Investing in sustainable infrastructure: new directions for international business research*

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Abstract

In the global economy today, there is both a supply-side push of large amounts of stimulus funding being directed at infrastructure investment and a corresponding demand-pull, with nearly all of the countries in the world committing themselves to the Sustainable Development Goals and to the transition to a net zero economy. In the energy sector, the pressure to rapidly increase the proportion of renewable capacity, primarily wind and solar, has created unprecedented opportunities for investment, but it also raises concerns about the availability of project finance investors to execute all of these projects, particularly in developing countries. We discuss three areas of future research that address the causes and remedies for such capacity constraints, namely, the structuring of project finance investment, demonstration effects, and the role of technological complementarities and leapfrogging in developing countries.

Keywords: infrastructure investment; international project finance; renewable energy; capacity constraints; leapfrogging

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1. Introduction

In August 2021 the G20 countries had committed a reported $3.2 trillion of stimulus funding, amounting to 3.2 per cent of their GDP, to infrastructure investment.[1] Of this amount, 90 per cent is due to be spent in the next two years, which would result in the largest push for infrastructure investment in many decades, and imply a 45 per cent increase in annual infrastructure investment.

At UNCTAD's World Investment Forum this year, infrastructure investment was tackled both from the perspective of the investing firms in sessions focused on international project finance and from the side of the lenders in sessions focused on sustainability bonds, as well as in sessions examining the role of financial institutions in channelling funds and developing the required measurement and reporting tools.

In addition to the supply-side push of public financing for infrastructure being made available on a large scale, there is a corresponding demand-pull, with nearly all countries in the world committing themselves to transitioning to a net zero economy. At the UNFCCC Glasgow Climate Conference (COP26), the target dates for reaching net zero ranged from 2035 for small developed countries such as Finland to 2060 and 2070 for large developing economies such as China and India, respectively.

While this push for infrastructure investment is impressive, a combination of public and private financing will be needed to achieve these goals, and there is reason to suspect that much less investment than the amounts needed to reach net zero will be directed at developing countries (IRENA and CPI, 2020). This outcome would put the success of the global commitments in jeopardy, particularly in terms of the goal of achieving a just transition.

There is therefore an urgent need to gain a better understanding of what is needed to mobilize the necessary private investment, particularly in developing countries. Transnational corporations (TNCs) will play an important role as investors and transferers of technology in this transition (UNCTAD, 2021), and until the start of the COVID-19 pandemic, renewable energy investment was one of the largest sectors of greenfield investment (Bloomberg NEF, 2020; Patala et al., 2021).

We have identified three areas of future research in international business and finance that can inform discussions on the policy measures needed to attract investment. The first of these involves a better understanding of project finance

[1] Global Infrastructure Hub, "With USD3.2 trillion in investments announced, G20 governments are leveraging infrastructure's transformative potential to achieve greater social, environmental, and economic outcomes", 4 November 2021, www.gihub.org.

as a cross-border business modality and how some of the risks in these projects can be mitigated. Second is an examination of the role of positive and negative demonstration effects in foreign direct investment (FDI) and how these can affect new projects. Third is the need to examine global complementarities in green innovation and the possibilities of leapfrogging for developing countries during the energy transition. We discuss each of these in turn.

2. Project financing as a cross-border modality

Since the mid-1980s a large part of the research in the international business field has focused on international production by TNCs, and specifically production in developing countries that is part of the global division of labour that is increasingly referred to as global value chains (GVCs) in the literature (Gereffi, 2019; Gereffi, Frederick and Bamber, 2019; Zhan, 2021). GVC participation continues to be important for many developing countries (including the least developed countries). Yet since the 2000s increasing attention has also been paid to the growing share of services in the value-adding activities that cross borders, whether through trade, licenses and royalty payments, or contractual services (Buckley, Strange, Timmer and de Vries, 2020). Parallel to the changes in the productive networks of TNCs, there has also been growing interest in the literature in the increasing internationalization of the research and development activities of TNCs, which now extend to emerging markets such as China and India (Lundan and Cantwell, 2020).

But while the research focuses in the literature have shifted as the global economy has evolved, the area of infrastructure investment has received very little attention to date. When it comes to transportation and communication infrastructure, economic and business historians have explained how successive rounds of technology development have fostered new possibilities for business expansion, from the building of the railroads to air travel and container shipping, and from the telegraph and telephone to the internet (Jones, 2004). However, even in these cases, most of the attention has been on the possibilities created by the improved speed and reliability of transportation and communication, rather than on the physical infrastructure that has made this possible. Similarly, while many studies have focused on the global oil industry, these mainly examine oligopolistic rivalry between firms, and not the energy infrastructure that these firms helped to create.

Today, we are living at the dawn of a new era of infrastructure investment which is not driven in the first instance by the possibilities created by new technologies, but rather by the collective decision-making of countries trying to forestall the worst consequences of climate change. This era of investment is likely to involve cross-border activities of TNCs to a substantial extent, but there is little in the existing literature that could serve as a foundation for examining this phenomenon.

Most of the international business literature has concentrated on FDI as the primary modality for technology transfer. With the rise of services, the literature has also taken on board various contractual forms of cross-border engagement, in the end depicting the TNC as a network or a global factory that is a combination of foreign investment and nonequity modalities (Buckley, 2011; UNCTAD, 2011). What is notable is that while these modalities control the exposure and risk of the TNC by limiting the equity commitment, they are all modalities that can be engaged by the firm itself and require merely the agreement of the foreign counterparty buying the license or entering into a contractual agreement.

This is different from the way in which most infrastructure investment projects are structured. While textbooks mention turnkey and build-operate-transfer agreements, there has been very little empirical research into the strategies of firms that participate in such projects, and do so across borders (for a notable exception, see Uner, E. Çavuşgil and S. T. Çavuşgil (2018)). Infrastructure is a diverse field that covers transportation infrastructure such as roads, railways and bridges; social infrastructure such as hospitals; and energy and sanitation infrastructure. Although all of these sectors are increasingly open to foreign investment, our focus is specifically on energy infrastructure and the investments that are needed to meet the commitments outlined at COP26.

Since electrification is seen as the key to reaching a net zero economy, the wind and solar energy sectors play central roles, because the efficiency improvements and cost reductions achieved with these technologies make them competitive with other forms of energy for the building of new generating capacity. The balance between wind and solar depends largely on natural conditions in each country. These technologies, which benefited from early policies by countries such as Germany that employed feed-in tariffs to encourage renewable energy production, will form the cornerstone of electrifying the energy systems of developed and developing countries alike (IRENA, 2020).

The knowledge that is required to develop and run a modern wind or solar park typically involves multiple partners in the site selection, construction and operating phases. At the same time, the equity participation of the investing firm is not sufficient to fully finance the project, which will always involve outside lenders that set their own constraints. Although such constraints may in fact be beneficial in ensuring the financial viability and increasingly, the sustainability of the project, in contrast to other types of FDI projects, the TNC is unable to solely control many of the important aspects of the project.

In an emerging market, the building of a wind or solar park typically involves lenders such as a regional development bank providing green loans, the government as a counterparty and the TNC as a private investor. Since such projects generate income for investors over a considerably long period of time, there is a notable

counterparty risk. Although all FDI is risky in that it is often costly to reverse – which is reflected in the fact that FDI tends to be more stable than portfolio investment over time – the risks related to project finance are somewhat different from those faced by greenfield equity investors. Project finance can be characterized as a cooperative modality involving multiple partners and jointly owned assets. In contrast to equity joint ventures, where the underlying assets are typically knowledge intensive and difficult to measure, in project finance, the assets are physical and carry multiple location-specific risks (Müllner, 2016).

To build capacity for wind or solar energy on a scale that enables the transition at the required pace involves substantial amounts of investment, including foreign investment. In August 2021 India reached 100 GW of installed renewable capacity (excluding large hydropower), putting it fourth in the world in terms of installed capacity.[2] The government has set an ambitious goal of 450 GW of installed renewable capacity by 2030 (about 60 per cent of installed total capacity), indicating a quadrupling of the amount of investment. Even in a country such as India that has developed a competitive wind energy industry, the proportion of foreign investment would probably need to quadruple as well. To know whether this is feasible, or what would make it feasible, we need considerably more research at the industry and firm levels on the factors that make projects viable and attractive for foreign investors. Several of these issues are policy-related, as both the counterparty risks and exchange-related risks are dependent on government actions, either as participants and regulators in the energy markets or in terms of the development of the local financial market.

3. Demonstration effects in FDI

We have argued that there is a need to study project finance as a distinct form of cross-border business activity and to analyse the risks and opportunities attached to it in the same way that other modalities have been analysed. There is also a need to move beyond the TNC, to consider the role of the other essential actors in project finance and to examine what impact both positive and negative demonstration effects have on investment.

We know from previous research that an initial investment by a large multinational has a strong positive signalling value and tends to attract other investment into the same area. We also know that investment by one large player, particularly in an oligopoly, often invites a matching move by another large player, a so-called

[2] India, Ministry of New and Renewable Energy, "India achieves 100 GW milestone of installed renewable energy capacity", 12 August 2021, https://pib.gov.in.

follow-my-leader strategy (Dunning and Lundan, 2008). Both of these factors contribute to the observed bunching of investment in both space and time. We also know that in connection with currency crises and other kinds of economic and political instability, there are negative contagion effects on nearby markets which may or may not have been directly affected.

All of these effects seem to be present in the infrastructure market, which at the moment is characterized by ample availability of financing to facilitate the energy transition, but difficulty finding bankable projects. This can be because of negative demonstration effects, caused by projects that fail because they take too long to come to fruition or because of difficulties in recovering payment during an earlier project. Both instances send a strong negative signal to the investor community. That said, one successful project can have a very positive effect in demonstrating the viability of the investment location.[3]

Suitable conditions do not arise on their own. They require deliberate policy reform on the part of the government and capacity-building efforts by lenders and multilateral institutions such as UNCTAD and the IFC in training government officials and structuring contracts. Successful management of projects also requires a willingness on the part of governments to be treated as business partners with the scrutiny that is attached to that, rather than as sovereigns whose actions and commitments can scarcely be questioned.

Aside from anecdotal evidence on the factors leading to success and failure, there is considerably more room for international business scholars to examine what actions create credible counterparties with governments at different levels of development, and what can be done in the structuring of project finance deals that would mitigate the risks for private investors (for earlier studies, see Sawant (2010) and Vaaler, James and Aguilera (2008)). There is also an urgent need to address other finance-related topics such as the handling of currency risks by e.g. promoting local currency lending (which will not be feasible in all markets), or even relying on some emerging fintech solutions for risk mitigation.

Finally, while it is certainly important to get the policy environment right, international business research should also engage with the question of how the process of policymaking affects TNCs. The introduction of new policies requires careful consideration of the divergent time horizons of policymakers and investors, which is especially relevant in long-term infrastructure projects (see e.g. Fay et al. (2015)). Dynamic policy reforms are a double-edged sword in the sense that they have the potential to send a strong positive signal to investors, while also being able to

[3] The examples in this section draw in part on a very informative panel discussion on International Project Finance at the UNCTAD World Investment Forum on 20 October 2021.

cause negative consequences due to transition costs and uncertainty (Cuervo-Cazurra, Gaur and Singh, 2019; Fay et al., 2015). In addition to focusing on the content of policies, we clearly require more research on policy dynamics and how their effects can be mediated by the actions of TNCs and governments.

4. Global complementarities in innovation and leapfrogging during the energy transition

In addition to choosing to focus on infrastructure investment and examining the specificities of this form of investment, the third area of promising new research lies in examining the potential and limits of realizing global complementarities that enable leapfrogging in energy systems across the globe.

The mobile revolution in Asia and Africa has demonstrated how communication technology can bring efficiency gains and essential services to people without requiring large infrastructure investment as in the age of fixed-line telephony. Although the production of electricity does require the building of physical infrastructure, the cost competitiveness of solar and wind means there is potential for developing countries to leapfrog again if they can move directly into renewable sources of energy without committing to further decades of fossil-fuel-based energy production to cover their growing energy demand (Carbon Tracker Initiative, 2021).

Such leapfrogging is supported by the geography of renewable energy resources, but it will require a large amount of investment that is not likely to be available from purely domestic sources. Countries that put in place policies to promote green infrastructure investment and that come across as credible counterparties with successful demonstration projects are the ones likely to experience the gains from cost competitive and sustainable energy infrastructure. However, in the latest Climatescope survey, although three quarters of the countries had renewable energy targets in place, less than half of the countries had put in place policies to explicitly encourage investment in renewables (Bloomberg NEF, 2020).

If and when this transition is successful, and countries advance beyond the point where their immediate energy needs can be met by renewable sources, new possibilities will open up. One is the possibility to build additional capacity for green electricity generation that could be used in so-called power-to-X applications, where the electricity could be used to produce green hydrogen, biofuels or synthetic fuels for use in difficult-to-electrify sectors such as ocean shipping, heavy road or rail transport, and air travel (IRENA, 2020).

The second possibility is the emergence of multinational energy value chains (MEVCs). For example, a recent study by the World Energy Council estimated that 50 per cent of the green hydrogen demand in the European Union (EU) will

have to be imported (WEC, 2021). The new EU budget for external cooperation has increased the support for climate change projects to 30 per cent,[4] specifically targeting North Africa (Van Wijk and Wouters, 2021). Morocco is a prime example of laying the groundwork for the emergence of new MEVCs on the back of infrastructure investment and policy reform that has already attracted foreign co-funding. For example, the giant solar plant Noor received over a third of its financing from the German development bank (KfW). Private projects are bound to follow in the wake of a 2020 bilateral agreement, all with an aim to meet Germany's green hydrogen demand.[5]

The success of these MEVCs depends critically on complementarities in the form of common technological standards and regulations, specifically in power-to-X applications. However, current efforts are still driven by national pilot projects with little cross-border engagement. Multiple projects are being undertaken in developed countries such as Denmark, Germany, Sweden and the United Kingdom. In something of a landmark, in October 2021, the Swedish company SSAB delivered its first batch of green steel to a customer.[6] China and Japan have also been at the forefront of patent applications in this area over the past few years (IEA, 2021).

Especially for TNCs, innovation requires cross-border knowledge exchange, but this will become increasingly difficult where regional technology standards and regulations proliferate. A lack of co-innovation, arguably driven by the strategic importance and public funding of large-scale hydrogen projects, could seriously hamper MEVC opportunities. We think that exploring the potential and limits of MEVCs is a promising area of future research. It will require a better understanding of how TNCs can enable leapfrogging in developing countries through the transfer of technology and institutions, and an appreciation of how locational and technological complementarities will drive or limit MEVCs as well as TNCs' access to renewable energy worldwide. From a policy perspective, as national and regional energy systems are being redesigned, there is an increased need for collaboration between the public and private sectors, and there is an urgent need to examine the structures and modalities available for cross-border collaboration that would allow for common technological standards to be developed.

[4] European Commission, "European Commission welcomes the endorsement of the new €79.5 billion NDICI-Global Europe instrument to support EU's external action", press release, 29 March 2021, https://ec.europa.eu.

[5] Bauke Baumann, "Green hydrogen from Morocco – no magic bullet for Europe's climate neutrality", 9 February 2021, Heinrich-Böll-Stiftung, https://eu.boell.org.

[6] SAAB, "The world's first fossil-free steel ready for delivery ", 18 August 2021, www.ssab.com.

5. Conclusions

The World Investment Forum provided a unique platform for discussions that included all of the main actors involved in infrastructure investment, namely investing firms (specifically TNCs), lenders and governments. Informed by these discussions, we argued that there are three streams of research that should receive high priority on the research agenda of international business scholars, namely, project risks, demonstration effects and complementarities in innovation.

We believe that these three research streams are important for understanding where the bottlenecks are likely to arise in the transition to sustainable energy systems. Money alone does not build wind parks, and capacity constraints make themselves known in different ways. One scenario is simply that projects remain undone, because all the resources required for execution are employed elsewhere. This is a difficult situation to remedy, because it is caused by the unprecedented simultaneous supply of funding and demand for projects around the world. The second kind of bottleneck situation is the one that can be remedied by public policy, which is that projects that are viable should not go undone because of obstacles that turn investors away and lead them to look for easier projects. For developing countries, examining the sources of counterparty risk and effective ways of mitigating it is essential for being able to compete for the limited supply of project-executing firms.

As in any market, it is to be expected that the supply of investing firms in the energy market is somewhat elastic, so that more firms will come into the market over time. However, in order to fuel the growth of emerging economies in a sustainable manner, and to enable the (double) leapfrogging scenario, it will be essential for developing countries to be able to attract a large share of new energy projects. But as long as plenty of other viable projects are available in developed countries, it is difficult for projects in developing countries to get executed, unless the obstacles can be cleared out of the way of the investors. This is a technical issue in terms of how deals can be financed and structured better, but it is also a question of collecting and analysing best practices, so that more information is available on policies that work. This is in part achieved by the capacity-building efforts of international organizations and development banks, in part by contributions made by academic researchers and in part by events such as the World Investment Forum, which offers an opportunity for information exchange across a wide range of governments and private sector actors.

References

Bloomberg NEF (2020). *Climatescope Emerging Markets Outlook 2020: Energy Transition in the World's Fastest Growing Economies*. https://global-climatescope.org/assets/data/reports/climatescope-2020-report-en.pdf.

Buckley, Peter J. (2011). "International integration and coordination in the global factory", *Management International Review*, 51(2), pp. 269–283.

Carbon Tracker Initiative (2021). "Reach for the sun: the emerging market electricity leapfrog", 14 July. https://carbontracker.org.

Cuervo-Cazurra, Alvaro, Ajai Gaur and Deeksha A. Singh (2019). "Pro-market institutions and global strategy: the pendulum of pro-market reforms and reversals", *Journal of International Business Studies*, 50(4), pp. 598–632.

Dunning, John H., and Sarianna M. Lundan (2008). *Multinational Enterprises and the Global Economy* (Cheltenham: Edward Elgar).

Fay, Marianne, Stephane Hallegatte, Adrien Vogt-Schilb, Julie Rozenberg, Ulf Narloch and Tom Kerr (2015). *Decarbonizing Development: Three Steps to a Zero-Carbon Future* (Washington, D.C.: World Bank).

Gereffi, Gary (2019). "Global value chains and international development policy: bringing firms, networks and policy-engaged scholarship back in", *Journal of International Business Policy*, 2(3), pp. 195–210.

Gereffi, Gary, Stacey Frederick and Penny Bamber (2019). "Diverse paths of upgrading in high-tech manufacturing: Costa Rica in the electronics and medical devices global value chains", *Transnational Corporations*, 26(1), pp. 1–29.

International Renewable Energy Agency (IRENA) (2020). *Global Renewables Outlook: Energy Transformation 2050*. www.irena.org.

IRENA and Climate Change Initiative (CPI) (2020). *Global Landscape of Renewable Energy Finance 2020*. www.irena.org.

Jones, Geoffrey (2004). *Multinationals and Global Capitalism: From the Nineteenth to the Twenty First Century* (New York: Oxford University Press).

Lundan, Sarianna M., and John Cantwell (2020). "The local co-evolution of firms and governments in the Information Age", *Journal of International Business Studies*, 51(9), pp. 1516–1528.

Müllner, Jakob (2016). "From uncertainty to risk—a risk management framework for market entry", *Journal of World Business*, 51(5), pp. 800–814.

Patala, Samuli, Jouni K. Juntunen, Sarianna M. Lundan and Tiina Ritvala (2021). "Multinational energy utilities in the energy transition: a configurational study of the drivers of FDI in renewables", *Journal of International Business Studies*, 52(5), pp. 930–950.

Sawant, Rajeev J. (2010). "The economics of large-scale infrastructure FDI: the case of project finance", *Journal of International Business Studies*, 41(6), pp. 1036–1055.

United Nations Conference on Trade and Development (UNCTAD) (2011). *World Investment Report 2011: Non-equity Modes of International Production and Development* (New York and Geneva: United Nations).

_____ (2021). *World Investment Report 2021: Investing in Sustainable Recovery* (New York and Geneva: United Nations).

Uner, M. Mithat, Erin Çavuşgil and S. Tamer Çavuşgil (2018). "Build-operate-transfer projects as a hybrid mode of market entry: the case of Yavuz Sultan Selim Bridge in Istanbul", *International Business Review*, 27(4), pp. 797–802.

Vaaler, Paul M., Barclay E. James and Ruth V. Aguilera (2008). "Risk and capital structure in Asian project finance", *Asia Pacific Journal of Management*, 25(1), pp. 25–50.

Van Wijk, Ad, and Frank Wouters (2021). "Hydrogen–the bridge between Africa and Europe", in Margot P. C. Weijnen, Zofia Lukszo and Samira Farahani, eds., *Shaping an Inclusive Energy Transition* (Cham: Springer), pp. 91–120.

World Energy Council (WEC) (2021). "Decarbonised hydrogen imports into the European Union: challenges and opportunities", October, *La Revue de l'Énergie*. www.weltenergierat.de/wp-content/uploads/2021/10/WEC-Europe_Hydrogen-Import-Study.pdf.

Zhan, James X. (2021). "GVC transformation and a new investment landscape in the 2020s: driving forces, directions, and a forward-looking research and policy agenda", *Journal of International Business Policy*, 4(2), pp. 206–220.