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The importance of project finance for renewable energy projects

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ABSTRACT

Given the magnitude of investment needs into low-carbon power generation, the availability and cost of capital is crucial for successful energy transitions. Recently, a strong increase of non-recourse project finance (as compared to corporate finance on a project sponsor's balance sheets) could be observed for power generation projects. Classical economic motivations for project finance are the prevention of contamination risk, and agency conflicts – however, these reasons do not apply for comparably small projects in low-risk environments, such as many renewable energy projects being realized today. This paper therefore assesses the importance of project finance for renewable energy projects in investment-grade countries, and the underlying drivers to use this kind of finance. Eight potential reasons for using project finance are distilled from economic and finance theory, and then empirically evaluated using a novel dataset for new power plant investments in Germany 2010–2015. Results show that in this extreme case with particularly low investment risks, project finance has much larger importance for renewables than for fossil fuel-based power plants. It is not used to reduce contamination risk or agency conflicts, but, instead driven by the "debt overhang" of non-utility sponsors such as independent project developers. We discuss implications for policy makers, the financial sector, as well as energy scholars concerned with power generation investment decisions.

1. Introduction

The global demand for electricity continues to grow, fueled by industrialization and urbanization in many parts of the world. At the same time, power generation is the largest single source of CO_2 emissions (IPCC, 2014) and needs to be transformed fundamentally. Hence, many governments aim at substantially expanding renewable energy in order to reach the 2 °C goal committed in the Paris Agreement. While power generation has always been an asset-heavy industry, capital intensity is even higher for most renewable energy sources as compared to fossil fuel-based plants (Schmidt, 2014). Thus policy makers worry about the availability and cost of capital for low-carbon power plants.

Globally, investment in power generation doubled between 2005 and 2015, reaching about 420 billion USD p.a., about 70% of it for renewables (IEA, 2016a). According to estimates, a comparable level of annual investment is needed throughout 2016–2025 to satisfy the growing demand and implement policies as pledged under the Paris Agreement. A pathway in line with the 2 °C goal will require even further investment, likely in the magnitude of additional 250 billion USD p.a. over the next decade (IEA, 2016b). While capital provision is crucial in facilitating the transition to renewables, research on the role of financial markets in capitalizing low-carbon power systems is still at an early stage (Hall et al., 2015).

The structure of owners currently raising capital for new power plants is well understood: On a global scale, 61% of new conventional power plants (fossil fuels, nuclear, hydropower) have been commissioned by state-owned enterprises in 2015, compared to only 35% from private companies (the remaining 4% being households/communities). For non-hydro renewables, in contrast, the private companies have a share of 53%, and households/communities another 16% (IEA, 2016a). The importance of private sponsors for renewable energy is even higher in OECD countries – in Germany, for instance, 59% of 2012 investment in renewable power plants have been made by institutional and strategic investors, and another 26% by private individuals (Trend Research, 2013).

Much less however is known about the financing structures used for these power plants. Following decades of debate on Modigliani and Miller's (1958) irrelevance proposition, it is now generally accepted that financing decisions matter for the value of a firm and as such need to be considered to assess investment projects (Myers, 2001). Whether sponsors are public or private, the first decision they have to make is between two main alternatives for a new project: Taking it on their balance sheet (i.e. using *corporate finance*), or opening a separate balance sheet drawing on *project finance*. When using corporate finance, a project sponsor utilizes all assets and cash flows from the existing firm to guarantee the credit provided by lenders (in case the sponsor is a

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public entity, including cash flows such as future tax returns). This is the classical way to finance investments for private or public enterprises, making up 85–90% of total capital investment in developed countries like the U.S. (Esty, 2004). When using project finance, in contrast, sponsors create a new entity (i.e. a special purpose vehicle) to incorporate the project; lenders will then depend on cash flows of the new project alone, with no or very limited claim on sponsor's assets.

Compared to the classical way of corporate finance, using project finance comes with significantly higher transaction cost. As the project performance is all a potential lender can rely on, the projected cash flows and cost need to be examined carefully. Thus bills for technical, commercial and legal advisors can sum up to 5–10% of the total project value. Hence, traditionally project finance has mainly been used for large, high-risk projects where sponsors need to protect their core firm from a potential project failure. Large and complex power plants, especially in developing countries, have been a "textbook case" for projects where this protection against a contamination of the core firm is worth the price (Gatti, 2013).

Recently, however, a surge of project finance could also be observed for less complex, relatively small and low-risk projects in technologies such as onshore wind and solar[1]: Globally, the use of project finance in new renewable energy plants increased from 16% of all projects in 2004 to a remarkable share of 52% in 2015 (FS-UNEP, 2016). While country-level data is hardly available, there is some evidence that project finance also plays an important role in investment-grade countries such as Germany (Arnold and Yildiz, 2015; Enzensberger et al., 2003), Chile (Nasirov et al., 2015), and Australia (Kann, 2009).

A clear understanding on the importance and motivations for project finance in low-risk environments is required for all parties concerned with renewable energy investments: Policy makers striving to design regulation that attracts private investment in renewable energy technologies, project sponsors and financial intermediaries thinking about how to innovate power generation financing, and energy scholars dealing with power plant investment decisions in the transition to low-carbon energy systems. This article therefore addresses the following questions:

1. How important is project finance for renewable energy projects in developed, low-risk countries?
2. What are the drivers and underlying reasons to use project finance in such settings?

This article draws on economic theory on rationales for project finance in general, as well as an empirical analysis of project finance prevalence in a specific country – namely Germany, a country with a particularly low-risk environment for renewables, as well as substantial investment in both conventional and renewable power generation capacity over the last years. The analysis is structured as follows: The next section recaps key characteristics of project finance and summarizes previous research regarding its use in the energy sector. Section 3 carves out eight potential reasons to use project finance based on economic literature, which are then assessed in the empirical part: Section 4 describes the data for the German case study and the empirical approach, Section 5 summarizes the empirical results. Implications are discussed in Section 6, and Section 7 concludes.

2. Project finance in the energy sector

2.1. Definition and global trends

There is some variety of what is considered "project finance" in certain industries or jurisdictions, but two key characteristics are generally accepted (cf. e.g. Gatti, 2013; Yescombe, 2013) and most relevant for economic analysis, and are the basis for the subsequent discussion:

- Project finance means the use of a special purpose vehicle (SPV), which is legally and commercially self-contained and serves only to realize the project.
- The SPV is financed without (or very limited) guarantees from the sponsors, such that lenders to the SPV depend on future project cash flows only and cannot recourse on the sponsors' other businesses.

This understanding is in line with the definition that is part of the Basel II framework, defining project finance as "*a method of funding in which the lender looks primarily to the revenues generated by a single project, both as the source of repayment and as security for the exposure. […] In such transactions, the lender is usually paid solely or almost exclusively out of the money generated by the contracts for the facility's output, such as the electricity sold by a power plant. The borrower is usually an SPE that is not permitted to perform any function other than developing, owning, and operating the installation. The consequence is that repayment depends primarily on the project's cash flow and on the collateral value of the project's assets.*" The framework also acknowledges that project finance is typically used for large and complex installations and mentions power plants, chemical processing plants, mines, as well as transport/environmental/telco as most common applications (BCBS, 2006, Art 221–222, p. 53). In this article we therefore adopt the Basel II definition.

Project finance dates back to the development of American railroads in the 19th century. Its use grew rapidly to develop oil & gas fields in the 1970s, and got a further boost as mean to realize transport projects such as bridges and tunnels from the 1980s on (Yescombe, 2013). While still making up only a small part of overall capital investment, the global project finance loans market is estimated at USD 277 billion in 2015. Three sectors account for the lion's share: Power generation, oil & gas, and transport infrastructure (Thomson Reuters, 2016).

A relatively recent development is the increasing use of project finance for renewable energy projects such as solar and onshore wind, many of which are smaller in scale and less complex than conventional power plants that traditionally used project finance (offshore wind projects, in contrast, resemble more conventional plants concerning size and complexity). Fig. 1 breaks down the investment in renewable energy by type of financing – on a global scale, project finance increased dramatically in importance over the last ten years, being used for more than half of all new investment in 2015.[2] Its share increased in parallel with the general increase of investment in renewables, meaning that a disproportionally high share of additional annual investment was channeled into the sector through project finance. Part of the shift towards project finance is driven by the expansion of renewables in emerging markets such as China. However this cannot explain the use of project finance entirely: In 2008, for instance, renewables investment was still dominated by Europe and the US, and project finance nevertheless accounted for 45% of all financing already. This article's analysis of a new dataset on project finance use in Germany will contribute to the understanding of project finance in investment-grade countries.

2.2. Previous research

While economic and financial theory addresses project finance in general (compare Section 3), studies looking at its use specifically in the energy sector are rare. In an early article, Pollio (1998) discusses the preference for project finance in the global energy sector. Based on a literature review and a discussion of the interests of sponsors, commercial banks and host governments, he concludes that risk management features (i.e. preventing lenders to recourse on the core firm in case of a project failure) are the key reason for using project finance, and that "project finance has nothing to do with capital constraints" (p. 689). More recently, some papers discuss the uptake of project finance for renewable

[1] In contrast to onshore wind and solar, offshore wind (deployed in Germany since 2010) is characterized by large and complex projects, and during 2010–2015 still prone to a high technology risk, cf. Section 4.2.

[2] While there are some challenges using BNEF data to analyze the type of financing on a project level (cf. Section 4.2), it serves reasonably well to illustrate the aggregate development, especially on a global level.