MFIs fulfilled their expectations and non-beneficiaries were asked whether their business would be improved if they had loan from SMCP.

To further gauge the significance of attitudes towards MFIs among beneficiaries, a chi-square test of goodness fit was conducted. The results have nullified the hypothesis that there is no positive attitude on expectations from MFIs. The test value (χ^2c) 32.4> Table value of chi-square (χ^2t) 3.84. This indicates that MFIs indeed helped those who benefited from them. Therefore, reject Hypothesis 3. See Table 6 for detail.

Table 6: Chi-Square Test of goodness fit to measure beneficiaries' expectation

Variables	Observed	Expected	$(O-E)^2/E$
High expectation	38	20	16.2
No expectation	2	20	16.2
Total	40	40	32.4

N.B. *Number of samples: 40=Beneficiaries.*

4.6. Impact of MFI Loans on Business Capital

To identify the role/contribution of micro finance institutions on small business in Eritrea. The beneficiaries were asked whether the loans acquired from the MFIs led to an increase in their capital. To this, 37 beneficiaries (92.5%) responded positively while a minority of 3 beneficiaries responded negatively. Beneficiaries were asked whether the loans acquired lead to increase in their capital. This is shown in Table 7.

Table 7: Chi-Square Test of goodness fit to measure the Impact MFI made to Beneficiaries

Variables	Observed	Expected	$(O-E)^2/E$
Yes	37	20	14.45
No	3	20	14.45
Total	40	40	28.9

N.B. *Number of samples: 40=Beneficiaries. Chi Square test results are unreliable because not all observed frequencies were greater than 5.*

This hypothesis is specific to beneficiaries who already use fund for their business from MFI. Apart from the descriptive statistics that indicate a majority of beneficiaries witnessing an increase in their capital as a result of MFI loans, a chi-square test of goodness fit has also shown that the impact of MFI loans is statistically significant as can be seen in table7 calculated value (χ^2c) 28.9> Table value (χ^2t) 3.84, then Hypothesis 4 is rejected.

5. Discussion

The results revealed profoundly important findings that would serve as useful information to small business owners and help them connect with the microfinance institutions. Additionally, this would also help the microfinance institutions to improve their activities.

The predominant challenge for both beneficiaries and non-beneficiaries of MFI in Asmara is financial constraint. And it is precisely for this reason that the beneficiaries sought funds from MFIs. Not surprisingly, the vast majority of these beneficiaries (92.5%) reported a positive impact on their businesses and an increase in their capital as a consequence of the credit from MFI. This would inevitably lead us to question why the non-beneficiaries did not follow suit to address their financial problems.

Those who had financial challenges at the start up were significantly less likely to know about MFI and those who have adequate capital were significantly more likely to know about MFI. The result may look contradictory, but it suggests that there are other, possibly more pressing reasons,

why a non-beneficial would remain a non-beneficiary despite having financial challenges.

It seems that the non-beneficiaries' lack of awareness about MFIs. The fact that more than two-thirds of the non-beneficiaries who participated in this study were not aware about MFIs and their activities compels us to look at the concept of information asymmetry from a different perspective. Asymmetry of information is the inability of financial institutions to determine whether the businesses are able to repay their loans. Asymmetric information is when a borrower once in possession of borrowed funds, may divert them (misappropriate) to other personal purposes other than the business activities. However, this study has found that it is not the lack of readily available detailed information about the performance and operations of small businesses that has been a bottleneck to the provision or offering of credit to the non-beneficiaries. On the contrary, it is the total lack of awareness of the majority of non-beneficiaries about the very existence of the MFIs that has denied them the much-needed funds for the growth of their business and augmentation of their capital.

The reason why information asymmetry with regards to MFIs is heavily skewed towards the non-beneficiaries may be attributed to various factors upon deeper study. However, the evidence at hand points inevitably to the inability of the SMCP, the primary and only MFI in Eritrea, to sufficiently reach out to its intended beneficiaries. Indeed, as mentioned earlier, the SMCP, at least on paper, targets a vast portion of the Eritrean population, particularly focusing on disadvantaged segments like war veterans, returnees from the diaspora and women. One of the three operational strategies that are supposed to realize this mission is the strengthening of representative structures across all administrative levels in the country. However, the empirical findings of this study suggest that there may be a certain measure of complacency on the part of the SMCP in its implementation of this strategy. After all, you cannot blame the non-beneficiaries for not knowing about the SMCP if it does not make efforts to advertise its services and reach out to potential clients.

This lack of awareness in business owners in Asmara, Eritrea is in stark contrast to the level of awareness described in other studies. For instance, Sharma and Deshmukh [2013], has found that awareness about MFIs was rather high at 90.6% among the poor of Nagapur city in India. Not only had that but her study showed that the awareness extended to the different activities and offers of MFIs in varying degrees.

If businesses in Eritrea, which are already operating despite challenges, have such a low level of awareness about MFI, one can assume how a lack of knowledge in the general population is precluding many disadvantaged individuals from starting their own SMEs and contributing to the growth and development of the economy.

Would the non-beneficiaries have utilized loans of MFIs had they been aware? This is not a hypothetical question. The study found that 0.99% of non-beneficiaries had ever applied for a loan from SMCP. In plain terms, two-thirds of the non-beneficiaries did not know about the MFI and thus they never requested loans. Also, it has been found that the awareness about MFIs has a strong statistical relationship with the utilization of loans.

However, another factor that requires consideration is the skepticism of approximately 45% of non-beneficiaries towards loans. This does not mean that these beneficiaries were only averse to loans from MFIs as opposed to other financial institutions; rather, data indicates that 53.4% of non-beneficiaries cited banks as their primary source for additional capital. This leads us to surmise that non-beneficiaries could have made use of loans from MFIs if they had been aware of its availability, its ease of access and potential rewards.

6. Conclusion

By investigating both beneficiaries and non-beneficiaries, this study has been able to bring forth conclusive evidence that, when accessed, MFI loans have a significant positive impact on the growth of SMEs. However, it has also found that there is a big lack of awareness about MFIs and the services that they provide. It is this lack of awareness that has prevented the non-beneficiaries from utilizing loans from MFIs. On top of this, the negative attitude towards loans presents an additional challenge in helping SMEs to address financial shortages and problems in running their businesses. This clearly indicates that not only the non-beneficiaries but also people in general need to be made aware about the MFIs to increase the role of SMEs in the development of the Eritrean economy.

In this study the statistical logistic regression analysis reveals that those who has farmer background and whose nature of business is service are significantly more likely to be beneficiaries, on the other hand those who have more employees are less likely to be beneficiaries, that is, those who have large employment seem not to have necessity for MFI's help. On top of that the study found out that those who had adequate capital were more likely to be beneficiaries. This supports the proponents of MFI who argue that MFI can be a real solution to small business finance constraints.

The study also found out that those who had regulation challenges at the start of their business were significantly more likely to know about MFI. And also, those whose nature of business manufacturing, those whose education is degree level and those who had adequate capital are significantly more likely to know about MFI. But those who started their business to serve growth economy were less likely to know about MFI. This result suggests the need for research into the possible reasons for these observations.

At the outset, this study attempted to fill a gap in research on MFIs in general. This gap pertained to the levels of awareness and the attitudes of SMEs towards MFIs.

However, while reviewing previous literature, it has been found that the gap is far wider than previously conceived. Researchers have tended to focus their studies on the limited MFI activities being undertaken, particularly the beneficiaries. It cannot be maintained that socio-economic justice and development are being promoted by MFIs [Habte et al. 2017] while the majority of SMEs remain non-beneficiaries. Also, narrow research perspectives on the characteristics and behaviors of the beneficiaries or groups of beneficiaries fail to provide a fuller picture of the real situation [Asgedom & Muturi. 2014; Lensink & Mehrteab. 2003]. Therefore, future research on the domain of SMEs and MFIs needs to follow a more holistic approach.

This study confirms that, even in Eritrea, MFI help to stimulate growth of their beneficiaries through the provision of dearly needed resources. It was shown here that 93% of SMEs benefiting from access to MFI credit have seen an increase in their capital and were satisfied with MFI as their expectations had been met. Nonetheless, a worrying revelation is the fact that the awareness about the existence of MFI is exceptionally low in the case of Eritrea.

7. Recommendations

Solving the problem of lack of awareness about MFIs and the negative attitude towards loans rests primarily on the shoulders of the SMCP. Serious consideration must be given by the SMCP to take the following measures:

- Introducing extensive sensitization programs on MFI activities and their benefits to SMEs
- Galvanizing SMCP operational strategies; in particular, strengthening cooperation with stakeholders at all levels of the community to ensure wider outreach in the population
- Co-opting successful beneficiaries in the sensitization programs and encouraging them to share their practices

At the same time, the government must promulgate policies and create conducive grounds for the privatization and proliferation of MFIs in Eritrea.

Researchers can also contribute positively to these efforts by making studies to identify who and how more people can become beneficiaries of MFIs. More studies are also needed to identify challenges to SMEs on a broader scale and how they can be tackled.

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Appendix

Table A1: Detail questionnaire

Socioeconomic Profile		
B1	What is the nature of your Business?	
	B11	Manufacturing
	B12	Commerce
	B13	Services
	B14	Others
B2	Kindly indicate your gender. (Male:1, Female: 0)	
B3	Kindly tell us your age.	
	B31	18-30
	B32	31-45
	B33	45-60
	B34	Above 60
B4	What is the level of your Education?	
	B41	Illiterate
	B42	Elementary
	B43	Junior high school
	B44	Diploma level
	B45	Degree level
	B46	Above master's level
B5	Background of the owner.	
	B51	Farmer
	B52	Orphanage
	B53	Post-war victim
	B54	Ordinary
Case Study of Selected MFIs		
A1	How long have you kept your business?	
A2	The challenges you face when you start your busines.	
	A21	Societal
	A22	Financial
	A23	Location
	A24	Rules and regulation
	A25	Other challenges
A3	What was the objective for establishing your business?	
	A31	To generate income to support their family
	A32	To create employment opportunities for others
	A33	To be self employed
	A34	To serve the community
	A35	For better growth of economy
A4	How many people have you employed?	
A5	How did you finance when you start your business?	
	A51	Self
	A52	Friends & relatives
	A53	Partnership
	A54	Loans from banks & finance institutions
	A56	Others
A6	To get loan from bank what are the requirements?	
	A61	Collateral security
	A62	Good will
	A63	License
	A64	Others
A7	Do you have adequate capital for your business?	

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On the Correlation between Market Risk Premiums and SDGs: Implications to Corporate Value

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Abstract: There are plethora of papers analyzing the correlation between CSR / SDGs / ESG and corporate values / stock prices / stock returns, however, a few of them focus on how CSR / SDGs / ESG factors improve or destroy the corporate value and only a very limited number of papers analyze the market risk premium as factor of corporate value. This paper focuses on how the macro level SDG indices are associated with market risk premiums and the corporate value. We show that contributions to SDGs related activities pursuing to improve the overall SDG Index Score as well as SDG 3 (Good Health and Well-Being) and 13 (Climate Action) scores could increase the corporate value via the reduction of the market risk premium. On the other hand, SDG 15 (Life on Land) and 16 (Peace, Justice and Strong Institutions) scores are not correlated with market risk premiums, while an SDG 9 (Industry Innovation and Infrastructure) score is positively correlated with market risk premiums. We need further analysis to conclude the relationship between market risk premiums and SDG 1,2, 4-8, 10-12, 14, and 17.

Keywords：SDG Index, SDGs, ESG, CSR, Market Risk Premium, Corporate Value

1. Introduction

This paper analyzes whether there are significant correlations between Sustainable Development Goals (SDGs) and market risk premiums. We find that the SDGs related activities or projects improving the overall SDG Index Score as well as SDG 3 (Good Health and Well-Being) and 13 (Climate Action) scores could increase the value of the corporation via the reduction of the market risk premium. On the other hand, the correlation between market risk premiums and SDG 15 (Life on Land) and 16 (Peace, Justice and Strong Institutions) scores are not statistically significant at 10% level. An SDG 9 (Industry Innovation and Infrastructure) score is positively correlated with market risk premiums. We need further analysis to conclude the relationship between market risk premiums and SDG 1, 2, 4-8, 10-12, 14, and 17. Descriptions of 17 SDGs are shown in Table 1.

In this paper, the value of the corporation is defined as equation (1).

$$V_0 = \frac{E^P\left(CF_1\right)}{\left(1+WACC\right)^1} + \frac{E^P\left(CF_2\right)}{\left(1+WACC\right)^2} + \ldots + \frac{E^P\left(CF_n\right)}{\left(1+WACC\right)^n}$$
$$WACC = \frac{D}{E+D}\left(1-\tau\right)r_D + \frac{E}{E+D}r_E \qquad (1)$$
$$r_E = r_f + \beta\left(r_m - r_f\right)$$

where, V_0 is the value of the corporation at $t = 0$, $E^P()$ is the expected value calculator under the physical probability measure, CF_t is the free cash flow to the corporation at time t, n is the expected life span of the corporation, $WACC$ is the weighted average cost of capital, D is the market value of the debt, E is the market value of the equity, τ is the effective tax rate, r_D is the cost of debt, r_E is the cost of equity, r_f is the risk free rate, β is the measure of market risk, and r_m is the return on the market portfolio.

As seen in equation (1), if contributions to SDGs reduce the market risk premium (MRP) defined as r_m - r_f, the value of the corporation improves. A plethora of papers analyze the impact of Corporate Social Responsibility (CSR) / Environment, Social, and Governance (ESG) / SDGs factors on the corporate performance. However, as far as we know, few papers focus on the correlation between SDGs and MRPs. The only exceptions are Buhr et al. (2018), Kling et al. (2018), and Nemoto and Liu (2020). Buhr et al. (2018) and Kling et al. (2018) show that environmental consideration would reduce the country risk premium using the data of government bonds issued in 46 countries. However, they focus on the climate related indices and their impacts on the sovereign bond yields. Nemoto and Liu (2020) use country level ESG scores in order to analyze the correlation between these ESG scores and costs of sovereign debt. While Nemoto and Liu (2020) use the overall social score, they did not utilize more detailed social scores.

Table 1: Descriptions of 17 SDGs

SDGs	Descriptions
SDG 1	No Poverty
SDG 2	Zero Hunger
SDG 3	Good Health and Well-Being
SDG 4	Quality of 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	Reduced 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	Partnership for the Goals

Source: The United Nations' website (https://sdgs.un.org/goals, accessed July 10th, 2022).

On the other hand, this paper uses SDG indices related to all 17 goals including both social and environmental issues of all countries where these data are available. We use 790 samples in total for five years (158 countries' data per year on average) in terms of the overall SDG Index Score. This paper provides broader perspectives on how the contributions to SDGs have the impact on the market risk premiums.

This paper is organized as follows. The second section reviews the related literature. The third section describes the data employed. The fourth section shows the descriptive statistics and analyzes the correlation between the MRPs and the SDG indices. The fifth section concludes the paper.

2. Literature Review

A plethora of papers analyze the relationship between CSR / ESG / SDGs factors and the value of the corporation. However, the impact of CSR / ESG / SDGs consideration on corporate performance is controversial. Friede, Busch, and Bassen (2015) point out 62.6%, 6.9%, and 30.5% of 1,902 meta-analyses studies find positive, negative, or neutral correlation between corporate performances and CSR activities, respectively. While Friede, Busch, and Bassen (2015) claim that approximately 90% papers show non-negative results, the fact that 37.4% papers showing non-positive results is not ignorable.

Additionally, it is important to consider how SDGs create or destroy the value of the corporation. According to equation (1), SDGs have a positive impact on the value of a corporation if 1. the expected free cash flows are improved, 2. the risk premium is reduced, or 3. the expected life span of the corporation is improved by SDGs.

First, CSR could improve the value via the improvement of cash flow. Khan, Serafeim, and Yoon (2016) show that the corporations which have high investment in material sustainable issues have higher growth in returns on sales two years or later from the time corporations invested in material sustainable issues using U.S.A. data. As a result, monthly stock returns are higher for corporations which have high investment in material sustainability issues due to the higher alpha controlled by the Fama-French three-factor model (Fama and French 1993). On the other hand, Ogata (2016) shows that profitability and environmental, social, and governance scores (ESG scores) are not positively correlated with profitability measures such as ROE. Ogata (2016) also shows that Socially Responsible Investment (SRI) funds in Japan select corporations with higher ROE in the portfolio at first but the difference in ROE between firms in SRI funds and firms excluded from them diminish after five years or later from the time of selection. Goss and Roberts (2011) show that over emphasis on CSR might destroy the firm value due to the problem of over-investment.

On the other hand, the impact of CSR or ESG consideration on the risk premium is less controversial. For example, Lins, Servaes, and Tamayo (2017) show that firms concerning CSR have higher returns during the crisis period by 4-7 %, that is, lower risks in the crisis period. Orlitzky and Benjamin (2001) and Jo and Na (2012) show that investments in CSR reduce both the market risk measured by beta and the firm-specific risk. Shirasu (2011) using Japanese data shows that the average beta of corporations included in SRI funds is lower in crisis period than in normal period while average beta of other types of corporations is higher in crisis period.

Additionally, CSR / ESG / SDGs considerations could lead to lower yield spread. Crifo, Diaye, and Oueghlissi (2017) show that emphasis on ESG decreases the government bond spreads.

As for the analysis on the correlation between CSR / ESG / SDGs and MRPs, a very limited number of papers address these issues. As far as we know, Buhr et al. (2018), Kling et al. (2018), and Nemoto and Liu (2020) are the only exceptions. Buhr et al. (2018) and Kling et al. (2018) show that countries which are vulnerable to climate change tend

to have higher yield on country sovereign bonds. However, they use indices related to climate change only but do not utilize the indices related to social issues included in SDGs. Nemoto and Liu (2020) using country level ESG scores show that overall ESG scores are negatively correlated with sovereign debt costs. However, they just use one index for each social and environmental aspect while this paper uses all 17 SDGs indices including both environmental and social aspects in addition to one overall country level SDG Index Score.

Unique contributions of this paper to the literature are summarized as follows. First, this paper uses indices related to all 17 SDGs including both environmental and social issues in order to examine what kind of SDGs related activities have a positive, a negative, or no impact on MRPs. Second, we use both developing and developed countries' data to see how SDG indices are related to MRPs. Third, we use the MRP defined as r_m - r_f in equation (1), as a proxy of country risk premium instead of sovereign bond yield. Using MRP as a proxy of country risk premium allows investors to understand how the SDGs have impact not only on r_f but also on r_m in equation (1). Lastly, we use three kinds of MRPs in order to examine whether estimated impacts of SDGs related activities on MRPs are robust or not.

We explain details of data related to MRPs and SDGs in Section 3.

3. Data

We use three types of MRPs as proxies of the country risk premium and 18 types of SDG indices in order to consider how the environmental and social aspects have an impact on the market risk premium.

First of all, as for MRPs, we utilize the survey conducted by Fernandez (Fernandez et al. 2016-2021) and the data provided by Damodaran[1]. He updates the market risk premiums[2] in January every year except 2020. As for 2020, the premiums in April are reported. That is, the premiums estimated incorporate the impact of COVID-19. Damodaran estimates the premiums by two methodologies. One uses the credit ratings of the sovereign bonds and the other one uses the credit spreads implied by the credit default swaps. We call MRPs reported by Fernandez et al. (2016-2021) as MRP (F), those estimated from the credit ratings as MRP (CR), and those estimated from the credit spreads as MRP (CS) hereinafter.

As the determination of the best one among three types of MRPs is beyond the scope of this paper, we utilize all of these three types of MRPs. By doing so, we could check the robustness of the correlation between SDG indices and MRPs by seeing how many of them are significant. If all analyses show consistent results no matter the types of MRPs, we can reasonably conclude that correlations between SDGs and MRPs found by our analysis are more believable. If only one of the analyses shows the statistically significant result, the statistical significance might be just coincidentally observed.

We use MRPs instead of the spreads of bonds traded in the market because the impact of social and environmental issues such as climate risk on the finance market should be observed in both green and non-green bonds as these social and environmental issues are externalities (Preclaw and Bakshi 2015). In other words, both green and non-green bonds and even stocks should benefit from the less climate risk environment. It is difficult to extract the benefit (e.g. green premium) analyzing the difference of spread between green and non-green bonds. We assume that MRPs reflect the externalities of social and environmental issues within the country. We could also argue that a country's positive contribution to society or the environment could benefit other countries. Implications from our analysis just focus on the externalities which do not beyond the domestic environmental and social issues.

Second, as for SDG indices, we utilize Sachs et al. (2016-2020). Sachs et al. (2016-2020) report SDG indices for 17 goals and overall SDG Index Score for each country in June or July since 2015. We exclude the 2015 report, which only reports the indices for 34 industrialized countries. After that, SDG indices are reported for 149, 157, 156, 162, and 166 countries in 2016, 2017, 2018, 2019, and 2020, respectively. SDGs indices are scaled from 0 (worst) to 100 (best). Sachs et al. (2016-2020) note that they construct these indices based on the several indicators related to SDGs such as poverty headcount ratio at $1.90/day (% population). They refine the methodologies to calculate these SDG indices and claim that these indices cannot be compared across the report. However, we assume that change in the ranking or scores due to the

1 Data is retrieved from Damodaran's website (http://pages.stern.nyu.edu/~adamodar/, accessed on July 10th, 2022)

2 Damodaran defines r_m - r_f as equity risk premium (ERP). For simplicity, we call this ERP as MRP in this paper.

change in the methodology is not significant compared to the real improvement in the SDGs contribution to each country. We decided to use all the data from 2016 to 2020 in order to analyze the correlation between MRPs and SDG indices.

Third, we also use the control variables to see whether the statistical significance observed from the regression analysis is robust or not. Control variables employed to the regression analysis are Gross Domestic Product (GDP) per capita, Democracy Index, and Government Debt / GDP. In this sense, we exclude a control variable from the regression model if the correlation between the control variable and an SDG index is not statistically significant at 10% level. We retrieve GDP per capita from the World Bank, Government Debt / GDP from International Monetary Fund (IMF), and the Democracy Index from the Economist Intelligence Unit[3]. The Democracy Index measures the state of democracy for 165 independent states and two territories based on five categories, namely, electoral process and pluralism, civil liberties, the functioning of government, political participation, and political culture.

We report the descriptive statistics and results of regression analysis in section 4.

4. Analysis

4.1 Descriptive Statistics

Table 2 shows the descriptive statistics of MRPs. MRP (F), MRP (CR), and MRP (CS) are different in terms of the absolute values but trends of these values are more or less the same. Additionally, Table 3 reports the correlation among these three MRPs. Raw values as well as differences of these MRPs are highly correlated with each other.

As these MRPs are not perfectly correlated, we can reasonably say these MRPs capture different perspectives of country risk premiums. Using these MRPs are meaningful to examine the correlation between contributions to SDGs and MRPs.

Table 2: Descriptive Statistics of MRPs

MRP (F)						
	All	2021	2020	2019	2018	2017
Mean	7.90%	7.62%	8.22%	8.19%	7.68%	7.68%
Median	7.00%	6.85%	7.20%	7.50%	6.90%	6.70%
s.d.	2.82%	2.44%	2.90%	2.99%	3.06%	2.74%
Min	5.10%	5.20%	5.60%	5.60%	5.10%	5.60%
Max	23.70%	19.80%	23.10%	23.70%	22.10%	17.40%
N	330	86	79	67	57	41
MRP (CR)						
	All	2021	2020	2019	2018	2017
Mean	10.24%	8.55%	12.56%	10.76%	8.94%	10.36%
Median	9.24%	8.21%	11.51%	10.13%	7.96%	9.24%
s.d.	4.13%	3.35%	5.05%	3.84%	3.06%	3.73%
Min	4.72%	4.72%	6.01%	5.96%	5.08%	5.69%
Max	28.10%	23.90%	24.52%	28.10%	16.60%	19.90%
N	675	140	140	135	131	129
MRP (CS)						
	All	2021	2020	2019	2018	2017
Mean	7.73%	6.33%	9.21%	8.35%	6.38%	8.16%
median	6.76%	5.50%	7.63%	7.40%	5.97%	7.15%
s.d.	3.50%	2.02%	4.44%	2.49%	1.39%	4.83%
Min	4.72%	4.72%	6.01%	5.96%	5.08%	5.69%
Max	43.15%	12.99%	31.78%	15.68%	11.28%	43.15%
N	353	74	76	76	63	64

Note: MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021), MRP (CR) and MRP (CS) are estimated by Damodaran and based on the credit ratings and the credit spreads, respectively. s.d. indicates standard deviation. N indicates the number of samples.

Table 3: Correlations among MRPs (F, CR, and CS)

Raw Values			
	MRP (F)	MRP (CR)	MRP (CS)
MRP (F)	1.00***	0.89***	0.75***
MRP (CR)	0.89***	1.00***	0.83***
MRP (CS)	0.75***	0.83***	1.00***
Year-to-Year Differences			
	MRP (F)	MRP (CR)	MRP (CS)
MRP (F)	1.00***	0.52***	0.41***
MRP (CR)	0.52***	1.00***	0.77***
MRP (CS)	0.41***	0.77***	1.00***

Note: MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021), MRP (CR) and MRP (CS) are estimated by Damodaran and based on the credit ratings and the credit spreads, respectively. *** indicates 1% level of statistical significance.

3 Data is retrieved from The Economist Intelligence Unit's website (https://www.eiu.com/n/campaigns/democracy-index-2020/, accessed July 10th, 2022)

Table 4: Descriptive Statistics of the SDG indices and Control Variables

Panel A: SDG Indices

Overall SDG Index Score						
	All	2020	2019	2018	2017	2016
Mean	64.28	66.77	65.99	64.90	64.84	58.41
Median	65.92	68.73	68.01	66.06	65.97	59.33
s.d.	11.36	9.96	10.03	10.18	10.80	13.80
Min	26.10	38.54	39.08	37.66	36.75	26.10
Max	85.61	84.72	85.22	84.98	85.61	84.53
N	790	166	162	156	157	149
SDG 1 (No Poverty)						
	All	2020	2019	2018	2017	2016
Mean	79.98	73.83	74.40	86.25	85.22	NA
Median	96.70	90.62	90.40	98.61	98.23	NA
s.d.	28.74	32.16	31.50	23.77	24.50	NA
Min	0.00	0.00	0.00	0.00	0.00	NA
Max	100.00	100.00	100.00	100.00	100.00	NA
N	616	154	151	156	155	NA
SDG 2 (Zero Hunger)						
	All	2020	2019	2018	2017	2016
Mean	53.91	55.19	53.56	54.42	52.40	NA
Median	53.62	56.55	53.70	52.57	51.43	NA
s.d.	11.65	10.62	9.79	13.57	12.30	NA
Min	14.74	20.76	19.01	14.74	21.84	NA
Max	83.23	80.24	77.87	83.23	80.42	NA
N	641	166	162	156	157	NA
SDG 3 (Good Health and Well-Being)						
	All	2020	2019	2018	2017	2016
Mean	70.25	69.30	70.04	70.99	70.74	NA
Median	76.19	75.58	75.62	76.66	76.19	NA
s.d.	19.72	20.10	20.11	19.07	19.70	NA
Min	15.41	15.41	17.59	21.75	24.55	NA
Max	97.89	97.08	97.89	97.05	97.58	NA
N	641	166	162	156	157	NA
SDG 4 (Quality Education)						
	All	2020	2019	2018	2017	2016
Mean	74.83	78.69	76.90	71.13	72.34	NA
Median	83.14	87.94	85.86	79.39	80.24	NA
s.d.	23.26	22.68	23.37	23.61	22.76	NA
Min	1.64	1.64	8.42	4.77	3.91	NA
Max	99.94	99.91	99.92	99.94	99.84	NA
N	639	164	162	156	157	NA
SDG 5 (Gender Equality)						
	All	2020	2019	2018	2017	2016
Mean	61.30	61.04	60.17	64.18	59.87	NA
Median	64.10	63.44	62.71	67.91	63.83	NA
s.d.	16.25	16.39	16.19	15.72	16.50	NA
Min	6.72	6.72	10.39	15.01	14.16	NA
Max	92.60	91.23	89.24	91.89	92.60	NA
N	641	166	162	156	157	NA
SDG 6 (Clean Water and Sanitation)						
	All	2020	2019	2018	2017	2016
Mean	72.25	67.86	67.64	75.60	78.32	NA
Median	74.05	69.56	69.20	80.99	82.94	NA
s.d.	16.76	14.72	16.44	16.96	16.35	NA
Min	27.47	32.71	27.47	28.85	29.16	NA
Max	100.00	94.95	96.98	100.00	98.50	NA
N	641	166	162	156	157	NA
SDG 7 (Affordable and Clean Energy)						
	All	2020	2019	2018	2017	2016
Mean	68.78	71.66	71.13	66.00	66.09	NA
Median	81.84	87.15	86.49	79.60	78.56	NA
s.d.	27.94	27.67	28.14	27.98	27.73	NA
Min	0.00	0.11	0.00	0.00	0.00	NA
Max	99.91	99.71	99.37	98.89	99.91	NA
N	641	166	162	156	157	NA
SDG 8 (Decent Work and Economic Growth)						
	All	2020	2019	2018	2017	2016
Mean	67.65	71.77	71.63	64.90	61.92	NA
Median	70.60	72.60	72.57	64.53	61.85	NA
s.d.	14.83	10.56	10.43	16.37	18.18	NA
Min	11.95	37.47	36.48	11.95	17.05	NA
Max	95.76	91.85	90.61	92.93	95.76	NA
N	641	166	162	156	157	NA
SDG 9 (Industry Innovation and Infrastructure)						
	All	2020	2019	2018	2017	2016
Mean	36.47	41.81	35.06	35.29	33.46	NA
Median	29.83	35.04	29.32	28.93	26.35	NA
s.d.	25.03	27.22	23.72	24.09	24.22	NA
Min	0.85	1.81	1.87	0.85	1.69	NA
Max	98.76	98.76	93.31	92.83	93.86	NA
N	641	166	162	156	157	NA
SDG 10 (Reduced Inequalities)						
	All	2020	2019	2018	2017	2016
Mean	58.91	56.96	59.12	57.28	62.52	NA
Median	60.59	57.10	60.68	60.49	66.23	NA
s.d.	23.92	23.98	24.36	23.15	24.06	NA
Min	0.00	0.00	0.00	0.00	0.00	NA
Max	100.00	100.00	100.00	100.00	100.00	NA
N	596	149	148	156	143	NA
SDG 11 (Sustainable Cities and Communities)						
	All	2020	2019	2018	2017	2016
Mean	71.95	71.58	71.81	70.81	73.60	NA
Median	77.23	77.01	77.43	75.44	80.11	NA
s.d.	17.85	16.76	16.10	15.87	22.10	NA
Min	0.00	17.71	27.76	26.42	0.00	NA
Max	100.00	100.00	98.35	97.28	100.00	NA
N	641	166	162	156	157	NA
SDG 12 (Responsible Consumption and Production)						
	All	2020	2019	2018	2017	2016
Mean	73.10	76.45	77.43	69.24	68.94	NA
Median	76.30	81.38	82.80	73.30	73.10	NA
s.d.	16.15	17.45	19.00	12.49	12.51	NA
Min	17.77	17.77	22.17	28.86	24.31	NA
Max	99.29	96.21	99.29	93.69	93.57	NA
N	641	166	162	156	157	NA

SDG 13 (Climate Action)						
	All	2020	2019	2018	2017	2016
Mean	82.79	83.29	86.61	82.33	78.78	NA
Median	87.04	90.00	90.91	85.61	81.66	NA
s.d.	14.53	18.78	13.35	11.65	11.93	NA
Min	13.31	13.31	33.41	23.30	30.14	NA
Max	99.91	99.91	99.43	95.93	95.00	NA
N	641	166	162	156	157	NA
SDG 14 (Life below Water)						
	All	2020	2019	2018	2017	2016
Mean	51.28	60.71	50.51	48.65	45.53	NA
Median	51.50	61.24	52.32	48.42	45.81	NA
s.d.	13.43	11.30	15.05	10.15	12.48	NA
Min	5.80	5.80	8.67	10.67	10.53	NA
Max	83.07	83.07	81.30	81.54	75.98	NA
N	526	126	126	156	118	NA
SDG 15 (Life on Land)						
	All	2020	2019	2018	2017	2016
Mean	62.80	65.88	64.81	60.38	59.86	NA
Median	63.01	65.25	65.38	60.74	60.72	NA
s.d.	14.60	14.05	14.64	13.06	15.68	NA
Min	11.08	25.25	23.50	25.66	11.08	NA
Max	97.84	97.84	93.31	90.71	90.44	NA
N	641	166	162	156	157	NA
SDG 16 (Peace, Justice and Strong Institutions)						
	All	2020	2019	2018	2017	2016
Mean	64.89	66.25	66.01	63.84	63.33	NA
Median	64.88	67.40	67.44	64.08	63.02	NA
s.d.	13.67	14.03	14.05	13.62	12.78	NA
Min	29.90	29.90	31.07	36.40	31.21	NA
Max	94.65	94.65	93.05	93.09	92.37	NA
N	641	166	162	156	157	NA
SDG 17 (Partnership for the Goals)						
	All	2020	2019	2018	2017	2016
Mean	63.41	62.15	64.46	62.06	65.02	NA
Median	61.93	61.75	63.04	59.77	62.87	NA
s.d.	15.24	14.34	14.79	15.06	16.65	NA
Min	0.00	30.93	27.24	0.00	0.00	NA
Max	100.00	100.00	100.00	100.00	100.00	NA
N	641	166	162	156	157	NA

Panel B: Control Variables

GDP per capita (USD, GDP_t)						
	All	2020	2019	2018	2017	2016
Mean	20,251	20,233	21,431	20,758	19,893	18,939
Median	13,142	13,026	14,099	13,555	12,771	12,224
s.d.	20,717	21,118	21,717	21,150	20,347	19,320
Min	771	771	783	780	774	797
Max	119,415	118,504	119,415	117,245	114,986	113,365
N	912	180	183	183	183	183

Democracy Index (DI_t)						
	All	2020	2019	2018	2017	2016
Mean	5.44	5.36	5.43	5.47	5.46	5.51
Median	5.70	5.72	5.65	5.66	5.69	5.73
s.d.	2.22	2.25	2.25	2.21	2.20	2.21
Min	1.08	1.08	1.08	1.08	1.08	1.08
Max	9.93	9.81	9.87	9.87	9.87	9.93
N	820	164	164	164	164	164
Government Debt / GDP (%, $Debt_t$)						
	All	2020	2019	2018	2017	2016
Mean	58.20	67.95	56.90	55.59	55.34	55.30
Median	49.22	58.91	49.06	48.18	47.44	46.71
s.d.	37.26	42.82	35.90	34.87	35.16	35.85
Min	2.58	2.86	2.58	2.59	2.83	3.00
Max	272.92	272.92	200.35	199.72	202.54	194.60
N	831	165	166	166	167	167

Source: We retrieve SDG indices from Sachs et al. (2016-2020), GDP per capita (GDP_t) from the World Bank, the Democracy Index (DI_t) from The Economist Intelligence Unit, and Government Debt / GDP ($Debt_t$) from International Monetary Fund (IMF),
Note: Sachs et al. (2016) does not report the SDG index for each goal.

As shown in Panel A of Table 4, mean and median of each SDG index do not change significantly each year. Their standard deviations are also consistent each year. While the methodologies to calculate the SDG indices are modified year by year, we can reasonably make use of these indices to compare with MRPs.

According to Panel B of Table 4, as for GDP_t, there are huge differences between median and mean each year. It indicates that GDP per capita might not follow the normal distribution. We exclude the outliers when applying panel regression models. Details of the method applied to exclude outliers are explained in section 4.2. On the other hand, as for DI_t, its median and mean values are more or less same for each year. Lastly, as for $Debt_t$, it has significantly increased in 2020. It could be due to the impact of COVID-19. We exclude $Debt_t$ from the analysis of SDG 1, 2, 5, 6, 8, 10, 13, and 15 as these SDG indices are not correlated with $Debt_t$. In other words, inclusion of $Debt_t$ does not have the impact on the estimation of correlations between SDG indices and MRPs. Main purpose of this paper is estimation of these correlations but not the construction of the statistical model to forecast these MRPs.

In the next subsection, we run the regression in order to estimate the correlations between SDG indices and MRPs.

4.2 Regression Analysis

In order to analyze the correlation between MRPs and SDGs indices, we have applied the panel data regression model. First of all, we have conducted the Hausman test to see which is more appropriate, fixed effect model or random effect model for all regression specifications. If the Hausman test rejects the null hypothesis, results from the fixed effects and the random effects model are significantly different. In this case, results from fixed effects models are more appropriate.

However, even if the Hausman test does not reject the null hypothesis, it does not necessarily mean the random effect model is more appropriate. According to Okui (2005), results of the fixed effects model are appropriate no matter the results of the Hausman test while results of random effect model are appropriate only if the Hausman test does not reject the null hypothesis. Additionally, statistical tests such as the Hausman test sometimes do not reject the null hypothesis even if the null hypothesis is not appropriate, that is, a fixed effect model could be appropriate. Furthermore, it is hard to prove that individual-specific effects e.g. country specific effects are not correlated with explanatory variables although we need this assumption in order to use a random effects model. Lastly, a fixed effects model could avoid the omitted variable bias.

In this paper, if the Hausman test rejects the null hypothesis at the 5% significance level, we just report the results of the fixed effects model. If not, we report results from both fixed and random effects models. In this case, if both models show the consistent results, we can reasonably conclude the results are robust. However, if these results are inconsistent with each other, we could not conclude what is the true correlation between the SDG index and MRPs. Results of the Hausman test are reported in Table 5.

Table 5 shows that we conclude the fixed effects model is appropriate for 65% (35 out of 54) of model specifications. We report results of both fixed and random effects models for 19 model specifications; we could not conclude which model is more appropriate.

Additionally, a problem of autocorrelation and cross-sectional dependence is observed in our analysis. We have corrected these issues using Driscoll and Kraay (1998) Robust Covariance Matrix Estimator. We also correct the heteroskedasticity using the HC3 estimator proposed by Davidson and MacKinnon (1993). HC3 estimator of the variance-covariance matrix of the regression coefficient is given by equation (2).

Table 5: Results of the Hausman Test (χ^2)

	MRP (F)	MRP (CR)	MRP (CS)
SDG Index Score	9.96*	2.86	8.97
SDG 1 (No Poverty)	29.56***	92.06***	2.44
SDG 2 (Zero Hunger)	27.87***	24.74***	63.44***
SDG 3 (Good Health and Well-Being)	16.50***	24.02***	28.41***
SDG 4 (Quality of Education)	14.06***	11.37**	182.83***
SDG 5 (Gender Equalities)	8.32**	22.11***	13.44***
SDG 6 (Clean Water and Sanitation)	525.22***	15.19***	57.81***
SDG 7 (Affordable and Clean Energy)	8.21*	44.73***	9.16
SDG 8 (Decent Work and Economic Growth)	7.04*	5.12	663.76***
SDG 9 (Industry Innovation and Infrastructure)	50.68***	2873.20***	40.63***
SDG 10 (Reduced Inequalities)	11.70**	12.71***	8.08*
SDG 11 (Sustainable Cities and Communities)	7.67	1.56	21.29***
SDG 12 (Responsible Consumption and Production)	8.62*	1.71	81.45***
SDG 13 (Climate Action)	75.90***	10.05**	249.35***
SDG 14 (Life below Water)	26.66***	5.76	5.94
SDG 15 (Life on Land)	27.71***	83.30***	4.65
SDG 16 (Peace, Justice and Strong Institutions)	11.81**	47.25***	11.24**
SDG 17 (Partnership for the Goals)	10.76*	0.45	5.24

Note: MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021), MRP (CR) and MRP (CS) are market risk premiums estimated by Damodaran and based on the credit ratings and the credit spreads, respectively. ***, **, and * indicate 1%, 5%, and 10% level of statistical significance, respectively.

$$HC3 = \left(\mathbf{X}'\mathbf{X}\right)^{-1}\mathbf{X}'diag\left[\frac{e_i^2}{\left(1-h_{ii}\right)}\right]\mathbf{X}'\left(\mathbf{X}'\mathbf{X}\right)^{-1} \qquad (2)$$

where, $\mathbf{X}$ is an $n \times (p + 1)$ matrix of independent variable values in the regression model including a column of ones for the regression constant where n is the number of samples and p is the number of independent variables. e_i is a sample residual. h_{ii}s are leverage values and diagonal elements in the hat matrix, $\mathbf{H}$, defined by equation (3)

$$\mathbf{H} = \mathbf{X}\left(\mathbf{X}'\mathbf{X}\right)^{-1}\mathbf{X}' \qquad (3)$$

Lastly, we detect outliers of both dependent and

independent variables conducting Rosner's generalized extreme Studentized deviate test by setting alpha as 1%. We remove these outliers for further analysis.

Applying these corrections of heteroskedasticity and cross sectional and time series correlation as well as removing outliers as mentioned above, we run the regression using the equation (4).

$$MRP_{j,t} = a_{i,j} + \beta_{1,i,j} SDG_{i,t} + \beta_{2,i,j} GDP_t + \beta_{3,i,j} DI_t + \beta_{4,i,j} Debt_t + \beta_{5,i,j} SDG_{i,t} \times GDP_t \quad (4)$$

where, $MRP_{j,t}$ is market risk premium provided by either Fernandez (MRP (F)), or Damodaran. Damodaran provides two types of MRPs, a MRP based on credit ratings (MRP(CR)) and the other MRP based on credit spreads (MRP(CS)) for each year, $SDG_{i,t}$ is the overall SDG Index Score or an SDG index of each goal minus the global average of overall SDG Index Score or the SDG index of each goal for each year, GDP_t is GDP per capita (in thousand USD) minus global average of GDP per capita (in thousand USD) for each year, DI_t is democracy index provided by Economists Intelligence Unit for each year, and $Debt_t$ is Government Debt / GDP for each year. We use the deviation from the average for $SDG_{i,t}$ and GDP_t in order to avoid multicollinearity as we utilize the interaction term of $SDG_{i,t}$ and GDP_t.

We include the interaction term of $SDG_{i,t}$ and GDP_t as the impact of SDGs on the MRPs might depend on the GDP per capita. We exclude $Debt_t$ if it is not correlated with SDG_i because our interest is not the creation of the model which explains the variations in $MRP_{j,t}$ the most but the correlations between $SDG_{i,t}$ and $MRP_{j,t}$ and how control variables affect their correlations.

A summary of the results of the regression are shown in Table 6. Details of results from the fixed effects model are reported in Table 7. Results from the random effect model are reported in Table 8 in case that the Hausman test does not reject the null hypothesis at 5% level, that is, it could not conclude that the fixed effects model is appropriate.

According to Table 6, relationships between SDG indices and MRPs vary depending on the type of MRPs utilized. However, some SDG indices show the consistent results no matter the types of MRPs we use.

All correlations between overall SDG Index Score and all types of MRPs are negative and statistically significant at least at 5 % level (Table 7 and 8). As shown in Table 7 and 8, coefficients of overall SDGs Index Score are negative and ranging from -0.036 to -0.121 depending on the types of the model, fixed or random, and MRPs used to estimate. These results suggest that improvements of overall SDG Index Score at the national level could improve the corporate value via the reduction of the market risk premium shown in equation (1). If the coefficient of -0.055 which is estimated by the fixed effect model using MRP (CR) as in Table 7, one point improvement in overall SDG score reduces MRP (CR) by 5.5 basis points. In other words, if a country or a company in the country wants to reduce MRP by 1%, overall SDG Index Score has to be improved by approximately 18 points.

Table 6: Summary of Results from Regression Model of SDGs Indices on Market Risk Premiums (MRPs)

	SDG Index ($\beta_{1,i,j}$)			Interaction ($\beta_{5,i,j}$)		
	MRP	Dam (CR)	Dam (CS)	MRP	Dam (CR)	Dam (CS)
SDG Index Score	**Neg.**	**Neg.**	**Neg.**	Pos.	NS	Inc.
SDG 1	Pos.	NS	Neg.	Neg.	NS	NS
SDG 2	NS	NS	Pos.	Neg.	Pos.	Neg.
SDG 3	**Neg.**	**Neg.**	**Neg.**	**Pos.**	**Pos.**	**Pos.**
SDG 4	NS	Pos.	Neg.	NS	Pos.	Pos.
SDG 5	NS	NS	Pos.	NS	NS	Neg.
SDG 6	NS	Neg.	Neg.	NS	NS	NS
SDG 7	NS	Neg.	Inc.	NS	Pos.	Pos.
SDG 8	NS	NS	Pos.	NS	NS	Pos.
SDG 9	**Pos.**	**Pos.**	**Pos.**	Pos.	NS	NS
SDG 10	Pos.	Pos.	Neg.	Neg.	NS	Pos.
SDG 11	NS	Inc.	Pos.	NS	Inc.	NS
SDG 12	NS	Pos.	Pos.	NS	NS	Neg.
SDG 13	**Neg.**	**Neg.**	**Neg.**	Pos.	NS	NS
SDG 14	Neg.	Inc.	Inc.	Neg.	NS	NS
SDG 15	**NS**	**NS**	**NS**	Pos.	Pos.	Inc.
SDG 16	**NS**	**NS**	**NS**	**Pos.**	**Pos.**	**Pos.**
SDG 17	Inc.	Inc.	Inc.	Inc.	Inc.	NS

Note: This table shows the sign of a coefficient of an SDG index and an interaction term of the SDG index and GDP per capita, e.g. $\beta_{1,i,j}$ and $\beta_{5,i,j}$ in equation (4). If $\beta_{5,i,j}$ is not statistically significant, $\beta_{1,i,j}$ is estimated by $MRP_{j,t} = a_{i,j} + \beta_{1,i,j} SDG_{i,t} + \beta_{2,i,j} GDP_t + \beta_{3,i,j} DI_t + \beta_{4,i,j} Debt_t$. MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021), MRP (CR) and MRP (CS) are market risk premiums estimated by Damodaran and based on the credit ratings and the credit spread, respectively. Description of SDGs are as follow. SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-Being, SDG 4: Quality of 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: Reduced 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, and SDG 17: Partnership for the Goals. Neg. indicates a coefficient of the SDG index or the interaction term was negative at 5% level of statistical significance, Pos. indicates the coefficient is positive at 5% level of statistical significance, NS indicates not statistically significant at 5% level, and Inc. indicates the sign of the coefficient is inconclusive.

Table 7: Fixed Effect Panel Data Regression Model of SDGs Indices on Market Risk Premium (MRP)

Panel A: Overall SDG Index Score

	MRP (F)	MRP (CR)	MRP (CS)
Overall SDG Index Score	-0.044**	-0.055***	-0.061**
s.d.	0.020	0.010	0.027
GDP_t	-0.019***	-0.164***	-0.091**
s.d.	0.004	0.055	0.046
DI_t	-0.691***	-0.333*	-0.864***
s.d..	0.153	0.197	0.239
$Debt_t$	0.011***	0.030**	0.032**
s.d.	0.001	0.013	0.016
Overall SDG Index Score × GDP_t	0.001***	NS	0.001
s.d.	0.000	NS	0.002
F	2.927	8.704	2.323
p (F)	0.014	0.000	0.044
Adj. R^2	-0.332	-0.194	-0.288
N	283	538	320

Panel B: SDG 1 (No Poverty)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 1	0.027***	0.000	-0.037***
s.d.	0.002	0.005	0.016
GDP_t	-0.106***	-0.300***	-0.157***
s.d.	0.016	0.080	0.047
DI_t	-0.848***	-0.533**	-0.771***
s.d..	0.159	0.237	0.123
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 1 × GDP_t	0.001***	NS	NS
s.d.	0.000	NS	NS
F	5.498	11.861	4.126
p (F)	0.000	0.000	0.007
Adj. R^2	-0.357	-0.262	-0.364
N	267	475	273

Panel C: SDG 2 (Zero Hunger)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 2	0.000	0.022**	0.107***
s.d.	0.007	0.010	0.027
GDP_t	-0.029	-0.292***	-0.132**
s.d.	0.020	0.069	0.056
DI_t	-0.758***	-0.469*	-0.706***
s.d..	0.186	0.255	0.176
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 2 × GDP_t	-0.001***	0.002***	-0.002***
s.d.	0.000	0.001	0.001
F	3.638	11.635	4.631
p (F)	0.007	0.000	0.001
Adj. R^2	-0.398	-0.223	-0.321
N	273	487	283

Panel D: SDG 3 (Good Health and Well-Being)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 3	-0.046***	-0.050**	-0.353***
s.d.	0.014	0.023	0.100
GDP_t	-0.162***	-0.407***	-0.447***
s.d.	0.012	0.072	0.064
DI_t	-0.819***	-0.498*	-0.821***
s.d..	0.167	0.254	0.254
$Debt_t$	0.006***	0.002	-0.001
s.d.	0.002	0.019	0.021
SDG 3 × GDP_t	0.005***	0.006*	0.012***
s.d.	0.000	0.003	0.003
F	6.284	8.264	8.321
p (F)	0.000	0.000	0.000
Adj. R^2	-0.275	-0.229	-0.182
N	245	434	263

Panel E: SDG 4 (Quality Education)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 4	0.007	0.016***	-0.018***
s.d.	0.006	0.005	0.006
GDP_t	-0.018**	-0.327***	-0.246***
s.d.	0.007	0.085	0.060
DI_t	-0.948***	-0.474*	-1.157***
s.d..	0.172	0.262	0.278
$Debt_t$	0.011***	0.007	0.016
s.d.	0.002	0.017	0.021
SDG 4 × GDP_t	NS	0.003***	0.004***
s.d.	NS	0.001	0.001
F	4.492	8.420	3.148
p (F)	0.002	0.000	0.009
Adj. R^2	-0.365	-0.227	-0.340
N	244	433	262

Panel F: SDG 5 (Gender Equality)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 5	0.010	0.008	0.100***
s.d.	0.014	0.009	0.009
GDP_t	-0.031**	-0.299***	-0.142**
s.d.	0.012	0.084	0.066
DI_t	-0.771***	-0.492*	-1.032***
s.d..	0.170	0.276	0.220
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 5 × GDP_t	NS	NS	-0.003***
s.d.	NS	NS	0.000
F	3.600	12.792	3.399
p (F)	0.015	0.000	0.010
Adj. R^2	-0.418	-0.245	-0.352
N	273	487	283

Panel G: SDG 6 (Clean Water and Sanitation)

	MRP (F)	MRP (CR)	MRP (CS)
SDG 6	0.001	-0.025***	-0.040***
s.d.	0.005	0.007	0.009
GDP_t	-0.033**	-0.293***	-0.176***
s.d.	0.014	0.076	0.062
DI_t	-0.763***	-0.471*	-0.920***
s.d..	0.173	0.281	0.235
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 6 × GDP_t	NS	NS	NS
s.d.	NS	NS	NS
F	3.522	15.421	4.887
p (F)	0.016	0.000	0.003
Adj. R^2	-0.420	-0.220	-0.339
N	273	487	283

Panel H: SDG 7 (Affordable and Clean Energy)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 7	-0.021	-0.019***	-0.084***
s.d.	0.015	0.007	0.013
GDP_t	-0.020***	-0.360***	-0.307***
s.d.	0.009	0.092	0.093
DI_t	-0.963***	-0.520**	-1.322***
s.d..	0.165	0.247	0.299
$Debt_t$	0.012***	0.003	0.004
s.d.	0.003	0.017	0.021
SDG 7 × GDP_t	NS	0.004***	0.005***
s.d.	NS	0.001	0.002
F	4.545	8.167	3.300
p (F)	0.002	0.000	0.007
Adj. R^2	-0.362	-0.231	-0.333
N	245	434	263

Panel I: SDG 8 (Decent Work and Economic Growth)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 8	-0.007	0.010	0.024**
s.d.	0.011	0.009	0.012
GDP_t	-0.037***	-0.291***	-0.174***
s.d.	0.009	0.071	0.062
DI_t	-0.772***	-0.442*	-0.888***
s.d..	0.160	0.240	0.223
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 8 × GDP_t	NS	NS	NS
s.d.	NS	NS	NS
F	3.793	13.165	3.376
p (F)	0.011	0.000	0.019
Adj. R^2	-0.414	-0.241	-0.368
N	273	487	283

Panel J: SDG 9 (Industry Innovation and Infrastructure)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 9	0.024***	0.072***	0.053***
s.d.	0.002	0.018	0.018
GDP_t	-0.030***	-0.266***	-0.165***
s.d.	0.006	0.074	0.052
DI_t	-0.964***	-0.549**	-1.236***
s.d..	0.148	0.233	0.271
$Debt_t$	0.013***	0.013	0.016
s.d.	0.003	0.016	0.023
SDG 9 × GDP_t	0.001*	NS	NS
s.d.	0.000	NS	NS
F	4.486	13.085	3.162
p (F)	0.001	0.000	0.015
Adj. R^2	-0.337	-0.188	-0.353
N	245	434	263

Panel K: SDG 10 (Reduced Inequalities)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 10	0.014*	0.008*	-0.014**
s.d.	0.009	0.004	0.006
GDP_t	-0.017	-0.299***	-0.276***
s.d.	0.016	0.087	0.075
DI_t	-0.782***	-0.494*	-0.839***
s.d..	0.177	0.253	0.211
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 10 × GDP_t	-0.001**	NS	0.003***
s.d.	0.000	NS	0.001
F	3.743	11.479	4.948
p (F)	0.006	0.000	0.001
Adj. R^2	-0.411	-0.275	-0.330
N	262	463	268

Panel L: SDG 11 (Sustainable Cities and Communities)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 11	-0.002	0.003**	0.016***
s.d.	0.006	0.001	0.005
GDP_t	-0.020**	-0.270***	-0.158***
s.d.	0.008	0.081	0.054
DI_t	-0.945***	-0.522*	-1.238***
s.d..	0.168	0.271	0.279
$Debt_t$	0.012***	0.011	0.018
s.d.	0.002	0.016	0.022
SDG 11 × GDP_t	NS	0.001	NS
s.d.	NS	0.000	NS
F	4.398	6.737	2.575
p (F)	0.002	0.000	0.039
Adj. R^2	-0.366	-0.256	-0.370
N	245	434	263

Panel M: SDG 12 (Responsible Consumption and Production)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 12	-0.007	0.047***	0.084***
s.d.	0.006	0.014	0.025
GDP_t	-0.028***	-0.212***	-0.150***
s.d.	0.010	0.055	0.038
DI_t	-0.944***	-0.459*	-1.115***
s.d.	0.168	0.269	0.259
$Debt_t$	0.011***	0.014	0.018
s.d.	0.003	0.017	0.021
SDG 12 × GDP_t	NS	NS	-0.001***
s.d.	NS	NS	0.000
F	4.532	12.339	4.016
p (F)	0.002	0.000	0.002
Adj. R^2	-0.362	-0.198	-0.309
N	245	434	263

Panel N: SDG 13 (Climate Action)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 13	-0.037***	-0.031**	-0.027*
s.d.	0.005	0.012	0.014
GDP_t	-0.032*	-0.312***	-0.192***
s.d.	0.018	0.082	0.065
DI_t	-0.907***	-0.596***	-1.056***
s.d..	0.161	0.220	0.227
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 13 × GDP_t	0.001***	NS	NS
s.d.	0.000	NS	NS
F	6.782	18.998	4.235
p (F)	0.000	0.000	0.006
Adj. R^2	-0.313	-0.188	-0.351
N	273	487	283

Panel O: SDG 14 (Life below Water)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 14	-0.004*	-0.005	0.002
s.d.	0.002	0.013	0.003
GDP_t	-0.021***	-0.266***	-0.175***
s.d.	0.006	0.072	0.060
DI_t	-0.912***	-0.394	-0.452***
s.d..	0.198	0.269	0.162
$Debt_t$	0.003	-0.010	-0.016***
s.d.	0.003	0.015	0.014
SDG 14 × GDP_t	-0.0002*	NS	NS
s.d.	0.0001	NS	NS
F	3.021	5.032	1.405
p (F)	0.013	0.001	0.235
Adj. R^2	-0.430	-0.369	-0.458
N	220	364	241

Panel P: SDG 15 (Life on Land)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 15	-0.004	-0.006	-0.020
s.d.	0.007	0.004	0.014
GDP_t	-0.043***	-0.311***	-0.189***
s.d.	0.012	0.080	0.067
DI_t	-0.757***	-0.495*	-0.917***
s.d..	0.176	0.273	0.223
$Debt_t$	NA	NA	NA
s.d.	NA	NA	NA
SDG 15 × GDP_t	0.0004***	0.0006**	0.0006**
s.d.	0.0001	0.0003	0.0002
F	3.039	9.977	2.250
p (F)	0.019	0.000	0.065
Adj. R^2	-0.416	-0.243	-0.382
N	273	487	283

Panel Q: SDG 16 (Peace, Justice and Strong Institutions)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 16	-0.004	-0.011	-0.021
s.d.	0.005	0.010	0.016
GDP_t	-0.031***	-0.301***	-0.195***
s.d.	0.008	0.085	0.057
DI_t	-0.912***	-0.439	-1.013***
s.d..	0.162	0.304	0.296
$Debt_t$	0.014***	0.010	0.015***
s.d.	0.003	0.017	0.023
SDG 16 × GDP_t	0.0005***	0.001***	0.001
s.d.	0.0002	0.000	0.001
F	3.677	7.054	2.109
p (F)	0.004	0.000	0.066
Adj. R^2	-0.368	-0.250	-0.375
N	245	434	263

Panel R: SDG 17 (Partnership for the Goals)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 17	0.013	-0.008*	-0.006
s.d.	0.014	0.004	0.005
GDP_t	-0.016***	-0.277***	-0.167***
s.d.	0.006	0.080	0.056
DI_t	-0.992***	-0.503*	-1.172***
s.d..	0.189	0.291	0.276
$Debt_t$	0.013***	0.009	0.017
s.d.	0.004	0.017	0.022
SDG 17 × GDP_t	-0.0002	0.0001	NS
s.d.	0.0004	0.0003	NS
F	3.693	6.640	2.466
p (F)	0.003	0.000	0.047
Adj. R^2	-0.367	-0.258	-0.373
N	245	434	263

Note: This table shows the parameter estimates from the fixed effect panel regression models shown in equation (4). If a coefficient of the interaction term of $SDG_{i,t}$ and GDP_t, $\beta_{5,i,j}$ in equation (4), is not statistically significant and if $Debt_t$ is correlated with SDG_i, $\beta_{1,i,j}$ is estimated by $MRP_{j,t} = a + \beta_{1,i,j}SDG_{i,t} + \beta_{2,i,j}GDP_t + \beta_{3,i,j}DI_t + \beta_{4,i,j}Debt_t$. If $Debt_t$ is not correlated with $SDG_{i,t}$, $\beta_{1,i,j}$ is estimated by $MRP_{j,t} = a_{i,j} + \beta_{1,i,j}SDG_{i,t} + \beta_{2,i,j}GDP_t + \beta_{3,i,j}DI_t$. We use three types of market risk premiums, MRP (F), MRP (CR), and MRP (CS), as dependent variables. MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021). MRP (CR) and MRP (CS) are market risk premiums estimated by Damodaran and based on the credit ratings and the credit spread, respectively. NA indicates correlation between $Debt_t$ and $SDG_{i,t}$ is not statistically significant at 5% level, thus, $Debt_t$ is excluded from the regression model. NS indicates a coefficient of the interaction term of $SDG_{i,t}$ and GDP_t is not statistically significant at 5% level, thus, the interaction term is excluded from the model. In case that the Hausman test does not reject the null hypothesis and $\beta_{5,i,j}$ of the random effect model is statistically significant at 5% level, the interaction term is included in the fixed model.

Table 8: Random Effect Panel Data Regression Model of SDGs Indices on Market Risk Premiums (MRP)

Panel A: Overall SDG Index Score

	MRP (F)	MRP (CR)	MRP (CS)
Overall SDG Index Score	-0.036**	-0.046***	-0.121***
s.d.	0.018	0.015	0.051
GDP_t	-0.055***	-0.094***	-0.070***
s.d.	0.004	0.009	0.007
DI_t	-0.342***	-0.364***	-0.415***
s.d..	0.085	0.103	0.079
$Debt_t$	0.004	0.017	0.013**
s.d.	0.006	0.012	0.005
Overall SDG Index Score × GDP_t	0.002***	NS	0.005***
s.d.	0.000	NS	0.001
Intercept	10.480***	11.850***	10.540***
s.d.	0.642	1.123	0.732
χ^2	86.642	200.026	138.081
p (χ^2)	0.000	0.000	0.000
Adj. R^2	0.515	0.326	0.400
N	283	538	320

Panel B: SDG 1 (No Poverty)

	MRP (CS)
Overall SDG Index Score	-0.055***
s.d.	0.012
GDP_t	-0.045***
s.d.	0.005
DI_t	-0.342***
s.d..	0.052
$Debt_t$	NA
s.d.	NA
Overall SDG Index Score × GDP_t	NS
s.d.	NS
Intercept	11.150***
s.d.	0.874
χ^2	103.455
p (χ^2)	0.000
Adj. R^2	0.35516
N	273

Panel C: SDG 7 (Affordable and Clean Energy)

	MRP (F)	MRP (CS)
SDG 7	-0.004	0.021
s.d.	0.007	0.023
GDP_t	-0.047***	-0.134***
s.d.	0.004	0.037
DI_t	-0.363***	-0.563***
s.d..	0.085	0.099
$Debt_t$	0.006	0.012**
s.d.	0.005	0.006
SDG 7 × GDP_t	NS	0.004***
s.d.	NS	0.001
Intercept	10.518***	10.639***
s.d.	0.617	0.942
χ^2	90.330	98.087
p (χ^2)	0.000	0.000
Adj. R^2	0.534	0.344
N	245	263

Panel D: SDG 8 (Decent Work and Economic Growth)

	MRP (F)	MRP (CR)
SDG 8	-0.013	-0.017
s.d.	0.009	0.013
GDP_t	-0.046***	-0.093***
s.d.	0.003	0.010
DI_t	-0.300***	-0.410***
s.d..	0.078	0.094
$Debt_t$	NA	NA
s.d.	NA	NA
SDG 8 × GDP_t	NS	NS
s.d.	NS	NS
Intercept	10.424***	12.832***
s.d.	0.539	1.301
χ^2	96.235	180.814
p (χ^2)	0.000	0.000
Adj. R^2	0.530	0.312
N	273	487

Panel E: SDG 10 (Reduced Inequalities)

	MRP (CS)
SDG 10	-0.017***
s.d.	0.005
GDP$_t$	-0.070***
s.d.	0.017
DI$_t$	-0.536***
s.d..	0.103
Debt$_t$	NA
s.d.	NA
SDG 10 × *GDP*$_t$	0.002***
s.d.	0.000
Intercept	11.632***
s.d.	1.118
χ^2	76.549
p (χ^2)	0.000
Adj. R^2	0.307
N	268

Panel F: SDG 11 (Sustainable Cities and Communities)

	MRP (F)	MRP (CR)
SDG 11	0.000	-0.014***
s.d.	0.002	0.005
GDP$_t$	-0.048***	-0.097***
s.d.	0.003	0.009
DI$_t$	-0.371***	-0.487***
s.d..	0.066	0.080
Debt$_t$	0.006	0.017*
s.d.	0.005	0.010
SDG 11 × *GDP*$_t$	NS	0.0004***
s.d.	NS	0.0001
Intercept	10.544***	12.374***
s.d.	0.562	1.071
χ^2	89.126	187.453
p (χ^2)	0.000	0.000
Adj. R^2	0.532	0.341
N	245	434

Panel G: SDG 12 (Responsible Consumptions and Production)

	MRP (F)	MRP (CR)
SDG 12	-0.015	0.023*
s.d.	0.009	0.013
GDP$_t$	-0.056***	-0.085***
s.d.	0.010	0.005
DI$_t$	-0.395***	-0.480***
s.d..	0.095	0.073
Debt$_t$	0.005	0.018*
s.d.	0.004	0.010
SDG 12 × *GDP*$_t$	NS	NS
s.d.	NS	NS
Intercept	10.722***	12.279***
s.d.	0.665	1.024
χ^2	93.013	191.643
p (χ^2)	0.000	0.000
Adj. R^2	0.537	0.346
N	245	434

Panel H: SDG 14 (Life below Water)

Dependent Variable	MRP (CR)	MRP (CS)
SDG 14	-0.019***	-0.021***
s.d.	0.003	0.005
GDP$_t$	-0.098***	-0.061***
s.d.	0.008	0.008
DI$_t$	-0.495***	-0.472***
s.d..	0.062	0.084
Debt$_t$	0.016	0.007
s.d.	0.010	0.006
SDG 14 × *GDP*$_t$	NS	NS
s.d.	NS	NS
Intercept	12.548***	11.225***
s.d.	0.849	1.072
χ^2	167.866	68.501
p (χ^2)	0.000	0.000
Adj. R^2	0.406	0.314
N	364	241

Panel I: SDG 15 (Life on Land)

Dependent Variable	MRP (CS)
SDG 15	0.003
s.d.	0.003
GDP$_t$	-0.064***
s.d.	0.009
DI$_t$	-0.445***
s.d..	0.097
Debt$_t$	NA
s.d.	NA
SDG 15 × *GDP*$_t$	-0.0004**
s.d.	0.0002
Intercept	11.423***
s.d.	1.228
χ^2	70.274
p (χ^2)	0.000
Adj. R^2	0.289
N	283

Panel J: SDG 17 (Partnership for the Goals)

Dependent Variable	MRP (F)	MRP (CR)	MRP (CS)
SDG 17	0.015***	0.014***	0.010***
s.d.	0.004	0.003	0.003
GDP_t	-0.049***	-0.100***	-0.065***
s.d.	0.003	0.009	0.010
DI_t	-0.385***	-0.511***	-0.529***
s.d..	0.074	0.092	0.102
$Debt_t$	0.006***	0.018*	0.012*
s.d.	0.005	0.010	0.005
SDG 17 × GDP_t	-0.0003***	-0.0004***	NS
s.d.	0.0001	0.0001	NS
Intercept	10.614***	12.500***	11.366***
s.d.	0.604	1.133	1.159
χ^2	94.916	189.584	76.381
p (χ^2)	0.000	0.000	0.000
Adj. R^2	0.541	0.343	0.305
N	245	434	263

Note: This table shows the parameter estimates from the random effect panel regression models shown in equation (4). These parameters are reported in the table only when the Hausman test does not reject the null hypothesis, that is, only when the fixed effect model is not necessarily appropriate. If a coefficient of the interaction term of $SDG_{i,t}$ and GDP_t, $\beta_{5,i,j}$ in equation (4), is not statistically significant and if $Debt_t$ is correlated with $SDG_{i,t}$, $\beta_{1,i,j}$ is estimated by $MRP_{j,t} = a_{i,j} + \beta_{1,i,j}SDG_{i,t} + \beta_{2,i,j}GDP_t + \beta_{3,i,j}DI_t + \beta_{4,i,j}Debt_t$. If $Debt_t$ is not correlated with $SDG_{i,t}$, $\beta_{1,i,j}$ is estimated by $MRP_{j,t} = a_{i,j} + \beta_{1,i,j}SDG_{i,t} + \beta_{2,i,j}GDP_t + \beta_{3,i,j}DI_t$. We use three types of market risk premiums, MRP (F), MRP (CR), and MRP (CS), as dependent variables. MRP (F) indicates market risk premiums estimated by Fernandez et al. (2016-2021). MRP (CR) and MRP (CS) are market risk premiums estimated by Damodaran. MRP (CR) and MRP (CS) are estimated based on the credit ratings and the credit spread, respectively. NA indicates correlation between $Debt_t$ and $SDG_{i,t}$ is not statistically significant at 5% level, thus, $Debt_t$ is excluded from the regression model. NS indicates a coefficient of the interaction term of $SDG_{i,t}$ and GDP_t is not statistically significant at 5% level, thus, the interaction term is excluded from the model.

While we need further analysis to conclude whether there is causality between SDG indices and MRPs, we can reasonably say if the corporation could commit to improve overall SDG Index Score in the country, its corporate value could be increased by the reduction of the market risk premium.

However, we could not conclude whether the impact of overall SDG Index Score on MRPs depends on the level of GDP_t as the coefficient of the interaction term, $\beta_{5,i,j}$ in equation (4), could be negative, positive, or neutral depending on the types of MRPs used. Impact of overall SDG Index Score could be inflated or deflated, depending on the level of GDP_t.

Similarly, the relationship between SDG 3 (Good Health and Well-Being) & SDG 13 (Climate Action) and MRPs are negative (Table 6-8). These correlations are robust. A corporation which commits to improve the health of people or solve climate issues could improve their corporate value by the reduction of the market risk premium.

Table 7 shows that regression coefficients of SDG 3 (Good Health and Well-Being) on MRPs are -0.046 for MRP (F), -0.050 for MRP (CR), and -0.353 for MRP (CS). Magnitudes of the impact of improvements in the SDG 3 are widely varied. Managers of the corporation considering to pursue SDG 3 need to carefully estimate its impact on the reduction in the risk premium of the corporation.

Additionally, as for SDG 3 (Good Health and Well-Being), the level of GDP_t is correlated with the impact of SDG_i on MRPs as the coefficients of interaction terms ($\beta_{5,i,j}$) in equation (4) are positive and statistically significant according to Table 7 and 8. Equation (5) shows how the impact of $SDG_{i,t}$ on MRPs varied depending on the level of GDP_t.

$$MRP_{j,t} = a_{i,j} + \left(\beta_{1,i,j} + \beta_{5,i,j}GDP\right)SDG_{i,t} + \beta_{2,i,j}GDP_t + \beta_{3,i,j}DI_t + \beta_{4,i,j}Debt_t \quad (5)$$

That is, the negative impact of SDG 3 (Good Health and Well-Being) on MRP is diminishing as the magnitude of GDP_t is increasing. According to equation (5), if GDP_t is higher than - ($\beta_{1,i,j}$ / $\beta_{5,i,j}$), the impact of SDG 3 on MRPs will be positive. As GDP_t is defined as the deviation from the average GDP per capita of all countries for each year, the average in 2020 is 20,233 USD as shown in Table 4, and - ($\beta_{1,i,j}$ / $\beta_{5,i,j}$) for MRP (F), MRP (CR), and MRP (CS) are -8.435, -9.064, and -28.804, respectively, thresholds of the GDP per capita for MRP (F), MRP (CR), and MRP (CS) are 28,658 USD, 29,287 USD, and 49,027 USD, respectively. GDP per capita of Japan in 2020 is 41,732 USD. As this value is bigger than the threshold estimated by the models using MRP (F) and MRP (CR) but smaller than the model using MRP (CS). Implications of the pursuant of SDG 3 for Japanese corporations have to be further analyzed. The improvement in SDG 3 could reduce MRPs in developing countries whose GDP_t is less than 28,658 USD but the improvement in SDG 3 could increase MRPs in developed countries whose GDP_t is higher than 49,027 USD.

On the other hand, the correlations between SDG 9 (Industry Innovation and Infrastructure) and MRPs are positive. That indicates that the higher SDG 9 score, the higher the market risk premiums. SDG 9 score consists of investment in research and development. We could infer that these countries achieving higher SDG 9 grow further by taking risks. In other words, the increase in the economic growth of the country could be bigger than the

increase in the MRPs. We would like to leave the analysis of the correlation between economic growth of the country and SDGs for future research.

Table 6 also shows that SDG 15 (Life on Land) & SDG 16 (Peace, Justice and Strong Institutions) are not correlated with MRPs. Companies could commit activities related to SDG 15 and 16, however, managers of these corporations should understand these activities are not necessarily improve the corporate value by the reduction of the market risk premium. That is, these managers need the consensus from the investors if these activities are costly and could damage their corporate values.

Additionally, as for SDG 16 (Peace, Justice and Strong Institutions), the coefficients of interaction ($\beta_{5,i,j}$) in equation (4) and (5) are positive and statistically significant according to Table 6 and 7. That is, if GDP_t is higher (lower), the impact of SDG 16 on MRPs would be more positive (negative). - ($\beta_{1,i,j}$ / $\beta_{5,i,j}$) for MRP (F), MRP (CR), and MRP (CS) are 9.452, 9.305, and 32.503, respectively. Thresholds of GDP per capita for MRP (F), MRP (CR), and MRP (CS) are 29,685 USD, 29,538 USD, and 52,736 USD, respectively. It could imply a developing country whose GDP per capita is less than 29,685 USD is willing to pursue a peaceful society while a developed country whose GDP per capita is higher than 52,736 USD could prefer less peaceful situations as they reduce the market risk premium. The development of the financial market could help to achieve a peaceful situation for developing countries while we need some schemes in addition to the financial market to achieve SDG 16 for developed countries. This result is consistent with Jha and Shayo (2019) which show that increase in the exposures to financial assets shifts the voting behavior towards parties pursuing peace from experiments in Israeli.

We need further analysis to conclude the relationship between MRPs and SDG 1,2, 4-8, 10-12, 14, and 17.

5. Conclusion

This paper analyzes the correlation between MRPs and the SDG indices to see whether the contributions to SDGs could improve the corporate value or not. Our findings suggest that there is strong negative correlation between overall SDG Index Score and MRPs. Furthermore, SDG 3 (Good Health and Well-Being) & 13 (Climate Action) scores are negatively correlated with MRPs. On the other hand, SDG 15 (Life on Land) & 16 (Peace, Justice and Strong Institutions) scores are not correlated with MRPs and SDG 9 (Industry Innovation and Infrastructure) score is positively correlated with MRP. We need further empirical analysis to conclude the impact of SDG 1, 2, 4-8, 10-12, 14, and 17 on MRPs

Thus, pursuant of SDGs improving overall SDG Index Score and SDG 3 (Good Health and Well-Being) & 13 (Climate Action) scores in the country could improve the corporate value by the reduction of MRPs. We would like to study further what exactly kind of activities could improve the overall SDG Index Score and SDG 3 & 13 scores and result in improvement of the corporate value.

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学会だより

- JAROS2022 研究発表大会について

  日時： 2022 年 12 月 3 日、4 日　（土日 2 日間 開催）

  場所： 東京理科大学神楽坂キャンパスもしくはオンライン（ハイブリッド）

  大会実行委員長：　東京理科大学 髙嶋 隆太 教授

  早割 受付中【大会参加】　（早割：11/6 日まで）

  一般研究報告セッション：エントリー受付中（9/12 月まで）

  （一般研究報告は、既に他の学会等で発表したものでも、発表可能です。）

編集後記

リアルオプション学会の機関誌「リアルオプションと戦略」第 12 巻第 1 号をお届けいたします。まず、第 11 巻第 2 号が 2020 年 3 月に刊行されてから 2 年以上経っての発行となったことにつきまして、深くお詫びを申し上げます。機関誌をお読み頂いている会員の方々、論文を投稿頂いた方にご迷惑をお掛けしまして申し訳ございませんでした。今後は年に 2 回をめどに定期的に刊行できるように体制を整えて参りたく存じますので引き続きお力添えを賜ることができましたら幸甚です。

本号は、初めての試みとして”Real Options in Global Perspectives”というテーマで、英語で執筆された査読論文 4 編を刊行致しました。リアルオプション学会の取り組みを国内外に発信することにより、リアルオプション学会会員の方々の便益を向上することができればと考えております。ご高見がございましたら編集委員会までお知らせ頂ければ幸甚です。

刊行が大幅に遅れましたこと深くお詫び申し上げます。今後も会員の方々に資するリアルオプション関する学術あるいは実務的な論文や論考を定期的に刊行して行きたく存じます。引き続きましてご厚誼の程、何卒宜しくお願い致します。

担当編集委員　伊藤晴祥

日本リアルオプション学会法人会員リスト

日本リアルオプション学会は以下の法人の方からのサポートを受けています。感謝申し上げます。

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