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Abstract

As the conversations surrounding climate change prevention and Sustainable Development Goal (SDG) financing grow in importance in the 21st century, so too do the conversations around the intersections of solutions around the topics. Blended financing has been utilized in several different forms over the past decade or so to tackle the largest problems in the global economy set out by the United Nation's SDGs. While the tool has been leveraged for several of these Sustainable Development Goals, it has been particularly useful in attracting private investment for environmental sustainability-focused projects via the programs in place at several of the Development Financing Institutions of which multilateral banks make up the majority. This paper explores the characteristics of several types of Blended Finance investments in the climate change space to identify if there are any descriptive drivers that have attracted more investment. The hope of this paper is to identify certain characteristics in these investment projects that may attract investments of lesser scale, in different sectors, or in countries that are not receiving as much Blended Finance investments.

Keywords

blended finance, foreign investment, climate change, financing, infrastructure, international development, public private partnership

Disciplines

Economic Policy | Finance | Growth and Development | Infrastructure | International Business | International Economics | Macroeconomics | Public Economics

EFFICACY OF BLENDED FINANCE IN CLIMATE CHANGE INFRASTRUCTURE
PROJECTS

By
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An Undergraduate Thesis submitted in partial fulfillment of the requirements for the
WHARTON RESEARCH SCHOLARS

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THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA
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Abstract

As the conversations surrounding climate change prevention and Sustainable Development Goal (SDG) financing grow in importance in the 21st century, so too do the conversations around the intersections of solutions around the topics. Blended financing has been utilized in several different forms over the past decade or so to tackle the largest problems in the global economy set out by the United Nation’s SDGs. While the tool has been leveraged for several of these Sustainable Development Goals, it has been particularly useful in attracting private investment for environmental sustainability-focused projects via the programs in place at several of the Development Financing Institutions of which multilateral banks make up the majority. This paper explores the characteristics of several types of Blended Finance investments in the climate change space to identify if there are any descriptive drivers that have attracted more investment. The hope of this paper is to identify certain characteristics in these investment projects that may attract investments of lesser scale, in different sectors, or in countries that are not receiving as much Blended Finance investments.

I. INTRODUCTION

a. What is Blended Finance?

As defined by the Development Finance Institution (DFI) Working Group on Blended Concessional Finance for Private Sector Projects (DFI Working Group), Blended Finance is “combining concessional finance from donors or third parties alongside DFIs’ normal own account finance and/or commercial finance from other investors, to develop private sector markets, address the Sustainable Development Goals (SDGs), and mobilize private

resources.” Blended Finance, therefore, is an investment tool targeted at investor-friendly development projects that have a sustainability and economic growth focus. Beyond its application as a reliable source of capital in countries that may not attract sufficient Official Development Assistance (ODA) or Foreign Direct Investment (FDI) to fund vital projects or allocate funds to smaller businesses in need, Blended Finance is also a tool designed to strengthen human capital and reinforce sustainability in recipient countries through on-the-ground implementation assistance, formal investment education, and working within existing markets to build commercially viable projects.

As policy experts, governmental leaders, economists, and academics collectively continue to examine the ways in which nations utilize official development assistance (ODA), private investment, grants, loans, and other debt instruments to improve their economies, new methods of fund mobilization have become more popular due to their potential for more efficient, effective, and immediate growth. Blended Finance is a relatively new channel for investment that is meant to support the achievement of the Sustainable Development Goals (SDGs) set forth by the United Nations and is one of the principle methods for meeting the goals of the Paris climate accord, as well. These two major missions are principal focuses for the international finance community because of the significant dearth of funding for full implementation of the goals included in both agreements. Without a significant push towards efficient funding for impact-driven development projects, relevant policy actors will not be able to reign in enough funds to combat struggles such as infrastructure development, elimination of hunger, eradication of poverty and homelessness, implementation of new pollution and fuel standards, or investments in the small- or medium-sized enterprises to make these projects work in the first place.

The primary areas of focus for Blended Finance projects have been global agriculture and food security, climate change-related financing, small- and medium-sized enterprises (SMEs), manufacturing, and technology. In October 2017, the DFI Working Group reported that “infrastructure, banking and agriculture were the sectors most targeted” by blended financing with “climate change and support to SMEs” as the “most prevalent themes within these sectors” (DFI Working Group Summary Report). With increased global attention to climate sustainability largely due to the Paris Climate Agreement of 2016, projects related to signatory nations meeting their national requirements are likely to be some of the largest recipients of Blended Finance.

b. This Paper’s Focus

While many, if not all, of the Sustainable Development Goals have entire United Nations committees or organizations devoted to them, investment in mitigating the effects of climate change through researching, developing, and utilizing sustainability-focused technology has been one of the most significant beneficiaries of Blended Finance since major DFIs began utilizing it as a channel for investment. This research will explore the major factors of the growing investment in sustainable energy-focused Blended Finance projects and other green-related Blended Finance projects in infrastructure. This research will also analyze, both qualitatively and quantitatively, characteristic differences between similar project types (by making comparisons as close to like-with-like as possible) to make conclusions about the potential external factors that influence increases in development investment such as project timeline, number of existing, local investors, geography, past investment success. This paper will not explore the well-documented general benefits of the risk mitigation, crowd-in

factors, or efficiency arguments for Blended Finance in general except in the ways it related to climate change investing more specifically.

The first qualitatively focused hypothesis of this research is that climate change's investment attraction stems at least in part from current global trends in the importance of climate change in new policy. The second hypothesis of this research is that Blended Finance climate change projects in wealthier nations attract more investment than do Blended Finance climate change projects in relatively less wealthy countries. While a causal inference may be difficult to make, it is a worthwhile finding to understand how significant of factors either credit or infrastructure capacity are in attracting investment. A third hypothesis is that Blended Finance projects of similar project type and scale related to climate change have generally decreased in cost overtime as more experience allows the relevant DFIs to improve their project performance metrics.

II. Literature

While there has been significant research from macroeconomists and political scientists regarding the efficacy of ODA and international investment on economic development and growth, there is significantly less research on the subtopic of Blended Finance (OECD, Gavas, Geddes, and Massa 2011, Elliot 2013, Lonsdale 2016). Because research in this subfield and the field itself are both relatively new and because this thesis will focus on the impact of climate-focused Blended Finance projects, there is room to build upon the existing research and meaningfully contribute to how Blended Finance in energy projects is understood and applied academically and practically. Of the literature focused more

specifically on Blended Finance, those published by the OECD and IFC (and its subgroups) discusses how to best leverage Blended Finance tools to achieve the SDGs and improve investment performance among developing nations (OECD 2018, IFC 2016). This paper's aim is to better ascertain why climate change projects in the Blended Finance space may achieve more funding and/or more success than comparably single-source-funded projects and other types of Blended Finance projects.

With that in mind, there are research papers that guide the bulk of this research. Existing literature providing a general overview of the theory and practice of Blended Finance clarifies how Blended Finance can be and has been helpful such as the Topic Guide written by Evidence on Demand's Mustapha, Prizzon, and Gavas (2014). The DFI Working Group produced a Summary Report in October 2017 to reaffirm and enhance principles surrounding Blended Finance use primarily for the benefit of other DFIs and governments that plan on engaging in Blended Finance projects. The Summary Report is a useful progress analysis as it gathers descriptive data on where, on what, and how Blended Finance has been used, shares best practices for tailoring financing in different contexts, and offers suggestions to maximize the impact of Blended Finance. As the leading voices in development finance, the DFIs that worked on this Summary Report determined core principles that can both help to forecast success and evaluate both the qualitative and quantitative impact of projects. Gavas and OECD colleagues (2011) explored Blended Finance's implications on existing 'aid-for-trade' schemes and how developing countries can attract increased aid and investment with new Blended Finance mechanisms. Michael Elliot of the ONE campaign (2015) discusses Blended Finance's potential gap in providing assistance to the poorest countries as well as the potential issues with transparency and accountability surrounding the metrics. Charles

Kenny (2015) of the Center for Global Development provides practical ways in which blending financial sources helped attract capital flows for infrastructure development in Addis and how particular factors can be replicated elsewhere.

A smaller set of existing literature discusses investment in environmentally-focused development projects. Morgado and Lasfargues (2017) of the OECD's Development Assistance Committee discuss how recipients of investment and investors themselves can maximize their impact in green projects through use of co-operating fund sources. Prior to that OECD study, there were studies from Bouwer and Aerts (2006) on the potential need for diverse sources of funding for adapting to new climate change policies and from Dellink and colleagues from the Institute for Environmental Studies (2009) discussing the methods in which the burden of climate change adaptation can be spread to remove the heaviest burden from those countries that have contributed the least to the primary drivers of climate change such as land-use and greenhouse gas emissions.

With this literature in mind, this paper aims to build off Morgado and Lasfargues (2017)'s recent work by analyzing particular characteristics of climate change-focused Blended Finance projects that have had the most impact and garnered the most investment attention. Another space in which I hope to contribute is describing the importance of additionality for climate change-related projects as opposed to other projects that may require less industry knowledge. Other main areas of research expansion relate to regional variation in Blended Finance investment and project sustainability of Blended Finance projects.

III. DATA

a. Data Description

Each of the World Bank-affiliated Climate Investment Funds (CIF) provide case studies and results data on its projects since 2008 related to Clean Technology (CTF), Forest Sustainability Investment (FIP), Climate Resilience (PPCR), and Scaling up Renewable Energy in low-income countries (SREP). Meant for different kinds of projects and countries at different income levels, each of these funds seeks the inclusion of private funding to bolster its impact and funding runway. The SREP also includes “private sector set asides” that help “[allocate] concessional Additionally, the Global Environment Facility (GEF) has an entire arm devoted to Blended Finance projects related to climate change in which it has been able to not only gather useful data on the projects but has also been able to compare these projects’ joint and individual efficacy with typical, unilaterally-funded projects. Along with datasets from the GEF and CIF, this paper utilizes data from the IFC-Canada Climate Change Program and the Finland-IFC Climate Change Program to gather case studies.

i. Clean Technology Fund (CTF)

The Clean Technology Fund provides results data based on 57 variables including country, project title, reporting year, region, specific technology, CTF funding in millions, partnering MDB, lifetime of the project, co-financing from various sources, among several others. The indicators that the World Bank focuses on with respect to the Clean Technology Fund are “(a) avoided greenhouse gas emissions, (b) increased finance for low carbon development mobilized, (c) increased supply of renewable energy; (d) increased access to public transport, and (e) increased energy efficiency” (World Bank Group Finances, 2017).

The dataset available through the World Bank Group Financial Data was updated last in December 2017. The data used in this research paper included 87 projects.

In addition to its datasets, CTF also publishes summary statistics on its key metrics such as these below:

Figure I. Summary statistics from CTF homepage

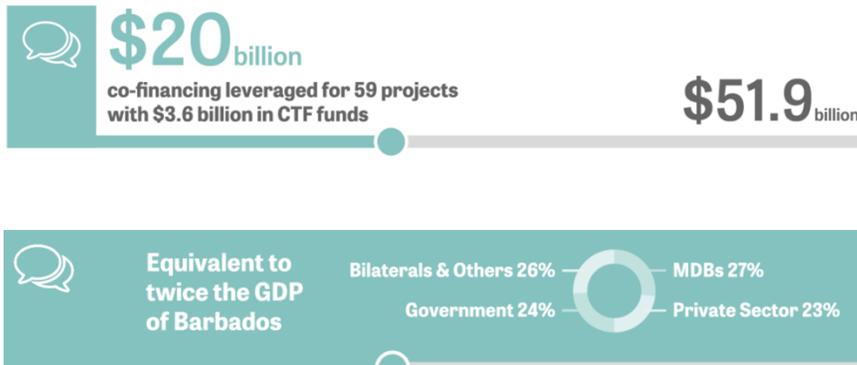
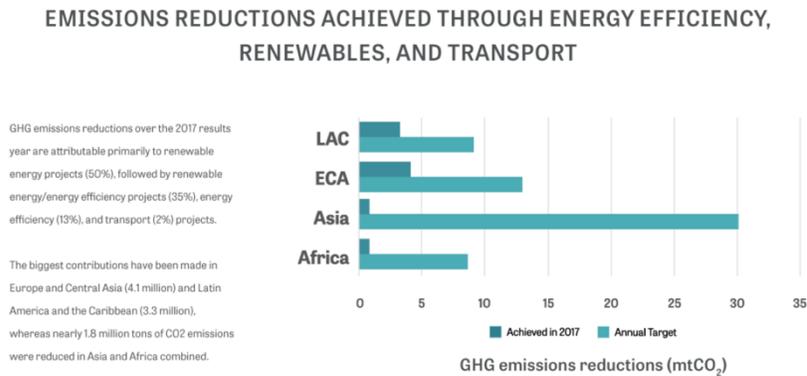


Figure II. Bar chart from CTF Homepage



ii. Scaling Up Renewable Energy Program (SREP)

The SREP dataset available through World Bank Group Finances includes results data based on 51 variables including country, project title, reporting year, region, technology, grid connection, amount of SREP funding, partnering MDB, lifetime of project, and other variables more focused on the social impact effects of the project than the Clean Technology Fund data such as the impact on different demographics such as the men, women, communities, and businesses impacted by the project. The data used in this research paper included 24 projects from the IFC's 2017 report.

iii. Global Environment Facility (GEF)

A large amount of the blended finance projects in climate change business have been partially funded through the Global Environment Facility (GEF). GEF provides exportable datasets based on its project database. The data used in this paper were those related tagged with “climate change” (1,647 projects) that were either “project approved” or “completed” (1,445 projects) which eliminates concepts (approved and not approved), cancelled projects, and those projects that have only reached the GEF Secretariat but are not complete.

iv. Case Studies

Though several projects operationalizing blended finance tools have not been completed as of March 2018, there are several that provide good insight into the valuable contingent characteristics of blended finance projects in the climate change business space.

a. SS Zambia (IFC-CCCP)

The Ngonye Power Company blended finance project in Zambia or “SS Zambia” as denoted by the International Finance Corporation (IFC) is a pending blended finance project

in Sub-Saharan Africa. The project purpose is to develop, finance, construct, operate, and maintain a large solar photovoltaic plant. One central feature of this project that demonstrates the benefit of blended financing is the inherent agreement that Zambia will have total control over this plant through its electric utility company through a 25-year power purchase agreement. This demonstrates the value the IFC puts on building domestic capacity through each of its projects. The project was procured through Scaling Solar Zambia, the industrial development corporation in Zambia. The \$45MM in project costs and other costs are provided through \$26MM in IFC A-loan (comes from IFC account), \$13MM in concessional funding, and additional funds from the European Investment Bank. In ensuring its additionality for this project, the IFC identifies the benefits it brings to the table in terms of transparency and financing certainty in a market with little-to-no track record. Providing strong credit history is one of the most beneficial outcomes of a successful blended finance project. Also, the IFC provides long-term financing and concessional funding at lower costs of capital than traditional investments and provides the expertise that comes from utilizing the IFC-Canada Climate Change Program (IFC-CCCP) as its primary source.

b. Parques Eolicos del Caribe (IFC-CCCP)

This other pending project is another one funded through the IFC-CCCP and is taking place in the Dominican Republic. The overall project costs are \$133MM of which IFC will finance \$32.5MM in A-loan, \$17MM through a blended finance subordinated loan, and co-financing from the Inter-America Development Bank (IDB). In terms of additionality and key characteristics, one highlight is that the IFC believes this project will have a powerful demonstration effect in that it may provide a signal to global power developers and DFIs

that the Dominican Republic has the framework for successful renewable energy projects. Additionally, the capacity of commercial banks in the Dominican Republic are such that the sector is hesitant to finance projects they perceive as overly risky in the power sector.

Other key aspects of this project and other IFC-funded projects are worth mentioning, too for their blended finance-specific benefits. The IFC engages in Environmental and Social Mitigation Measures to ensure minimal waste, greenhouse gas emissions, and pollution. The appraisals for the projects are fully updated after years of inactivity which demonstrates a commitment to current data and accurate reporting. The reporting on the environmental and social impact, IFC visits to the site, environmental compliance reports, visits to nearby communities, and stakeholder buy-in assessments are incredibly useful for ensuring the success of the projects. Because of the IFC's significantly larger capacity, each of these steps can be done with more expertise than if the Dominican Republic government sought to implement, evaluate, and monitor the project itself.

The usefulness of this case study is limited by the fact that most of the important milestones will be completed in throughout the summer and fall of 2018.

c. CEMEX Green (IFC Climate Business)

This project is particularly interesting because it provides blended financing to one Mexico's largest corporations and one of the world's largest cement producers to improve its environmental activity. The \$120MM of A-loan funding along with an additional possible \$50MM of blended finance tranching will help CEMEX implement its sustainable investment program which includes two thirds of its projects being labeled as

Climate Smart Projects. These projects will be related to investments in vertical roll mills, a wind farm, efficiency improvement, and a reduction of CO2 footprint in emerging markets.

The important highlight for the IFC is that by financing the CEMEX project, the IFC influences a large portfolio of new green projects across the world due to CEMEX's global presence. The green partnership with CEMEX will also demonstrate blended finance's climate change-focused applications for large, established companies in more developed markets. While blended finance has aided other middle-income countries (in fact predominantly middle-income countries as seen in the upcoming data analysis), the relationship that the IFC is cultivating with CEMEX is also a signal of usefulness for large corporations that they do not just need to leverage private financing.

d. Enel Wind Brazil

This wind power project is an example of a foreign company (Italian) leveraging blended finance for a direct investment in wind technology Brazil. Similar to the CEMEX project, this investment is related to several different projects, but all of these are spread throughout Brazil. Expected capital expenditures for this project are around \$600MM of which the IFC is providing \$200MM in A-loan form and plans to mobilize USD\$220MM worth of local currency from local banks to make up some of the remaining costs. The IFC provides expected developmental impacts on the contribution to the wind energy sector in Brazil by describing its impact on reducing the reliance on thermal energy and large-scale hydro generation. Also, in terms of additionality, the IFC makes a similar note to the CEMEX project on the value of consolidating a relationship with Enel Green Power as a global play

in renewable energy. By leveraging local currency, the IFC remains weary of crowd-out and demonstrates its commitment to crowding-in local private investment.

e. Thailand Solar PV with Solar Power Company Group (SPCG)

Unlike the other projects chosen as case studies, this solar project in Thailand is a completed blended finance project that was funded both by the IFC and the Clean Technology Fund (CTF) of the CIFs. The IFC pledged \$8MM in commercial funds that were coupled with \$4MM in concessional funding from the CTF. The main goal of this project was to help garner future investment support for the Thai market by supporting pilot programs. This project's aim is to set the groundwork for the SPCG to be financed fully on commercial terms in the future which requires strategic financing to move from the subsidized pilot projects.

c. Interviews

Apart from the datasets and case studies, this paper benefited from the perspectives of two high-level officials at the World Bank that offered insight on blended finance and its applications in global climate change business. These interviews were open format, had other people present, and took the form of unstructured question and answer. Because there were other people present, there was not opportunity for several follow-up questions in-person, but the overall themes of the project related to how blended finance positively utilizes partnerships and how climate change is an ideal business for these kinds of partnerships came through in the limited time spent with each official. These interviews rounded out the multi-perspective data gathering for blended finance in climate change business.

The first official engaged for this research was Mohamed Mohieldin who serves as the World Bank Group's Senior Vice President for the 2030 Development Agenda, UN Relations, and Partnerships. The highlights from this interview as follows:

- The principle of Maximization of Finance for Development is pervasive in the World Bank's determination of additionality. If the World Bank identifies local capacity to finish the project, it will not get involved in financing that project.
- The mobile industry has a great deal of potential for positively impacting climate action through the instant data it provides and the connectedness it facilitates.
- Companies engaging with the World Bank are not allowed to place short-term considerations ahead of long-term environmental concerns into their budgeting.
- Climate Change adaptation needs to leverage more blended financing to minimize carbon emissions from the beginning in nations that do not have domestic capacity to establish the necessary green infrastructure.

The second official engaged for this research was Nena Stoiljkovic who serves as the IFC's Vice President for Asia and Pacific and previously served as the Vice President for Blended Finance and Partnerships. In response to the question "Why do you feel that the money goes further in Climate business than in other areas in which the IFC is involved," Ms. Stoiljkovic offered responses that align with this paper's hypotheses. She said that the IFC has been engaged in the climate business for longer, so the best practices from the sector have improved the efficiency of the IFC's work and much of the climate business has historically been done in middle-income countries. Ms. Stoiljkovic mentioned that the IFC, sensibly, found it much easier to mobilize private funds in mid-tier countries with existing markets. The focus on Agri-business in Africa, she stated, can be hindered by fragile

institutions and a lack of capital. The recent global trends in conversation and action in the climate change space have also helped their climate business more than the other blended finance focus areas.

d. Limitations and Weaknesses

Throughout the course of the research period, this paper encountered limitations and weaknesses that limited its potential impact. The lack of completed projects and therefore lack of evaluation data on blended finance projects hindered thoughtful, deep analysis of its comparative benefits, in practice. While this paper sought out to better understand how blended finance investments in the climate change space outpace other types of investments or other sectors, the lack of completed blended finance projects and enormous diversity of projects in the traditional investment space make the comparisons very imbalanced. Further, the lack of any first-hand accounts limits available claims on the practical benefits of blended finance for climate change projects. Further research would therefore benefit from an on-site research study of these climate change blended finance projects to grasp the more nuanced benefits that are only observable in person. Another limitation was the general timeline of the research. More time would have allowed for potential travel to speak with practitioners, deeper analysis, and other exploratory angles related to the topic.

A weakness in this research paper was the lack of more advanced statistical analysis tools. While one of the previously mentioned limitations was a lack of available data, visual basic for applications (VBA) or R may have been more helpful in manipulating the raw data that was available to provide more informative summary statistics or organize the data in a more digestible way. Another weakness in the data is that it is unfortunately not

representative of the overall sample of blended finance projects. For reasons ranging from data not being published, blended finance projects being in their infancy, and adaption along with reporting from only a few major DFIs, the sample that was analyzed in this paper cannot be extrapolated to all projects of these types. That being said, the lack or representativeness also hinders the paper's ability to make definitive statements or claims regarding its findings except in the context of the data that was used.

IV. Data Analysis

Each of the datasets used were analyzed in similar ways through Microsoft Excel. Using Microsoft formulae SUM, SUMIF, COUNT, COUNTIF, and AVERAGE, basic summary statistics were provided for each dataset.

a. GEF Data

The GEF dataset was the largest of the three with 1,445 projects after filtering out projects with less relevance. 18 of the 50 most funded (grant + co-financing) GEF projects are from China with 6 of the top 10 coming from China. China far outpaces the rest of the world in its use of blended finance for climate change with over \$11B in total project funding, 63 sole projects, and an average of \$176MM of funding per project. China is the only GEF-affiliated reporting country with more than 50 blended finance projects which may demonstrate its commitment to this form of investment in battling climate change. 8 other countries have received more than \$1B in project funding from grants and co-financing (in order after China): India, Mexico, Philippines, Brazil, Vietnam, Russia, Nigeria, and Morocco. As the next-most GEF-funded country, India has

received \$3.8B in funding and has the next most projects with 41. Nigeria has the next largest average funding per project at \$104MM per project.

Regionally, there are some interesting findings, too. Asia (China, India, Philippines, Vietnam) make up 4 of the 10 countries with the most total project funding with \$17.93B for 142 projects at an average of \$108MM per project. Latin America and the Caribbean (LAC) (Mexico and Brazil) have 2 countries in the top 10 countries with the most funded projects with \$3.66B total for 42 projects at an \$86MM average per project. Africa (Nigeria, Morocco, South Africa) has 3 of these top 10 with \$3.09B total, 47 projects, and an average of \$71.4MM per project. The last country in the top 10 also rounds out the BRICS – the Russian Federation with \$1.3B in total funding for 16 projects at an average of \$81MM per project. The mean total funding is \$306.4MM (skewed by China's \$11B), mean project number is 8.4, and the mean average funding per project is \$22.4MM (also skewed by China). Because China is such an outlier in the data, the use of medians is also important. The median total funding is \$108.2MM, median number of projects is 7.0, and the median average funding per project is \$16.7MM.

b. SREP Data

The SREP data analysis produced the following summary statistics of interest:

By type, solar projects receive more SREP funding (28.3%) than do geothermal, hydro, or mixed renewable energy projects. By region, Africa receives more SREP funding (48.9%) than do the Asia, LAC, or Europe and Central Asia (ECA) regions. Finally, the data shows that there has been a downtrend in the funding of reported SREP

projects with the most funding coming in 2014 (60.5% of the total from 2014-2017) and decreases each year since – 2015 (21.0%), 2016 (14.7%), and 2017 (3.8%).

c. CTF Data

The CTF data analysis produced the following summary statistics of interest:

By type, solar projects receive more CTF funding (34.3% of total) than do geothermal, wind, or mixed renewable energy projects, just as the SREP data showed in that subset. By region, Asia receives the most funding with 34.0% of the total ahead of Africa, LAC, and ECA.

V. Discussion

Overall, this research produced both unexpected and somewhat predictable findings related to the hypotheses at hand. The research findings support the first hypothesis related to the trending climate change conversations' effects on investment attraction. The qualitative research in the form of the interviews supports the hypothesis that more global policy attention to climate change through the Sustainable Development Goals, Paris Accord, and the general impact of climate change on domestic economies has led to more investments in the realm. The data findings show that there have been more funding opportunities recently except for the downwards trend over time for SREP projects. The SREP finding may be confounded by the program's focus on low income nations because over time, the target nations will have more access to other blended finance (and traditional) instruments for financing thus decreasing the need for SREP funding, but this cannot be supported or rejected by the data at hand.

The second hypothesis that more investment is attracted to wealthier nations than relatively poorer countries can also be supported by the data. While the GEF does not provide blended finance tools to the most developed countries which tend to serve as GEF donor countries, the nations that received the most funding were predominantly the middle-income countries that Ms. Stoilkovic highlighted. The BRICS nations that are characterized by their growth and increasing importance in the global economy were all in the top ten most-funded GEF projects in the manipulated dataset. On the other end, of the 250 least-funded projects in the filtered category described in Data, none are projects from BRICS nations. Prior research and economic theory supports the rationale that established markets with better credit histories and high gross domestic products receive more foreign investment be it blended or not.

The final hypothesis that costs went decrease overtime due to increased experienced was neither supported nor rejected. While stated vaguely, this hypothesis would most closely apply to overhead costs, transaction costs, and costs related to delay. Data on these kinds of costs were not available, so no real judgment of whether DFIs have increased in their efficiency are available to support or reject this hypothesis.

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VIII. Appendices

Datasets available upon request