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Theories of Sustainable Finance

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This paper attempts to formulate new theories of sustainable finance, meeting a need to establish a set of propositions that can help us understand the behaviour and actions of economic agents towards sustainable finance. The paper used a literature survey to establish a theoretical relationship between sustainable finance and the actions of economic agents. The paper proposed six theories of sustainable finance, namely, the priority theory of sustainable finance, the resource theory of sustainable finance, the peer emulation theory of sustainable finance, the life span theory of sustainable finance, the positive signalling theory of sustainable finance, and the system disruption theory of sustainable finance. These theories offer believable explanations for the behaviour and actions of economic agents towards sustainable finance. Academics, policy makers, economists, researchers and students will find these theories very useful in their work in sustainable finance.

Key Words: theories of sustainable finance, priority theory, resource theory, peer emulation theory, life span theory, positive signalling theory, system disruption theory, economic agents, green bonds, green finance
JEL Classification: Q01, Q21, G28

Introduction

There is growing interest in sustainable finance, which can be seen in the widespread private sector support for sustainable finance, the issuance of national policy for sustainable financing in some countries, and the rise in sustainable finance research by academics (Migliorelli 2021; Kuhn 2020; Cunha, Meira, and Orsato 2021; Thistlethwaite 2014). This interest shows that sustainable finance has reached an important stage in development. But the legitimacy of sustainable finance as a field of study will be linked to the quality of theories that can explain and predict the behaviour and actions of economic agents towards the sustainable finance agenda.

At present, many published articles in the sustainable finance literature do not use theories and this slows the development of sustainable finance as a field of study. Formulating theories of sustainable finance will not

only develop sustainable finance as a field of study, but it will also help ensure that the field of sustainable finance will become a vibrant arena for theory testing using real world data, and it can open up an avenue to use empirical data to validate, refute or refine existing theory formulation. Therefore, it is important to formulate theories of sustainable finance.

Many ideas, opinions, expectations and perspectives on sustainable finance have emerged in the academic literature and in policy circles, such as the need for the banking sector to play a significant role in promoting sustainable financing (Jeucken 2010; Weber 2014); the need to develop sustainable finance regulation and disclosure rules (Ahlström and Monciardini 2021; Chiu 2021); the need to avoid greenwashing (Zeidan 2020; Gregory 2021); the need to ensure that investors put sustainability over short-term profits (Ryszawska 2018); the need to promote sustainable finance through the issuance of green bonds (Park 2018); the role of sustainable finance in achieving the sustainable development goals (Ziolo, Bak, and Cheba 2021); allowing financial institutions to play a significant role in promoting sustainable finance (Ozili 2021); the mainstreaming of sustainable finance as a solution to climate change risk (Chebly, Rutz, and Schiano 2018); and mobilizing institutional efforts towards sustainable financing (Shalneva and Zinchenko 2018). While these ideas and perspectives on sustainable finance are interesting and noteworthy, they do not provide explanations for the behaviour and actions of economic agents towards sustainable finance. Migliorelli (2021) observed that the sustainable finance landscape is characterised by heterogeneity which hinders the smooth conceptual development of sustainable finance. These observations in the literature present a strong case for formulating theories of sustainable finance.

Motivated by this concern, this paper formulates some theories of sustainable finance that explain the behaviour and actions of economic agents towards the sustainable finance agenda. The formulated theories are the priority theory of sustainable finance, the resource theory of sustainable finance, the peer emulation theory of sustainable finance, the life span theory of sustainable finance, the positive signalling theory of sustainable finance and the system disruption theory of sustainable finance. While no theory is perfect, the theories presented in this paper provide a good starting point from which a set of relationships and interrelationships can be established.

The theory formulation in this paper contributes to the sustainability literature. It presents a comprehensive understanding of the behaviour

and actions of economic agents towards sustainable finance. Economists, sustainability enthusiasts, policy makers and researchers can use these theories to explain the behaviour of economic agents towards sustainable finance in a single location or across countries.

The remainder of the paper is organized as follows. The second section presents a conceptual background and the literature review. The third section presents the theories of sustainable finance. The fourth section concludes.

Conceptual Framework and Literature Review

DEFINING SUSTAINABLE FINANCE

Several studies in the literature have defined sustainable finance. For instance, Ryszawska (2016) defines sustainable finance as finance that supports sustainable development in three combined dimensions which are the economic dimension, environmental dimension, and the social dimension. Migliorelli (2021) defines sustainable finance as finance that supports sectors or activities that contribute to the achievement of at least one of the relevant sustainability dimensions. Gerster (2011) defines sustainable finance as finance that takes into account environmental, social, and governance (ESG) factors. Ozili (2021) defines sustainable finance as finance that takes into account ESG considerations when making investment decisions in the financial sector. Bakken (2021) defines sustainable finance as investment decisions that take into account the ESG factors of an economic activity or project. Sommer (2020) defines sustainable finance as the mobilization and allocation of capital to support the transition towards a more sustainable economy. The International Capital Market Association defines sustainable finance as finance that incorporates climate, green and social finance while also adding wider considerations concerning the longer-term economic sustainability of the organizations that are being funded, as well as the role and stability of the overall financial system in which they operate (International Capital Market Association 2020). United Nations Environment Programme defines sustainable finance as finance that meets the long-term needs of a sustainable and inclusive economy along all dimensions relevant to achieving those needs, including economic, social, and environmental issues (UN Environment 2017).

Collectively, these definitions of sustainable finance can be grouped into two categories. The first category views sustainable finance as finance

that takes into account economic, social and governance considerations while the second category views sustainable finance as finance that meets the long-term needs of the economy.

The sustainable finance literature is a growing literature within the broader finance literature. Migliorelli (2021) observes that the sustainable finance landscape is dominated by an overabundance of heterogeneous concepts, definitions, and industry and policy standards. Migliorelli (2021) argues that such heterogeneity may hinder the smooth conceptual development of sustainable finance. To reduce the heterogeneity, the author recommends that the conceptual and applied practice of sustainable finance should be referred to as 'finance for sustainability.' Granier and Rigot (2021) conducted a bibliometric analysis of sustainable finance studies from 1981 to 2018. They find that the sustainable finance debate is structured around five themes: the performance of socially responsible investment (SRI) funds, corporate social responsibility, the performance of responsible companies and stock market indices, the investment strategies of financial actors, and the role of pension funds in sustainable development.

Existing studies in the sustainable finance literature emphasize the need for financial institutions to focus on sustainable financing. For instance, Oman and Svartzman (2021) argue that the financial sector needs to play a greater role in the transition towards a sustainable economy, and that policy makers in different parts of the world have begun to develop sustainable finance programmes to achieve the ambitious target of combating climate change based on the Paris agreement. Shabb, Curtis, and Libertson (2021) point out that the finance sector is playing an ever increasing role in supporting the transition to sustainable development by incorporating sustainability into their financial analysis and investment portfolios. Schoenmaker (2018) shows that some financial institutions have started to avoid unsustainable companies from a risk perspective, and have begun to invest in sustainable companies and projects to create long-term value for the wider community.

Schumacher, Chenet, and Volz (2020) examine the role of sustainable finance and investment in Japan and how the Japanese financial sector can mitigate growing climate risks and support Japan's transition towards a zero-carbon, sustainable economy. They show that the Japanese financial sector and its institutions are exposed to significant climate risks em-

anating from both inside and outside Japan, and the Japanese financial sector has started to consider climate-related risks and to align itself with the sustainable development goals and the 2°C warming scenarios outlined in the Paris climate agreement. Urban and Wójcik (2019) investigate how investment banks integrate sustainability in their underwriting services. They find that investment banks continue to patronize underwriting companies that have been flagged for major environmental, social, and governance misconduct, and that investment banks do not restrain from underwriting companies that provide contentious products, such as tobacco, coal, and nuclear weapons.

Fatemi and Fooladi (2013) argue that the current approach to shareholder wealth maximization is no longer a valid guide for the creation of sustainable wealth because it emphasizes short-termism which has had the unintended consequence of forcing many firms to externalize their social and environmental costs. The author calls for a shift to sustainable finance. Ryszawska (2016) also shows that the role of finance is changing from the dominant view of maximizing profits and shareholder wealth towards one supporting sustainable development, a green economy, a low carbon economy, and mitigation of climate change. Ozili (2021) proffers solutions that can make finance become sustainable. Ozili (2021) argues that (i) there should be greater focus on how some aspects of finance can contribute to sustainability; (ii) light-touch regulation may be needed to grow the relatively small sustainable finance sector; (iii) there is a need to adopt a bottom-up approach to grow the sustainable finance sector; (iv) voluntary ESG disclosures and related sustainability reporting should be encouraged; and (v) short-term financial instruments can complement long-term instruments in sustainable financing.

Theories of Sustainable Finance

This section presents some theories of sustainable finance. The theories are the priority theory of sustainable finance, the resource theory of sustainable finance, the peer emulation theory of sustainable finance, the life span theory of sustainable finance, the positive signalling theory of sustainable finance, and the system disruption theory of sustainable finance. The theories are summarized in table 1.

PRIORITY THEORY OF SUSTAINABLE FINANCE

The priority theory of sustainable finance argues that the rate at which economic agents make every effort to achieve sustainable finance goals

TABLE 1 Summary of the Theories

Proposition	Merits	Demerits
Priority Theory of Sustainable Finance		
States that the rate at which economic agents make every effort to achieve sustainable finance goals in a country or region is a true reflection of the priority given to the sustainable finance agenda.	(i) It recognizes that economic agents have multiple important priorities with the possibility of making the attainment of sustainable finance goals an additional priority; (ii) it gives economic agents an opportunity to articulate the importance or priority they give to sustainable finance goals.	(i) Prioritizing the attainment of sustainable finance goals does not necessarily mean that the sustainable finance goals will be achieved; (ii) sustainable finance goals can still be achieved without making it a priority.
Peer Emulation Theory of Sustainable Finance		
States that economic agents take similar actions, or adopt similar policies and strategies, of the peers they emulate in pursuit of sustainable finance goals.	(i) It provides an opportunity for economic agents to share the same societal, economic and political ideals on sustainable finance with the peers they emulate; (ii) it is faster to adopt the sustainable finance policies and actions already adopted by peers as only few adjustments need to be made before adopting it; (iii) it is cheaper to adopt the policies and actions taken by peers as the copying economic agent does not need to spend much of its own resources to formulate an entirely new course of action, policy or strategy to achieve its sustainable finance goals; (iv) significant improvement can be made to the sustainable finance policies and actions that have been adopted by peers.	(i) Adopting the sustainable finance policies and actions that have been adopted by peers bypasses the distinct creativity involved in developing a new course of action, policy or strategy from scratch as well as the valuable insights that could be gained during the process; (ii) adopting the same or similar sustainable finance policies and actions that have been adopted by peers in other countries may not yield the expected results due to differences in financial markets, financial regulation, governance mechanisms, and political will to achieve sustainable finance goals.

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in a country or region is a true reflection of the priority given to the sustainable finance agenda (Wilson 2010). The priority can be assessed from three dimensions: (i) the coordinated, independent and collaborative ef-

TABLE 1   *Continued from the previous page*

Proposition	Merits	Demerits
Life Span Theory of Sustainable Finance		
States that economic agents' interest in sustainable finance is affected by the life span of sustainable finance products, services, instruments, schemes, policies or activities.	(i) It provides a good explanation for why there is increased (or decreased) demand or support for specific sustainable financing instruments, products or services such as green bonds; (ii) it recognizes the role of information or prediction about the life span stages of sustainable financing products, services, instruments, schemes, policies or activities.	(i) Information about the life span stages of sustainable financing products, services, instruments, schemes, policies or activities may not be readily available; (ii) predictions about the life span stages of a specific sustainable financing product, service, instrument, scheme, policy or activity may be inaccurate.
System Disruption Theory of Sustainable Finance		
The potential disruption to the existing system (mainstream finance) arising from the transition to sustainable finance can compel economic agents to make a decision on whether or not to support or join the transition to sustainable finance.	(i) It acknowledges that the transition to sustainable finance can disrupt the existing mainstream financial system; (ii) the theory proposes that full information disclosure to economic agents about how the transition to sustainable finance will take place and its effect on economic agents can help economic agents to understand the reason for the shift to sustainable finance, and such explanations can help to reduce their resistance to the transition to sustainable finance.	(i) The transition to sustainable finance may not necessarily require overhauling the entire mainstream financial system.

forts put together by economic agents towards achieving sustainable finance goals, (ii) how quickly or slowly a consensus is reached, and (iii) how quickly or slowly actions are taken towards achieving sustainable finance goals.

  Generally, economic agents have different priorities. These priorities can be ranked from the least important to the most important. The rank-

TABLE 1   *Continued from the previous page*

Proposition	Merits	Demerits
Positive Signalling Theory		
States that economic agents have an incentive to disclose positive information about their commitment to pursue one or more sustainable finance goals in order to signal good news to external parties who can support their sustainable finance goals.	The disclosure of information about sustainable finance can reduce information asymmetry between investors and firms.	(i) Disclosing information about sustainable finance does not mean that economic agents will follow through with actions; (ii) the frequent disclosure of positive information about sustainable financing by firms could be used as a tactic to suppress or hide bad information in firms.
Resource Theory of Sustainable Finance		
States that some countries have superior human-made resources which gives them a comparative advantage in achieving their sustainable finance goals and in transitioning to sustainable finance, compared to other countries.	(i) It recognizes that some countries have abundant human-made resources compared to other countries; (ii) the resource theory of sustainable finance recognizes the differences in the level of development among countries, since development is a human-made process and is also a function of the amount of available human-made resources.	(i) The differences in human-made resources could be used as a basis to discriminate against countries that are unable to achieve their sustainable finance goals; (ii) the theory does not recognize the fact that it takes a long time to build human-made resources.

ing of sustainable finance goals in their list of priorities is a true reflection of the importance given to sustainable finance goals by economic agents. However, these priorities may change over time in response to changing realities in a country or in the world. If the sustainable finance agenda is listed among the priorities of economic agents at a particular time, it means that economic agents will take the sustainable finance agenda very seriously and will put in a great deal of effort to achieve sustainable finance goals (Kuhn 2020). Conversely, if the sustainable finance agenda is not listed among the priorities of economic agents, it means that economic agents will not take this agenda very seriously during a given time period and will not put in any effort to achieve sustainable finance goals during that period (Krauss, Krüger, and Meyer 2016). For instance, in the case of firms, financial institutions can show the priority they give

to achieving sustainable finance goals by incorporating the principles of sustainable financing into their core business model so that sustainability becomes a fundamental principle guiding the conduct of their business activities (Setyowati 2020; Cunha, Meira, and Orsato 2021).

Prioritizing sustainable finance goals is not without consequence. This is because making the attainment of sustainable finance goals a priority can lead to abandoning other important goals until the sustainable finance goals are achieved. This means there will be a trade-off: to forgo one goal in order to achieve another goal. Such trade-offs can be very costly, thereby leading to the rejection of the idea to prioritize sustainable finance goals over other important goals. For example, developing countries that have important economic development needs, such as increasing GDP per capita, may not see the need to prioritize sustainable finance goals as they may consider sustainable finance to be an inferior economic development need. The implication of the priority theory of sustainable finance is that the priority given to sustainable finance goals depends on the priority given to other important goals at the time the prioritizing is being considered.

The priority theory of sustainable finance has two merits. First, it recognizes the fact that economic agents have multiple important priorities with the possibility of making the attainment of sustainable finance goals an additional priority. Secondly, it gives economic agents an opportunity to articulate the importance or priority they give to sustainable finance goals (Wilson 2010). Such priority may be articulated through public announcements in the media (Pinchot and Christianson 2020).

The priority theory of sustainable finance has two demerits. One demerit of the theory is that prioritizing the attainment of sustainable finance goals does not necessarily mean that these goals will be achieved. Another is that sustainable finance goals can still be achieved without making them a priority per se. For instance, the sustainable finance goals of a country can be achieved by private sector agents without making it a national policy priority.

THE PEER EMULATION THEORY OF SUSTAINABLE FINANCE

The peer emulation theory of sustainable finance argues that economic agents take similar actions, or adopt similar policies and strategies, of the peers they emulate in pursuit of sustainable finance goals. The peer emulation theory of sustainable finance suggests that, when there are no uniform standards to guide action towards sustainable finance, economic agents resort to adopting similar policies or actions taken by the peers

they admire or emulate. This implies that economic agents will pursue specific sustainable finance goals because the peers they emulate are doing so or have already done so in the past. Emulating one's peers makes sense when economic agents share similar perspectives and views on sustainability (Cowett 2008). The tendency to emulate ones' peers in the pursuit of sustainable finance goals is stronger when two or more economic agents have similar societal, political and economic ideologies and aspirations (Ditlev-Simonsen and Midttun 2011). For example, countries that share the same ideals on climate change will most likely adopt similar sustainable finance policies and actions towards achieving their individual sustainable finance goals.

The peer emulation theory of sustainable finance has five merits. First, it provides an opportunity for economic agents to share the same societal, economic and political ideals on sustainable finance with the peers they emulate. Second, it is easier and faster to adopt the sustainable finance policies and actions already adopted by peers as only few adjustments need to be made. Third, it is cheaper to adopt the policies and actions taken by peers as the copying economic agent does not need to spend much of their own resources to formulate an entirely new course of action, policy or strategy to achieve their sustainable finance goals. Fourth, significant improvement can be made to the sustainable finance policies and actions that have been adopted by peers. Such improvement can make the adopted policies become better and more attractive for the next adopter. Fifth, under this theory, economic agents do not view peers as direct or indirect competitors.

The peer emulation theory of sustainable finance has two demerits. First, adopting the sustainable finance policies and actions of peers bypasses the distinct creativity involved in developing a new course of action, policy or strategy from scratch as well as the valuable insights that could be gained during the process. Second, adopting the same or similar sustainable finance policies and actions that have been adopted by peers in other countries may not yield the expected result due to differences in financial markets, financial regulation, governance mechanisms, and the political will to achieve sustainable finance goals.

THE LIFE SPAN THEORY OF SUSTAINABLE FINANCE

This theory is adapted from Vernon's product cycle hypothesis (Vernon 1979). The life span theory of sustainable finance argues that interest in sustainable finance is affected by the life span of sustainable finance prod-

ucts, services, instruments, schemes, policies or activities. It argues that sophisticated economic agents know that sustainable finance products, services, instruments, schemes, policies or activities (hereinafter 'sustainable finance products') have a life cycle which begins with the introduction of sustainable finance as a new concept, the growth of sustainable finance, the maturity of sustainable finance, and the decline of sustainable finance. The knowledge that economic agents have about the life cycle of sustainable finance products, enables them to make independent predictions about the estimated life span of a specific sustainable finance products; and based on that prediction, economic agents are able to reach a decision on whether to make a short-term commitment, long-term commitment or no commitment at all to sustainable finance. This means that the extent of support for sustainable finance by economic agents, and the extent of their support for the transition from traditional/mainstream financing to sustainable financing, depends on the perceived life span of a specific sustainable finance products by economic agents.

The implication of the life span theory of sustainable finance is that economic agents may reduce their support for sustainable finance or make only a short-term commitment to sustainable financing if they believe that a given sustainable financing product will be short-lived or if they believe that the sustainable finance agenda will soon fade away just like other development schemes have faded away in the past. On the other hand, economic agents will increase their support for sustainable financing or make a long-term commitment to sustainable finance if they believe that a given sustainable financing product will exist for a long time or if they believe that the sustainable finance agenda will permanently replace existing traditional/mainstream sustainable finance products.

The life span theory of sustainable finance has two merits. The first merit of the life span theory of sustainable finance is that it provides a good explanation for why there is increased (or decreased) demand or support for specific sustainable financing instruments, products or services such as green bonds. If economic agents believe that the green bond market will grow and dominate the traditional/mainstream financial market for a long time, they are likely to invest more in green bonds. On the other hand, if economic agents believe that the green bond market will be short-lived, they will either reduce their investment in green bonds or avoid the green bond market. Another merit of the life span theory is that it recognizes the role of expectations about the lifespan of sustainable financing products.

The life span theory of sustainable finance has two demerits. The first demerit of the life span theory of sustainable finance is that expectation about the life span stages of sustainable financing products may be subjective and biased. Another demerit is that expectations or predictions about the life span stages of a specific sustainable financing product, service, instrument, scheme, policy or activity may be inaccurate.

SYSTEM DISRUPTION THEORY OF SUSTAINABLE FINANCE

The system disruption theory of sustainable finance argues that pursuing sustainable finance goals may disrupt the structure of the traditional/mainstream financial system and can disrupt businesses that rely heavily on traditional/mainstream financing. The disruption caused by the transition to sustainable finance, depending on its severity, may lead to resistance from affected economic agents, or a general lack of public support for the sustainable finance agenda. Under this theory, the potential disruption to the existing system (traditional/mainstream finance) arising from the transition can compel economic agents to make a decision on whether or not to support or join the transition to sustainable finance. Economic agents will base their decision on whether the perceived benefits of sustainable finance outweigh the costs, and whether the resulting disruption will significantly affect their business, income or means of livelihood.

Full information disclosure will undoubtedly help economic agents in reaching a decision on whether to support the transition to sustainable finance or not. The theory acknowledges that the transition to sustainable finance is not smooth, and can disrupt traditional/mainstream finance. The implication of the theory is that sufficient information should be disclosed about how the transition to sustainable finance will take place and which systems or structures will be discontinued, if any, in preparation for the transition. Information should also be disclosed about whether any new systems or structures will be created and how the change will affect businesses that heavily rely on traditional/mainstream finance to fund their business operations and activities. Information should also be disclosed about what will be done to compensate economic agents affected by the transition. Providing full information disclosure can help in making the transition smooth while at the same time offering compensation to those affected by the disruption caused by the sustainable finance transition.

The system disruption theory of sustainable finance has some mer-

its. First, it acknowledges that the transition to sustainable finance can disrupt the existing traditional/mainstream financial system. Second, the theory proposes that full information disclosure to economic agents about how the transition to sustainable finance will take place, and its effect on economic agents can help economic agents to understand the reason for the shift to sustainable finance, and such explanations can help to reduce their resistance to the transition.

The system disruption theory of sustainable finance has one demerit which is that the transition to sustainable finance may not necessarily require overhauling the entire traditional/mainstream financial system. Rather, sustainable finance can co-exist as a sub-sector within the traditional/mainstream financial system or may exist as a blended financial system (Gutterman 2020; Krauss, Krüger, and Meyer 2016), where economic agents can voluntarily decide whether they want financing that takes into account ESG factors or not (Ozili 2021).

POSITIVE SIGNALLING THEORY

The positive signalling theory argues that economic agents have an incentive to disclose positive information about their commitment to pursue one or more sustainable finance goals in order to signal good news to external parties who can support their goals (Quatrini 2021; Park 2018). Economic agents can disclose positive information about their sustainable finance intentions by making direct public announcements in the media or by providing additional voluntary financial and non-financial information in their published annual reports. For example, firms can publish information about their latest sustainable finance instruments or green bonds in order to attract investors who want to invest their funds in firms that have a sustainability orientation. Such disclosure makes it easier to attract investors who are interested in green bonds. Similarly, a government can publicly announce that it will issue a national sustainable finance policy. Such an announcement will not only increase the country's sustainability reputation, it can also signal the country's readiness to receive foreign technical support when implementing a national sustainable finance policy, and it can attract huge foreign direct investment aimed at green projects in the country.

The merit of the positive signalling theory of sustainable finance is that the disclosure of information can reduce information asymmetry between investors and firms.

The positive signalling theory has some demerits. First, disclosing in-

formation about sustainable finance does not mean that economic agents will follow through with actions. Second, the frequent disclosure of positive information about sustainable financing by firms could be used as a tactic to suppress or hide bad information such as when a firm has recently recorded huge losses in its investment portfolio that is linked to fossil fuel and then goes on to announce positive information about its sustainable investment intentions.

RESOURCE THEORY OF SUSTAINABLE FINANCE

The resource theory of sustainable finance proposes that the differences in human-made resources capable of supporting the attainment of sustainable finance goals is an explanation for why some countries have made tremendous progress in achieving their sustainable finance goals compared to other countries.

The resource theory of sustainable finance argues that some countries have superior human-made resources which give them a comparative advantage in achieving their sustainable finance goals and in transitioning to sustainable finance, compared to other countries. For example, some countries have abundant foreign reserves, a budget surplus, low external debt, a well-developed financial sector, advanced financial technology systems, robust financial regulation and supervision, strong climate change monitoring systems, better education about sustainability, a population that is sustainability-conscious, and a large number of institutional investors willing to invest in sustainable finance instruments. Countries with these abundant human-made resources have a comparative advantage and are therefore able to achieve their sustainable finance goals easily and more quickly than countries that do not have these resources. Countries with abundant human-made resources are also able to make a quicker transition from traditional/mainstream finance to sustainable finance compared to countries that have very few foreign reserves, a large budget deficit, high external debt, an under-developed financial sector, poor financial technology systems, weak financial regulation and supervision, and very few or no institutional investors willing to invest in sustainable finance instruments.

The implication of the resource theory of sustainable finance is that economic agents in countries that have abundant human-made resources can achieve sustainable finance goals much more quickly than countries that have limited human-made resources. Therefore, each country should be allowed to achieve its sustainable finance goals at its own pace and

within the limit of its available human-made resources. Countries that have very few human-made resources may lag behind in achieving sustainable finance goals while others may not be able to achieve any of their sustainable finance goals due to human-made resource constraints.

The resource theory of sustainable finance has two merits. First, it recognizes that some countries have abundant human-made resources compared to other countries, and this potentially explains why some countries are able to use their human-made resources to support the attainment of sustainable finance goals. Two, by taking into account the differences in human-made resources among countries, the resource theory of sustainable finance recognizes the differences in the level of development among countries since development is a human-made process and is also a function of the amount of available human-made resources.

The resource theory of sustainable finance has two demerits. First, the differences in human-made resources could be used as a basis to discriminate against countries that are unable to achieve their sustainable finance goals. Second, the theory does not recognize the fact that it takes a long time to build human-made resources. Therefore, countries that have very little human-made resources could use this as an excuse for not making any effort to achieve sustainable finance goals.

Conclusion

This paper formulated some theories of sustainable finance which could be used to advance the sustainability discussion in academic and policy circles. The formulated theories are: the priority theory of sustainable finance; the resource theory of sustainable finance; the peer emulation theory of sustainable finance; the life span theory of sustainable finance; the positive signalling theory of sustainable finance; and the system disruption theory of sustainable finance. These theories provide explanations for the behaviour and actions of economic agents towards the sustainable finance agenda.

Sustainable finance remains a growing field of study, and these theories can help to advance the ongoing discussions about sustainable finance. These formulated theories of sustainable finance have implications for developing a solid foundation to understand the behaviour and actions of economic agents towards sustainable finance. Future developments in sustainable finance may present new opportunities and challenges for theory development thereby presenting new opportunities for further research.

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Industry-Level Evidence of J-Curve Effects in the SACU Region

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Our study examines the cointegration relationship between exchange rate movements and trade balances for the five Southern African Customs Union (SACU) countries between 1995 and 2020. We disaggregate trade activity at an industry-level for 19 trade products and then determine whether industries benefit or are at a disadvantage during periods of currency depreciations over the short- and long-run. Applying pooled mean group (PMG) estimators to panel regression specifications of the industry-level J-curve, we find that exchange rate depreciations would be beneficial in 8 out of the 19 trade industries in the SACU region whilst harming the remaining 11 industries. In the strict, theoretical sense we only find J-curve effects in 6 of the 19 industries in which exchange depreciation initially hurt trade balances and then 'adjust' towards positive long-run effects. Altogether, we advise policymakers in SACU countries to consider devising (i) export-oriented policies for industries whose trade balance is strengthened by currency depreciations and (ii) import substitution industrialization policies and currency-risk mitigation strategies for industries whose trade balance is weakened by currency depreciations.

Key Words: real exchange rates, trade balances, J-curve, industry-level, Pooled Mean Group (PMG) estimators, African countries
JEL Classification: C32, C33, C51, F31, F41

Introduction

This study examines the relationship between exchange rates and trade balances (i.e. J-curve) for Southern African Custom Union (SACU) countries which form one of the oldest customs unions in the world (Manwa,

Wijeweera, and Kortt 2019). Theoretically, the J-curve postulates that real currency devaluation initially deteriorates the trade balance in the short-run but then subsequently, via adjustment lags, leads to improved trade balance over the long-run (Magee 1973; Bahamani-Oskooee 1985). Estimating the J-curve for SACU countries is an interesting case study as these countries have strong exchange rate and trade ties via their affiliation to a Common Monetary Area (CMA) and Free Trade Area (FTA).

On one hand, the SACU nations are bound by a Trilateral Monetary Agreement signed in 1986, and existing bilateral agreements between the smaller nations and South Africa create a platform for conducting monetary policy and forming exchange rate policies in the region (Asongu, Nwachukwu, and Tchamyou 2017). In particular, the Central Banks in Lesotho, Namibia and Eswatini have sacrificed their monetary policy independence and pegged their domestic currencies 'one-for-one' against the South African Rand, which, in turn, is floated in currency markets. Although Botswana is no longer part of the CMA, its currency is linked to a basket of currencies where the South African Rand accounts for a majority of the currency basket, and therefore it can be interpreted that by implication, the Botswana Pula is informally pegged to the South African Rand.

On the other hand, the SACU region constitutes a customs-free zone with a common external tariff and the 5 countries are bound by a Customs Union 'agreement' formally introduced in 1969 and later refined in 2002 following the abolishment of Apartheid rule in South Africa and the formation of the World Trade Organization (WTO). At the core of the trade agreements is a revenue sharing formula which divides the customs and excise revenue collected from trade activity, with the smaller nations financing a significant proportion of their domestic 'public bill' and supporting industrial development initiatives through received customs revenue (Gibb and Treasure 2006).

To strengthen the vulnerability of the SACU countries to external shocks and improve competitiveness in international markets, the World Bank (2020a) has suggested structural transformations at industry level aimed at diversifying trade activity away from traditional commodity and mining sectors into innovative manufacturing and services economies. Currently, exports in the smaller SACU nations are concentrated in a small number of products, namely diamonds, sugar, beverages, textiles, and wood products, produced by very few firms (World Bank 2020a) and manufacturing sectors have experienced very little growth over the last

two decades, particularly in the textile industry (Mlambo 2020). Makokera and Makokera (2020) suggest that industrial policies in SACU countries should not be limited to the manufacturing sector and SACU policymakers need to identify less explored yet highly innovative industries like trade in services and the digital economy.

At the centre of industrial policy, the exchange rate policy has been viewed as being instrumental to facilitating industrial development in SACU countries. Interestingly, there have been some observations recently made by academics and international governing agencies on how currency appreciations or depreciations influence industrial-level trade activity in the SACU region. For instance, Amusa and Fadiran (2019) show that South Africa's period of strong export performance and economic growth coincided with periods when the exchange rate was appreciating. Moreover, the World Bank (2015a) highlighted that, despite Botswana's reliance on natural resource exports, the country has not been affected by the 'Dutch Disease' even though the Pula has been overvalued since the global financial crisis. Conversely, the World Bank (2015a; b) argues that the overvaluation of the Lilangeni and Loti in the post-2009–2010 recessionary period remains a major source of concern for the textile industries in Eswatini and Lesotho whilst a more recent report by the World Bank (2020b) shows that recent currency depreciations resulting from the coronavirus pandemic may offer opportunities for manufacturing exports as well as for other trade areas.

However, the available empirical literature investigating the effects of currency movements on industry-level trade in SACU countries is mainly constrained to South African studies with a focus on manufacturing (Chiloane, Pretorius, and Botha 2014; Mlambo 2020) or agriculture industries (Poonyth and van Zyl 2000; Kargbo 2007). The consensus drawn from these studies is that exchange rate depreciations (appreciations) enhance (deteriorate) manufacturing and agricultural trade activity in South Africa. It is only the more recent studies of Amusa and Fadiran (2019) and Bahmani-Oskooee and Gelan (2020) which have examined the effects of exchange rate on a range of industry-level trade sectors in South Africa. On one hand, Amusa and Fadiran (2019) find J-curve effects in 6 out of 22 industries (live animals, prepared foodstuffs, textiles, machinery, toys and sports apparel, art works) whilst on the other hand, Bahmani-Oskooee and Gelan (2020) verify J-curve effects in 8 out of 25 industries (agriculture, marine products, food products, beverages and tobacco, wood products, printed material, machinery, computer

and electronics). Together, the studies of Amusa and Fadiran (2019) and Bahmani-Oskooee and Gelan (2020) imply that exchange rate deprecia-tions only benefit approximately a third of all trade products to the US, which are mainly agricultural and textile manufacturing trade.

Our study contributes to the developing literature in two ways. Firstly, it presents regional specific evidence of J-curve effects for the SACU countries, which to the best of our knowledge is the first study to do so. We find our panel approach convenient since the available industry-level trade data is constrained to annual data which would not yield enough data points to conduct country-specific analysis on individual SACU countries. Secondly, our study focuses on trade balances for 19 industry-level trade sectors against the rest of the world and not only confined to the U.S. bilateral trade. We argue that by focusing only on the bilateral trade with the US, previous works ignore the impact of industry-level trade activity with other key trading partners in Europe, the United Kingdom, Asia, Latin America and other African countries. The inclu-sion of other trading partners will provide a more complete picture of J-curve effects at industrial level trade activity for SACU countries.

Having provided a background to our study, the rest of the paper is organized as follows. Section 2 outlines the empirical framework of the study. Section 3 presents the empirical data along with the tests of integra-tion. Section 4 presents our main empirical findings. Section 5 concludes the study in the form of policy implications and avenues for future re-search.

Empirical Framework

For each of the 19 industries, we model the J-curve specification similar to those used in Bahmani-Oskooee and Gelan (2012):

$$tb_{ij,t} = \beta_{0i} + \beta_{1i}dgdp_{i,t} + \beta_{2i}wgdp_{i,t} + \beta_{3i}reer_{i,t} + e_t,$$
$$i = 1, 2, \ldots, N, t = 1, 2, \ldots, T, \tag{1}$$

where, *tb* is natural logarithm of trade balance for industry *j* in country *i*, *dgdp* is natural logarithm of gross domestic product for country *i*, *wgdp* is natural logarithm of world gross domestic product, and *reer* is natural logarithm real effective exchange rate for country *i*.

As far as the expected signs on the regression coefficients are con-cerned, economic theory proposes that $\beta_1 < 0$ and $\beta_2 > 0$. In other words, an increase in domestic income induces local people to import more,

hence worsening the trade balance, whereas an increase in the world income causes the rest of the world to substitute from exporting their products towards importing locally produced goods, which increases domestic exports and strengthens the trade balance. Moreover, in accordance with the J-curve theory, the sign on the β_3 coefficient is expected to be negative over the short-run and positive over the long-run, hence reflecting the 'J'-shaped relationship between real exchange rates and the trade balance.

To capture the short-run and long-run cointegration dynamics between the real exchange rate and the industrial trade balance we make use of the Pooled Mean Group (PMG) estimators of Pesaran, Shin, and Smith (1999). Notably, this econometric framework presents advantages over other contending panel models such as the panel vector autoregressive (PVAR) and the panel vector error correction model (PVECM) in the sense of accommodating a mixture of I(0) and I(1) variables. This is important as other panel models require all employed time series to be integrated of similar order and in most cases GDP and trade data evolve as unit root processes whereas real exchange rates would be stationary series, especially if they satisfy the purchasing power parity (PPP) condition (Nusair 2017). Pesaran, Shin, and Smith (1999) describe the PMG as a more efficient estimator than the mean group (MG) estimator and the dynamic fixed-effects (DFE) estimator since it involves both pooling and averaging and allows short-run coefficients and error correction coefficients to vary across countries but converge to a common long-run trend. In this regard, the PMG estimators provide an added advantage of dealing with possibly heterogeneous dynamics across countries and producing reliable estimates even with relatively small sample sizes.

We compactly re-formulate the trade balance equation (1) as the following panel autoregressive distributive lag (P-ARDL) specification:

$$
tb_{it} = \sum_{j=1}^{p-1} \lambda_{i,j} tb_{i,t-j} + \sum_{j=0}^{q-1} \sigma_{1i,j} dgdp_{i,t-j} + \sum_{j=0}^{q-1} \sigma_{2i,j} wgdp_{i,t-j}
$$

$$
+ \sum_{j=0}^{q-1} \sigma_{3i,j} wgdp_{i,t-j}) + \varepsilon_{it}, \tag{2}
$$

where $\varepsilon_{it} = (\varepsilon_{i1}, \dots, \varepsilon_{iT})$ is a vector of residual terms, and $\lambda_{i,j}$ and $\sigma_{i,j}$ are vectors of regression coefficients. The long-run coefficients (and intercept) in regression (1) are then computed as

$$\beta_{0i} = \frac{u}{1 - \sum_{j=1}^{p-1} \lambda_{i,j}}, \quad \beta_{1i} = \frac{\sum_{j=0}^{q-1} \sigma_{1i,j}}{1 - \sum_{j=1}^{p-1} \lambda_{i,j}},$$

$$\beta_{2i} = \frac{\sum_{j=0}^{q-1} \sigma_{2i,j}}{1 - \sum_{j=1}^{p-1} \lambda_{i,j}}, \quad \beta_{3i} = \frac{\sum_{j=0}^{q-1} \sigma_{3i,j}}{1 - \sum_{j=1}^{p-1} \lambda_{i,j}}.$$

The error correction representation of equation (2) can then be specified as:

$$\Delta tb_{i,t} = \phi_i(tb_{i,t-1} - \beta_{0i} - \beta_{1i}dgdp_{i,t} - \beta_{2i}wgdp_{i,t} - \beta_{2i}reer_{i,t})$$

$$+ \sum_{j=1}^{p-1} \lambda_{i,j}^* \Delta tb_{i,t-j} + \sum_{j=0}^{q-1} \sigma_{1i,j}^* \Delta dgdp_{i,t-j}$$

$$+ \sum_{j=0}^{q-1} \sigma_{2i,j}^* \Delta wgdp_{i,t-j} + \sum_{j=0}^{q-1} \sigma_{2i,j}^* \Delta reer_{i,t-j} + u_{it}, \tag{3}$$

where Δ is a first difference operator, $\lambda_{i,j}^* = - \sum_{m=j+1}^{p} \lambda_{i,m}, \sigma_{i,j}^* = - \sum_{m=j+1}^{q} \sigma_{i,m}$, and $\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{i,j})$ is the error correction term which measures the speed of adjustment back to steady state equilibrium subsequent to a shock to the system and the parameter is expected to be significantly negative in value. To formally test for cointegration effects amongst the variables, we conduct the Pedroni (1999) panel cointegration tests for (i) within-dimension and (ii) between dimension. To compute the test statistics, Pedroni (1999) suggests the two-staged empirical process. Under the first stage, we estimate baseline regression equation (1) using the first differences of the variables, i.e.

$$\Delta tb_{i,t} = \beta_{0i} + \beta_{1i}\Delta dgdp_{i,t} + \beta_{2i}\Delta wgdp_{i,t} + \beta_{3i}\Delta reer_{i,t} + \eta_{i,t} \tag{4}$$

and we then compute the variable L^2 as the long-run variance of $\eta_{i,t}$ using the Newey-West estimator. Under the second stage, we extract the error term, $e_{i,t}$, from long-run cointegration regression (1) and estimate two regressions to extract parametric and non-parametric test statistics. For the parametric statistics, we estimate:

$$e_{i,t} = \psi\beta e_{i,t-1} + \Delta e_{i,t-1} + \Delta e_{i,t-2} + \ldots + \Delta e_{i,t-p} + v_{i,t} \tag{5}$$

and use the residuals, $v_{i,t}$, to compute the long-run and simple variance of the errors as σ^2 and s^2, respectively. For the non-parametric statistics, we estimate:

$$e_{i,t} = \psi_i e_{i,t-1} + v_{i,t} \tag{6}$$

and, as before, we compute the long-run and simple variance of the errors as σ^2 and s^2, respectively and use them to create the variable, γ, as $\gamma = (\sigma^2 - s^2)/2$.

From regressions (5) and (6), Pedroni (1999) proposes the testing of two sets of hypotheses. Under the first set, the null hypothesis of no cointegration (i.e. H_{10}: $\psi_i = 1$ for all i) is tested against the alternative of cointegration effects (i.e. H_{11}: $\psi_i = \psi < 1$ for all i) which is tested using the following 4 within-dimension statistics (i.e. Panel v-statistic, Panel ρ-statistic, Panel ADF-statistic (parametric), Panel PP-statistic (parametric)). Under the second set of hypotheses, the null hypothesis of no cointegration (i.e. H_{10}: $\psi_i = 1$ for all i) is tested against the alternative of cointegration effects (i.e. H_{11}: $\psi_i < 1, \psi_i \neq \psi$) which is tested using the following 3 between-dimension statistics (i.e. Group ρ-statistic, Group ADF-statistic (parametric), Group PP-statistic (non-parametric)). The aforementioned test statistics are then compared with critical values tabulated in Pedroni (1999) to determine significance of cointegration effect amongst the observed series.

Empirical Data and Unit Root Tests

The empirical data used in our study is collected for the 5 SACU countries (South Africa, Botswana, Eswatini, Namibia and Lesotho) and is sourced from two main databases. Firstly, from the World Bank Development Indicators we source three variables, those being domestic GDP in millions of US dollars at 2015 constant prices (DGDP), world GDP in millions of US dollars at 2015 constant prices (WGDP) and the real effective exchange rate weighted against several foreign currencies (REER). Secondly, from the United Nations Conference on Trade and Development (UNCTAD) database, we collect import and export trade data with the rest of the world for 19 industries and we construct the trade balance (TB) variable by subtracting imports (M) from exports (X) and dividing the trade balance by GDP (i.e. (X − M)/GDP), which is consistent with previous literature, i.e. Bahmani-Oskooee and Gelan (2012), and Bahmani-Oskooee, Huseynov, and Jamilov (2013). Note that we collect our empirical data on annual frequencies between 1995 and 2020, and further transform our empirical data into their natural logarithm for empirical purposes.

The definitions and descriptive statistics of our empirical data is summarized in table 1 and as can be observed, the averages for the trade balance for all products produces a negative mean, implying an overall trade deficit for the SACU countries over the period 2001–2018. How-

TABLE 1   Summary of Panel Time Series Variables

Dependent variables	(1)	(2)	(3)	(4)	(5)
Domestic GDP	*dgdp*	W	9.098	3.875	0.00
World GDP	*wgdp*	W	17.710	4.237	0.00
Real effective exchange rate	*reer*	W	4.586	1.843	0.00
Trade balance: All products	ALL	U	−0.264	0.461	0.00
All food items	AFI	U	−0.461	1.186	0.00
Agricultural raw materials	ARM	U	0.044	1.239	0.30
Beverages and tobacco	BNT	U	−0.881	1.888	0.00
Chemical products	C	U	−1.338	1.655	0.00
Crude materials, inedible, except fuels	CI	U	0.814	1.311	0.00
Commodities and transactions	CNT	U	−0.371	2.567	0.13
Electronic excluding parts and components	E	U	−1.789	0.919	0.66
Fuels	F	U	−3.220	2.335	0.00
Food and live animals	FNL	U	−0.480	1.365	0.00
Iron and steel	INS	U	−2.020	2.425	0.48
Manufactured goods	MG	U	−0.984	0.927	0.00
Mineral fuels, lubricants and related materials	MLNR	U	−3.220	2.335	0.00
Miscellaneous manufactured articles, n.e.s.	MMA	U	−1.646	1.393	0.02
Machinery and transport equipment	MNT	U	−1.592	0.765	0.03
Ores and metals	ONM	U	0.519	2.012	0.00
Primary commodities	PC	U	0.154	1.098	0.00
Parts and comp. for elect. and electronic goods	PNC	U	−2.309	1.238	0.49
Pearls, precious stones and non-monetary gold	PPN	U	−2.310	2.941	0.00
Textile fibres, yarn, fabrics and clothing	TYFC	U	−0.619	1.046	0.00

NOTES   Column headings are as follows: (1) notation, (2) source, (3) mean, (4) standard deviation, (5) JB (*p*-value). W – World Bank Development Indicators, U – United Nations Conference on Trade and Development.

ever, when the trade basket is disaggregated into 19 products, we observe 4 commodities which, on average, have exports which are greater than their imports due to possible comparative advantages in production (i.e. Primary commodities, precious stones and non-monetary gold; Agriculture raw materials; Ores and metal; Crude materials, inedible except fuels). We note the remaining 15 trade commodities produce negative trade balance averages which may signify comparative disadvantages in production in commodities such as electronics as well as their parts and components;

TABLE 2   Unit Root Test Results

Variable	Levin, Lin, and Chu				Im, Pesaran, and Shin			
	Int	Trend	Int	Trend	Int	Trend	Int	Trend
dgdp	−1.07*	0.59	−4.88***	−4.28***	0.99	−0.14	−3.57***	−1.87**
wgdp	−0.74	1.11	−3.12***	−2.33***	1.97	0.61	−2.71***	−2.84***
reer	−1.49*	−0.35	−4.73***	−3.88***	−1.89**	−1.17	−4.15***	−2.52***
ALL	−1.53*	0.14	−2.86***	−1.46*	−1.23	0.08	−4.64***	−3.23***
AFI	−1.38*	0.00	−4.06***	−2.30***	−0.66	−0.50	−5.63***	−4.08***
ARM	−2.03**	−2.40***	−8.81***	−7.20***	−1.73**	−2.21***	−8.33***	−6.83***
BNT	−0.44	0.58	−4.61***	−3.25***	−0.34	0.03	−5.57***	−4.58***
C	−1.99**	−1.68**	−6.18***	−5.24***	−1.16	−0.08	−6.78***	−6.02***
CI	−1.05	−0.95	−6.78***	−5.50***	−0.61	−0.83	−6.86***	−5.39***
CNT	−0.51	−0.43	−5.03***	−3.61***	−0.46	−0.45	−4.98***	−3.42***
E	−0.57	−1.35*	−6.16***	−5.18***	−1.13	−1.14	−6.46***	−5.28***
F	−2.20**	−1.44*	−5.09***	−3.43***	−1.52*	−0.72	−5.86***	−4.43***
FNL	−1.59*	−0.30	−3.62***	−1.56*	−0.77	−0.77	−6.66***	−5.21***
INS	−0.76	0.04	−4.29***	−2.94***	−1.94**	−0.75	−4.96***	−3.51***
MG	−2.07**	−0.58	−3.77***	−2.61***	−1.63*	−0.14	−5.25***	−4.01***
MLNR	−2.20**	−1.44*	−5.09***	−3.43***	−1.52*	−0.72	−5.86***	−4–43***
MMA	0.06	−0.36	−5.47***	−4.38***	−0.28	0.38	−5.38***	−4.26***
MNT	−1.01	−1.87**	−2.99***	−2.42***	−0.72	−1.78**	−5.96***	−4.46***
ONM	−0.82	−0.29	−3.24***	−1.58**	−0.97	−1.01	−7.25***	−5.84***
PC	−0.39	1.59	−2.94***	−2.06**	0.20	0.98	−5.13***	−3.97***
PNC	−0.30	−0.37	−2.78***	−2.71***	0.21	−0.73	−5.24***	−3.59***
PPN	0.96	1.38	−1.53*	0.16	0.96	0.03	−4.06***	−2.59***
TYFC	0.45	0.82	−3.87***	−3.11***	0.38	0.94	−3.55***	−2.37***

NOTES   ***, **, * indicate significance at the 1%, 5% and 10% levels.

and in manufactured goods as well as in machinery and transport equipment.

Table 2 presents the findings from Levin, Lin, and Chu (2002) (hereafter LLC) and Im, Pesaran, and Shin (2003) (hereafter IPS) panel unit root tests performed with (i) an intercept and (ii) an intercept and trend, on our empirical series. Whereas the LLC tests the null hypothesis that each individual time series contains a unit root against the alternative that each series is I(0) stationary, the IPS tests the null hypothesis of a

unit root against the alternative hypothesis that some of the individual series do not contain unit roots. The reported findings in table 2 are ambiguous when both tests are performed on the levels of the variables, regardless of whether an intercept or a trend is included. However, in their first differences all test statistics manage to reject the respective unit root hypotheses in both tests, hence rendering the series to be generally first-difference stationary variables. All in all, we render the series compatible with the proposed PMG estimators as none of the series is integrated of an order higher than I(1).

Empirical Results and Discussions

We begin our empirical analysis by reporting the panel cointegration tests on the estimated panel ARDL regressions for each of the 19 industries. The computed within-statistics (pooled statistics) and the between-statistics (pooled-mean group statistics) for all industries are reported in table 3. The within-statistics, which test the null of no cointegration against the alternative 'homogenous' cointegration effects, reject the null hypothesis in 32 out of the 80 tested cases (i.e. Panel v-statistics with 4 out of 20 cases; Panel ρ-statistics with 5 out of 20 cases; Panel ADF-statistics with 9 out of 20 cases; and Panel PP-statistics with 14 out of 20 cases). Collectively, we note that for 4 industries the null hypotheses cannot be rejected in all 'within-statistics' (i.e. All allocated products; Iron and Steel; Miscellaneous manufactured articles; and Primary commodities, precious stones and non-monetary gold). On the other hand, the between statistics, which test the null of no cointegration against the alternative 'heterogenous' cointegration effects, offer more optimistic results as they reject the null hypothesis in 38 out of the 60 tested cases (i.e. mean-group ρ-statistics with 8 out of 20 cases; mean-group ADF-statistics with 10 out of 20 cases; and mean-group PP-statistics with 20 out of 20 cases). Note that at least one of the mean group statistics mange to reject the no cointegration null hypothesis for all trade industries which we treat as sufficient evidence in favour of cointegration effects in all selected industries. We hence proceed to our main PMG estimates.

The PMG estimates of the PARDL model are reported in table 4 for the short-run dynamics and in table 5 for the long-run. From the short-run estimates, we firstly note that 9 trade commodities produce their expected negative and statistically significant estimates on at least one of the two lags on the real exchange rate variable (i.e. Beverages and tobacco; Commodities and transactions; Fuels; Iron and steel; Manufactured goods;

TABLE 3 Panel Cointegration Test Results

Industry	Within-statistics				Between-statistics		
	Panel v-Statistic	Panel ρ-Statistic	Panel ADF-Statistic	Panel PP-Statistic	Group ρ-statistic	Group PP-statistic	Group ADF-statistic
ALL	−0.39 (0.65)	0.37 (0.39)	0.38 (0.65)	−0.10 (0.46)	0.15 (0.56)	−0.72 (0.23)	−1.14 (0.09)*
AFI	−0.61 (0.73)	0.63 (0.73)	−0.00 (0.50)	−0.59 (0.28)	−0.11 (0.46)	−0.66 (0.26)	−1.45 (0.07)*
ARM	−1.32 (0.91)	−1.43 (0.07)*	−4.71 (0.00)***	−3.40(0.00)***	−1.99 (0.02)**	−3.72 (0.00)***	−3.72 (0.00)***
BNT	0.65 (0.26)	−1.74(0.04)*	−2.59 (0.00)***	−4.91 (0.00)***	0.19 (0.57)	−7.74 (0.00)***	−5.29 (0.00)***
C	0.30 (0.30)	−0.32 (0.37)	−0.05 (0.48)	−2.51(0.01)***	−2.98 (0.00)***	−2.28 (0.01)***	−9.12 (0.00)***
CI	−0.96 (0.83)	−0.66 (0.25)	−2.02 (0.02)**	−2.23 (0.01)*	−2.25 (0.01)***	−3.04 (0.00)***	−9.99 (0.00)***
CNT	0.18 (0.43)	−0.49 (0.31)	−3.51 (0.00)***	−3.99 0.00)***	0.04 (0.51)	−3.33 (0.00)***	−2.93 (0.00)***
E	−0.04 (0.51)	−0.92 (0.10)*	−4.36 (0.00)***	−3.77(0.00)***	−1.01 (0.10)*	−3.72 (0.00)***	−5.56 (0.00)***
F	0.15 (0.44)	0.14 (0.56)	0.04 (0.52)	−1.75 (0.04)**	−0.76 (0.22)	−0.78 (0.22)	−2.39 (0.01)***
FNL	−0.79 (0.79)	0.68 (0.75)	−0.72 (0.23)	−0.98 (0.09)*	−0.52 (0.30)	−0.59 (0.28)	−2.04 (0.02)**
INS	0.16 (0.44)	0.75 (0.77)	1.01 (0.84)	−0.20 (0.42)	−2.11 (0.02)**	−2.88 (0.00)***	−9.29 (0.00)***
MG	−0.88 (0.81)	−1.01 (0.10)*	−1.54 (0.06)*	−2.72 0.00)***	0.13 (0.55)	−0.37 (0.35)	−1.18 (0.09)*
MLNR	0.15 (0.44)	0.14 (0.56)	0.04 ((0.52)	−1.75 (0.04)**	−0.76 (0.22)	−0.78 (0.22)	−2.39 (0.01)***
MMA	0.01 (0.49)	0.42 (0.66)	0.52 (0.70)	−0.81 (0.21)	−0.94 (0.10)*	−2.72 (0.00)***	−5.21 (0.00)***
MNT	0.01 (0.50)	−0.63 (0.27)	−4.80(0.00)***	−4.60 (0.00)***	−0.10 (0.46)	−1.46 (0.07)*	−1.40 (0.03)*
ONM	1.31 (0.09)*	0.01 (0.51)	−1.23 (0.09)*	−1.91 (0.03)**	−0.87 (0.10)*	−0.32 (0.37)	−2.62 (0.00)***
PC	−0.14 (0.55)	0.70 (0.76)	0.81 (0.79)	0.05 ((0.52)	0.18 (0.57)	−0.37 (0.35)	−0.97 (0.09)*
PNC	1.34 (0.09)*	−1.99 (0.02)**	−1.99 (0.02)**	−8.96 (0.00)***	−1.57 (0.05)**	−1.20 (0.10)*	−3.67 (0.00)***
PPN	1.25 (0.10)*	−0.79 (0.22)	−0.12 (0.45)	−2.55(0.01)***	−0.31 (0.38)	0.82 (0.79)	−3.54 (0.00)***
TYFC	1.02 (0.10)*	0.05 (0.52)	−0.41 (0.34)	−0.77 (0.22)	0.37 (0.65)	−0.47 (0.32)	−1.97 (0.02)**

NOTES Numbers inside the parentheses next to coefficient estimates are t-ratios. The numbers inside the parentheses next to coefficient estimates of the normality are the probability. The numbers inside the parentheses next to coefficient estimates of the LM and heteroskedacity are the probability (Chi-square). ***, **, * indicate significance at the 1%, 5% and 10% levels. The numbers inside the parentheses next to coefficient estimates of the reset are the probability of the t-statistic.

TABLE 4   Summary for Short-Run Results

Industry						Short Run Estimates						
	Δtb_{t-1}	Δtb_{t-2}	$\Delta dgdp$	$\Delta dgdp_{t-1}$	$\Delta dgdp_{t-2}$	$wgdp$	$wgdp_{t-1}$	$wgdp_{t-2}$	$\Delta reer$	$\Delta reer_{t-1}$	$\Delta reer_{t-2}$	ect_{t-1}
ALL	0.01 (0.96)	0.24 (0.35)	0.03 (0.94)	0.30 (0.73)	1.13 (0.21)	0.50 (0.39)	−0.69 (0.52)	−1.16 (0.10)*	0.19 (0.78)	−0.07 (0.95)	−0.88 (0.52)	−0.64 (0.01)**
AFI	−0.68 (0.05)**	−0.33 (0.04)**	2.03 (0.10)*	2.86 (0.26)	0.27 (0.86)	−1.25 (0.45)	−2.99 (0.10)*	1.47 (0.33)	−1.85 (0.26)	−2.49 (0.30)	−0.84 (0.61)	−0.46 (0.02)**
ARM	−0.65 (0.00)***	−0.49 (0.00)***	−3.39 (0.06)*	−3.27 (0.05)**	−1.01 (0.67)	1.96 (0.05)**	4.49 (0.02)**	2.71 (0.03)**	3.62 (0.01)***	3.45 (0.05)**	2.53 (0.55)	−0.11 (0.00)***
BNT	0.10 (0.83)	0.02 (0.95)	6.51 (0.09)*	10.04 (0.09)*	4.17 (0.45)	−2.65 (0.21)	−12.00 (0.10)*	1.81 (0.61)	−4.70 (0.09)*	−10.53 (0.10)*	−2.82 (0.44)	−0.68 (0.01)**
C	−0.47 (0.09)*	−0.44 (0.02)**	−1.85 (0.03)**	−1.36 (0.44)	−1.59 (0.09)*	4.25 (0.09)*	2.06 (0.58)	4.79 (0.02)**	1.70 (0.30)	−0.15 (0.97)	0.94 (0.69)	−0.65 (0.01)**
CI	0.38 (0.09)*	0.19 (0.14)	4.17 (0.32)	−2.05 (0.41)	2.80 (0.55)	−2.27 (0.39)	6.82 (0.01)***	1.23 (0.69)	−4.42 (0.26)	3.90 (0.01)***	−1.90 (0.75)	−1.07 (0.06)*
CNT	−0.68 (0.00)***	−0.31 (0.39)	12.08 (0.41)	2.21 (0.54)	−4.69 (0.66)	−15.78 (0.25)	2.32 (0.82)	6.29 (0.49)	−12.33 (0.46)	−7.06 (0.09)*	−5.70 (0.63)	−0.36 (0.00)***
E	0.01 (0.98)	0.08 (0.70)	1.47 (0.58)	−0.67 (0.84)	2.32 (0.35)	−2.29 (0.45)	3.07 (0.65)	1.00 (0.52)	7.29 (0.23)	2.70 (0.32)	−1.40 (0.63)	−0.66 (0.01)**
F	−0.52 (0.01)*	−0.43 (0.07)*	7.82 (0.01)***	6.96 (0.04)**	7.82 (0.04)**	−3.39 (0.04)**	−6.05 (0.01)***	−5.63 (0.28)	−3.14 (0.37)	−5.89 (0.09)*	−9.35 (0.02)**	−0.98 (0.00)***
FNL	−0.68 (0.02)**	−0.40 (0.02)**	1.18 (0.23)	2.76 (0.16)*	0.06 (0.96)	−0.64 (0.78)	−2.91 (0.09)*	1.45 (0.42)	−1.57 (0.34)	−2.59 (0.22)	−0.85 (0.63)	−0.44 (0.02)**
INS	0.64 (0.08)*	0.39 (0.33)	−2.45 (0.27)	1.06 (0.44)	−1.94 (0.33)	5.79 (0.05)**	−2.58 (0.09)*	4.13 (0.27)	3.99 (0.09)*	−3.93 (0.04)**	−1.55 (0.71)	−1.29 (0.01)***
MG	0.12 (0.60)	0.06 (0.70)	−0.15 (0.86)	1.31 (0.10)*	−0.00 (0.99)	0.78 (0.41)	−0.88 (0.30)	0.96 (0.32)	0.89 (0.31)	−2.05 (0.10)*	−0.75 (0.57)	−0.95 (0.01)***
MLNR	−0.29 (0.02)**	−0.56 (0.23)	7.82 (0.01)***	6.96 (0.04)**	7.82 (0.04)**	−3.39 (0.04)**	−6.05 (0.01)***	−5.63 (0.28)	−3.14 (0.37)	−5.89 (0.09)*	−9.35 (0.02)**	−0.98 (0.00)***
MMA	−0.39 (0.00)***	−0.18 (0.06)*	0.60 (0.91)	4.43 (0.09)*	2.56 (0.40)	0.42 (0.95)	−6.23 (0.10)*	−2.38 (0.62)	2.48 (0.65)	−5.43 (0.04)**	−2.08 (0.59)	−0.19 (0.02)**
MNT	0.89 (0.56)	0.53 (0.82)	1.70 (0.10)*	−0.09 (0.93)	−1.11 (0.04)**	−1.72 (0.10)*	0.18 (0.66)	2.94 (0.00)***	−1.17 (0.64)	0.45 (0.82)	1.37 (0.41)	−0.75 (0.00)***
ONM	0.13 (0.71)	0.20 (0.47)	6.45 (0.00)***	0.41 (0.89)	−0.30 (0.94)	−4.00 (0.26)	5.61 (0.09)*	2.29 (0.67)	−8.53 (0.00)***	1.06 (0.74)	2.46 (0.66)	−1.03 (0.09)*
PC	−0.57 (0.00)***	−0.12 (0.65)	0.68 (0.52)	0.49 (0.80)	1.63 (0.32)	0.40 (0.77)	0.50 (0.59)	−0.67 (0.63)	0.44 (0.69)	0.20 (0.92)	−0.35 (0.81)	−0.10 (0.02)**
PNC	−0.49 (0.10)*	−0.03 (0.91)	−1.83 (0.42)	−2.75 (0.12)*	−4.73 (0.08)*	0.10 (0.95)	4.34 (0.08)*	5.09 (0.09)*	1.09 (0.77)	1.00 (0.63)	4.18 (0.10)*	−0.36 (0.15)
PPN	−0.38 (0.09)*	−0.06 (0.68)	−2.37 (0.48)	2.99 (0.69)	1.53 (0.49)	−5.56 (0.01)***	−2.07 (0.77)	−0.99 (0.86)	2.28 (0.61)	−1.94 (0.87)	4.44 (0.55)	−0.22 (0.01)**
TYFC	−0.82 (0.01)**	−0.56 (0.02)**	2.20 (0.24)	1.64 (0.23)	−0.42 (0.69)	−1.26 (0.59)	0.60 (0.55)	−0.30 (0.82)	−4.12 (0.02)**	−3.23 (0.07)*	−0.21 (0.86)	−0.43 (0.02)**

NOTES   Numbers inside the parentheses next to coefficient estimates are *t*-ratios. The numbers inside the parentheses next to coefficient estimates of the normality are the probability. The numbers inside the parentheses next to coefficient estimates of the LM and heteroskedacity are the probability (Chi-square). ***, **, * indicate significance at the 1%, 5% and 10% levels. The numbers inside the parentheses next to coefficient estimates of the reset are the probability of the *t*-statistic.

TABLE 5 Summary of Long-Run Results

Industry	Long Run Estimates		
	dgdp	*wgdp*	*reer*
ALL	−1.51 (0.00)***	1.72 (0.00)***	0.58 (0.00)***
AFI	2.36 (0.00)***	−3.02 (0.00)***	−1.63 (0.00)***
ARM	32.05 (0.00)***	−36.48 (0.00)***	−29.16 (0.00)***
BNT	−4.10 (0.00)***	3.26 (0.00)***	7.36 0.00)***
C	3.95 (0.00)***	−4.92 (0.00)***	−3.91 (0.00)***
CI	0.15 (0.75)	0.41 (0.43)	−2.53 (0.00)***
CNT	−69.41 (0.00)***	86.96 (0.00)***	81.99 (0.00)***
E	−4.69 (0.00)***	5.60 (0.00)***	−6.12 (0.00)***
F	−6.55 (0.00)***	7.41 (0.00)***	5.22 (0.00)***
FNL	2.99 (0.00)***	−3.77 (0.00)***	−2.16 (0.00)***
INS	0.65 (0.00)***	−1.23 (0.00)***	−0.03 (0.89)
MG	−1.83 (0.00)***	2.18 (0.00)***	1.39 (0.00)***
MLNR	−6.55 (0.00)***	7.41 (0.00)***	5.22 (0.00)***
MMA	−25.68 (0.00)***	29.33 (0.00)***	12.12 (0.00)***
MNT	−0.54 (0.10)*	0.76 (0.05)**	−0.46 (0.10)*
ONM	0.00 (0.99)	0.47 (0.33)	−2.43 (0.00)***
PC	10.32 (0.01)***	−13.26 (0.01)***	−17.86 (0.00)***
PNC	3.35 (0.01)***	−3.77 (0.01)***	−3.15 (0.00)***
PPN	5.74 (0.40)	−4.89 (0.55)	−2.53 (0.71)
TYFC	−4.70 (0.00)***	3.58 (0.00)***	7.02 (0.00)***

NOTES Numbers inside the parentheses next to coefficient estimates are *t*-ratios. The numbers inside the parentheses next to coefficient estimates of the normality are the probability. The numbers inside the parentheses next to coefficient estimates of the LM and heteroskedacity are the probability (Chi-square). ***, **, * indicate significance at the 1%, 5% and 10% levels. The numbers inside the parentheses next to coefficient estimates of the reset are the probability of the *t*-statistic.

Mineral fuels, lubricants and related materials; Miscellaneous manufactured articles; Ores and metals; and Textile fibres, yarn, fabrics and clothing). Furthermore, we note that for these industries, the short-run coefficients on the lags for domestic GDP produces expected negative and statistically significant estimates, whereas concerning the world GDP variables, the estimates are significantly positive as expected.

On the other hand, 3 trade commodities produce positive and statis-

tically significant short-run estimates on the real exchange rate variables (i.e. Agricultural raw materials; Crude materials, inedible, except fuels; Parts and components for electrical and electronic goods).

We also note 'reverse' signs on the coefficient estimates for the domestic and world GDP variables which produce positive and negative estimates, respectively, and these estimates are statistically significant. All remaining trade commodities that are not mentioned above do not find any statistically significant estimates on the real exchange rate variable. Nevertheless, the error correction terms associated with all trade commodities produce their 'correct' negative and significant estimates, implying that the observed short-run dynamics transition into their steady-state long-run equilibriums.

Focusing on our long-run estimates reported in table 4, we note that 8 industries produce their expected positive and statistically significant estimate on the real exchange rate variable (i.e. All allocated products; Beverages and tobacco; Commodities and transactions; Fuels; Manufactured goods; Mineral fuels, lubricants and related materials; Miscellaneous manufactured articles; and Textile fibres, yarn, fabrics and clothing). According to the 'new definition' (Bahmani-Oskooee and Ratha 2004) of the J-curve (under the traditional definition, the J-curve is confirmed solely when exchange rate depreciations boast trade balance over the long-run whereas under the new definition, the currency depreciation harms trade balance in the short-run whilst improving it only in the long-run), these 8 industries would benefit from long-run real exchange rate depreciations. Ten of the remaining 12 commodity groups produce negative and statistically significant estimates on the real exchange rate variable (All food items; Chemical products; Crude materials, inedibles except fuels; Electronic excluding parts and components; Food and live animals; Machinery and transport equipment; Ores and metals; Primary commodities; as well as Parts and components for electrical and electronic goods). Finally, only Pearls, precious stones and non-monetary gold items produce insignificant long-run coefficients on the real exchange rate variable.

In knitting together our results obtained from both the short-run and the long-run estimates in tables 4 and 5, we conclude on the 'traditional definition' (Rose and Yellen 1989) of the J-curve holding for 7 industries (i.e. Beverages and tobacco; Commodities and transactions; Fuels; Manufactured goods; Mineral fuels, lubricants and related materials; Miscellaneous manufactured articles, Textile fibres, yarn, fabrics and

clothing). We note that our overall findings of industry-specific J-curve dynamics are comparable to those previously found for other emerging economies such as in Bahmani-Oskooee and Harvey (2015), who find similar evidence for manufactured articles and special transactions in US–Indonesia trade; Bahmani-Oskooee and Mitra (2009) for similar evidence on textile yarn and thread, tubes and manufactures of metal, and other crude minerals, soaps in US–India trade; as well as Bahmani-Oskooee, Huseynov, and Jamilov (2013) for similar evidence on polymer, rubber and plastics for trade between Azerbaijan and the world.

Conclusion

Economic theory suggests a 'J-curve' relationship between real exchange rates and the trade balance, initially being negative related over the short-run and subsequently turning positive in the long-run. Our study examined this relationship for the 5 SACU countries which are considered as one of the oldest customs unions in the world, with South Africa being the trade 'hub' of the group and the exchange rates of the 4 smaller nations (Botswana, Lesotho, Namibia and Eswatini) being closely linked with South Africa's free-floating Rand currency. In differing from previous related literature, we disaggregate the trade balance according to 19 industries which form the core of SACU's trade activities, hence reducing susceptibility to the 'aggregation bias' described in Rose and Yellen (1989) and Bahmani-Oskooee and Ardalani (2006). In applying PMG estimators to Panel ARDL econometric models for annual data spanning over 1995 to 2020, our empirical findings can be summarized as follows.

Firstly, we find exchange rate devaluations harming long-run trade balance in 10 industries (All food items; Chemical products; Crude materials, inedibles except fuels; Electronic excluding parts and components; Food and live animals; Machinery and transport equipment; Ores and metals; Primary commodities, Pearls, precious stones and non-monetary gold; and Parts and components for electrical and electronic goods). Secondly, exchange rate devaluations boost long-run trade balance in the remaining 8 industries (i.e. All allocated products; Beverages and tobacco; Commodities and transactions; Fuels; Manufactured goods; Mineral fuels, lubricants and related materials; Miscellaneous manufactured articles; and Textile fibres, yarn, fabrics and clothing). Thirdly, in further using the strict definition of J-curve effects in which the short-run exchange rate depreciations adversely influence the trade balance before exerting

positive long-run effects, we note that only 7 industries fit the definition (i.e. Beverages and tobacco; Commodities and transactions; Fuels; Manufactured goods; Mineral fuels, lubricants and related materials; Miscellaneous manufactured articles; Textile fibres, yarn, fabrics and clothing). Lastly, only Pearls, precious stones and non-monetary gold items are irresponsive to exchange rate fluctuations over the long-run.

Considering that South Africa's currency has been on a deteriorating path over the last 4 years or so, there are some important policy implications which can be drawn from our study. For instance, current exchange rate depreciations will assist in strengthening the trade balance of the textile and clothing industry which is considered a sectoral priority regarding industrial development in the smaller member states (especially Lesotho) as is demonstrable by the establishment of the Textile and Clothing Industry Development Programme (TCIDP). SACU policymakers must take advantage of currency depreciations as a means of diversifying into other manufacturing sectors which enjoy dynamic economies of scale and present opportunities for innovation technology. For the other sectors, such as food, precious metals, electronics, and machinery, whose trade balance will be adversely affected by currency depreciations, firms in these sectors need to engage in currency risk mitigation strategies such as forward contracts and currency options. Moreover, these sectors should further consider import substitution industrialization policies as a means of boosting domestic production, relying less on expensive imports and consequentially strengthening the trade balance of these sectors over the long-run. Nonetheless, seeing that our study is conducted at industry-level using linear cointegration analysis, we recommend that future studies can be further undertaken at firm-level using more advanced econometric tools which can account for time-variation and cyclical asymmetries.

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Impact of Foreign Direct Investment on Energy Consumption: Empirical Evidence

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The paper investigates the association between foreign direct investment (FDI) and energy consumption within the purview of trade liberalization and economic growth from 1971 to 2014 in Bangladesh, employing the Auto Regressive Distributive Lag (ARDL) bounds testing approach. The study result depicts a negative impact of FDI on energy consumption in both the long and short run. Moreover, the study results persist robust to alternative measurements and estimators. Furthermore, a unidirectional causal relationship moving from energy consumption to foreign direct investment supports the institutional strength of the energy sector. Therefore, policymakers should undertake a pragmatic policy for the best utilization of FDI in the energy sector and reinforce local firms' absorptive capability to internalize FDI-centric information spillover in energy conservation.

Introduction

Energy consumption is considered a crucial instrument and integral to accelerating economic productivity, economic growth (Belke, Dobnik, and Dreger 2011) and sustainable development (Kahouli 2017). In this case, the energy security issue has become a critical phenomenon as stated in the three crucial sustainable development goals (SDGs 7, 9 and 13), underlining green energy, innovation, and green finance for sustainable development. Even a sustainable development/productivity mechanism requires much and significantly cleaner energy (Sharmin and Tareque 2020; Shahbaz and Lean 2012). Thus, energy consumption is directly associated with sustainable development that helps determine a country's social and economic progress (Mahmood et al. 2014).

However, in 2009, Bangladesh experienced sluggish growth in supplying the energy demanded for materializing the sustainable development goals. In consequence, the prospective plan targeting 2021 includes securing a vital expansion to address this supply shortage via improving user efficiency, encouraging private sector investment and diversifying energy sources (Ministry of Planning 2020). Bangladesh has maintained an average 7 percent GDP growth over a decade, graduating from Least Developed Countries to Lower Middle-Income status in 2015. The estimated final energy consumption is around 55.50 mtoe (Million tonnes of Oil Equivalent), averaging about a 6% increase in energy consumption annually (Ministry of Power, Energy and Mineral Resources 2021). Aiming to achieve Vision 2041, the Bangladesh government targeted adopting energy development strategies (including adopting new capital outlays in energy generation, transmission, and distribution; diversifying the energy mix from natural gas to renewable energy and cleaner coal technologies; conserving energy; and optimum use of existing installed power generation capacities) for securing energy security and sustainability (Government of Bangladesh 2020). However, the energy developments have critical implications for climate change and have also caused increasingly severe environmental issues such as Greenhouse Gas (GHG) emissions, especially CO_2 and air pollution (Wang et al. 2011; Rauf et al. 2018) through the linkage between energy consumption and carbon emission. Therefore, the developing countries are considering the issue of adopting energy-efficient technology, which may lead to a reduction in carbon emissions relative to energy use via the usage of renewable energy. Relevant to this, Yuan et al. (2009) suggested ways of reducing energy use, such as improved energy policy, introducing developed energy-efficient technology and strict energy-use regulations.

Pertaining to this background, most developing economies consider the foreign direct investment (FDI) inflows as an alternative measure to tackle the countries' economic problems (Amoako and Insaidoo 2021). In Bangladesh, the investment requirements for the energy sector are estimated at USD 7.5 billion by 2021 and an additional USD 21 billion by 2030; both the public and the private sectors of Bangladesh have to struggle to match this investment capacity (Mahbub and Jongwanich 2019). In this regard, the Bangladeshi government encourages FDI inflows in the energy sector, given previous implemented supportive policies (such as, tax exemption on royalties, technical know-how, and technical assistance fees, and on the interest of foreign loans). FDIs to the energy (power, gas

and petroleum) sector in 2015–2016 amounted to USD 208 million, accounting for 10% of total FDI flows. In addition, they increased to USD 606.71 million, accounting for around 24.2% of total flows (Bangladesh Bank 2021). FDI as an external source of finance influences the total investments of a country as well as being a source of innovation that can promote energy efficiency to stimulate economic growth (Doytch and Narayan 2016). In this context, globalization also appears to be the key agent in consolidating economic integration among developing countries which have restructured their economic policies by eliminating obstacles and enacting friendly policies in foreign trade and investment. However, massive competition exists among them to attract FDI (Latief and Lefen 2019).

FDI inflows transfer technology, knowledge and management practices to the host country along with the capital. According to Brucal, Javorcik, and Love (2019), developed economies prefer to shift their multinational companies and industries to developing economies (because of their strict and high environmental standards), and they primarily endeavour to replicate the energy-efficient and clean technologies of host countries. In earlier days, Blomström and Kokko (1996) claimed that FDI inflows are the simplest means of technology transfer to developing countries, as they often come with the latest packages of technology and innovations. In this case, FDI can bridge the 'idea gaps' between developed and developing countries as it integrates technological advancement and skills acquisition to maximize production (figure 1).

South Asian countries represent themselves as the fast-growing economies in the world. The region has witnessed a relatively favourable population growth, energy use, and per capita income. This region utilizes domestic and external investments in power supply, fuel, and infrastructure, prioritizing the effectiveness of these investments. The welfare and standard of life of its citizens have substantially increased because of the significant advantages of a highly managed acceleration of the energy system of this region (International Energy Agency 2019). In fact, these countries largely depend on crude oil and gas imports due to the shortage of local energy sources, where FDI has a significant share in energizing the energy sector of this area (Latief and Lefen 2019).

As in other developing economies, the demand for energy consumption in Bangladesh has gradually risen with its population growth and economic activities. FDI is assumed to support the least developed and developing countries, especially Bangladesh, in several ways. First of all,
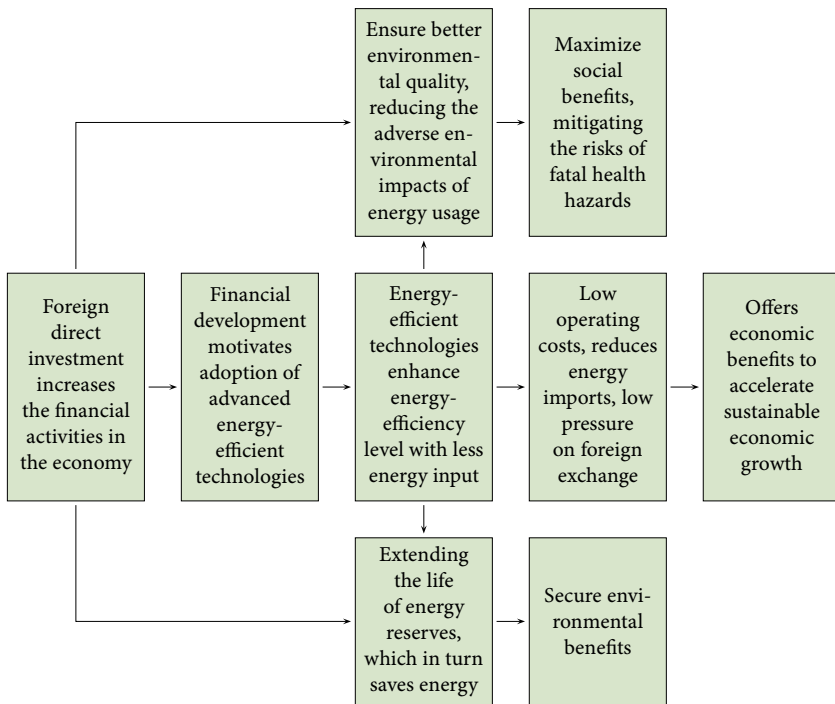
FIGURE 1 Linkages between Energy Consumption and Foreign Direct Investment (FDI) Nexus

it enhances low domestic investment because of the resource scarcity in these countries. Secondly, FDI can create employment opportunities, escalate local competition and other affirmative externalities (for example, transfer of technological knowledge and expertise, ideologies etc.). Although Bangladesh proposes worthwhile investment facilities for overseas investors and adopts stimulating policies to magnetize FDI, it can be called one of South Asia's most open FDI systems (Khatun and Ahamad 2015).

The rationale for choosing Bangladesh for our investigation includes the following. Firstly, as a developing country in South Asia, Bangladesh is considered one of the most climate change-vulnerable countries in the world, and the country is not highly prepared to meet the risk. Furthermore, FDI increases the status of energy consumption and facilitates the energy-induced emissions level, which requires setting the country's development goal. Secondly, Bangladesh intends to become an industrial economy by 2041 to exploit the potential of globalization (trade, remit-

tances, FDI) and internal resources (workforce and natural resources, i.e. energy, blue economy, green economy). Therefore, the study looks into how FDI as an external or globalization dynamic is playing a role in strengthening the ability of internal dynamics, i.e. energy consumption in the context of Bangladesh. Furthermore, this study answers the question relating to the effective utilization of FDI in the energy sector to offset the negative externalities of energy consumption for achieving the SDG goal by 2030. Finally, conducting this study justifies the objective view of FDI in the energy sector of Bangladesh. In addition, available studies that have inspected the nexus between foreign direct investment and energy consumption of Bangladesh are scanty. In contrast, previous studies mainly delve into the association between FDI and economic growth.

The contribution of this study to the prevailing literature is myriad. First, the FDI-energy consumption nexus-related reverse findings, and representing these findings' rationale in the context of Bangladesh, are our value addition to the energy economics literature. Second, integrating both the inward (GNI per capita) and outward (trade openness) dynamics to investigate the FDI-energy consumption nexus in Bangladesh is our novel approach, using variables. Third, our study result is consistent in different, alternate measurement parameters, i.e. FMOLS, CCR, and DOLS, ensuring the robustness of findings emerging from the ARDL-based co-integration technique. The robustness check procedures also support the model's authenticity in inquiring into the FDI-energy consumption nexus in Bangladesh. Notably, our findings from a robust econometric technique reveal a negative relationship between FDI inflows and energy consumption in the context of Bangladesh. Moreover, this study's results may significantly help Bangladesh's policymakers design the appropriate policies concerning FDI employment in the energy consumption-related growth process.

The organization of this paper is as follows. Section 2 describes the FDI and energy nexus in Bangladesh and Section 3 examines the relevant literature concerning FDI and energy consumption. Section 4 illustrates the model, data, and methodology. Section 5 reports the empirical results. Section 6 includes the relevant discussions and Section 7 concludes with policy recommendations.

FDI and Energy Nexus in Bangladesh

In recent years, significant investments, e.g. FDI in energy and power sectors, have been encouraged through various policy supports in the con-
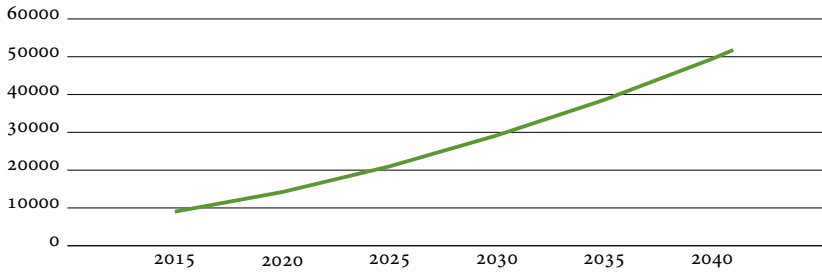
FIGURE 2   Forecast Power Demand up to 2041, in MW (based on data from Ministry of Power, Energy and Mineral Resources 2016)

text of Bangladesh to meet the increasing energy demands. The Power Sector Master Plan (Ministry of Power, Energy and Mineral Resources 2016) reveals that Bangladesh will witness a changing pattern of future electricity demand as economic activities have changed and increased simultaneously. It also forecasts a substantial rise in demand for energy (figure 2), particularly electricity in commercial, industrial, and public services (metro rails, special economic zones, and other services).

Apart from electricity generation and its use in Bangladesh, the policymakers of Bangladesh intend to source a substantial amount of primary energy from coal and renewable energies to reduce the pressure on gas and petroleum usage. There are variances in PSMPs and electricity generation in targeted amounts of sources, use of fuel, and technology. Indeed, the energy mix has been transforming but not that portion set in the PSMPs. As primary energy, natural gas is contributing considerably. No significant development is shown in coal usage. Renewable energy has had no crucial role. There exists an enormous change in technology used for generating electricity. In addition, gas and steam turbines used in power plants are fewer, while combined cycle usage in power plants has been increasing. The Power Sector Efficiency Master Plan (PSEMP) suggests that the government of Bangladesh has settled the goal to develop energy intensity by 20 percent by 2030 in comparison with the 2013 level (Khondaker and Ali 2019). However, the Government of Bangladesh has allocated inadequate resources due to various rivalries arising in the social sectors. Therefore, the local and foreign private sectors may be the critical source of investment for Bangladesh's energy and power sector. As domestic private investment is not near enough, the country requires wider-scale investments for the installation of local coal and natural gas and power plants in the country.

Considering the capital-intensive characteristics and the technological requisites of the energy sector, the government of Bangladesh encourages FDI inflows by introducing different convenient policies for foreign investors. Nevertheless, the inflows of FDI to Bangladesh are not convincing as the country still witnesses political instability, bureaucratic inertia, corruption, poor governance, and a poor law and order situation. All of these elements are determined as the leading causes of the poorly motivated investment environment in the country. Apart from this, foreign investors in electricity-intensive manufacturing industries are worried about the poor quality of electricity (Khondaker and Ali 2019).

Extant Literature Review

A substantial amount of literature is available that has demonstrated the contribution of FDI to energy consumption in developing economies; those studies reveal equivocal or mixed evidence, mostly its indirect influence. Most of the studies reveal that FDI could have an effect on overall output indirectly (if not directly) via knowledge and technology transfer or spillovers in the FDI receiving countries (Adams and Opoku 2015; Agbloyor et al. 2014; Doytch and Uctum 2011; Vu and Noy 2009; Zeng et al. 2020). Both the negative and positive effects of FDI on energy consumption prevail in the literature.

In this context, Cole (2006) states that the effect of FDI is diverse in the level of economic growth, economic formation, energy price and so on, since different countries embrace diverse conditions. Borensztein, De Gregorio, and Lee (1998) opined that FDI could help develop the productivity of enterprises through adopting advanced machinery-technology and management systems. In contrast, Mielnik and Goldemberg (2002) showed that FDI growth could shrink the intensity of energy consumption for their studied 20 developing countries. By establishing scale-structure-technology modelling, Antweiler, Copeland, and Taylor (2001) found that FDI could change the economic contribution, but not improve the energy consumption intensity. Omri and Kahouli (2014) confirm the growth (causality moving from energy to growth) and feedback hypothesis for relative per capita income in middle and low-income countries, respectively, during 1990–2011. Apergis and Tang (2013) find a positive relationship between the growth hypothesis and income level for a panel of 85 countries over the 1975–2007 period.

Hübler (2009) examined the effect of FDI and trading on energy-saving technology by employing CGE modelling. He found that FDI and

trading could develop the technology of energy-saving and decrease the intensity of energy consumption in the context of China. Shahbaz, Khan, and Tahir (2013) ascertain a bidirectional effect between energy use and trade.

Conversely, Herrerias, Cuadros, and Orts (2013) report an inverse relationship between imports and energy intensity utilizing a panel model with provincial data from 1985 to 2008. Sadorsky (2010) investigated the energy-FDI relationship for 22 developing countries, showing that FDI enhances energy consumption. He also stated that inflows of FDI generate liquidity that encourages investment in new power plants and factories to move up energy demand. Del Bo (2013) examined the spillover impact of the electricity sector in European countries, exploring whether industrial agglomeration could encourage FDI productivity spillover. Lee (2013) delved into the FDI-energy relationship employing panel cointegration techniques for 95% of G20 countries covering the period 1971–2009; the study detected no influential indication of an FDI relationship with clean energy use.

Alam et al. (2015) show that FDI was positively associated with energy consumption for the SAARC region over the period of 1975–2011. Reinvestigating electricity consumption, Zaman et al. (2012) found that FDI significantly increases electricity consumption in Pakistan during 1975–2010. Interestingly, the study of Paramati et al. (2018) revealed that FDI is one of the ways to guarantee efficient energy consumption. Salim et al. (2017) investigated the relationship between energy use and FDI inflows for China. The study explored whether FDI essentially enhances energy demand by enhancing the functions of industrialization (manufacturing) and transportation. Shahbaz et al. (2018b) utilized the data from the Netherlands and Ireland for the time of 1970Q1–2015Q4 by employing a quantile autoregressive distributed lag model. They detected that energy consumption relates to globalization intensely and positively in the long run.

Adom, Kwakwa, and Amankwaa (2018) found that FDI did not stimulate the efficiency of energy in the long run for African countries during 1970–2014 using the Stock-Watson dynamic OLS technique. Using OLS regression, fixed effect, generalized method of moments (GMM), and random effect instruments, Muhammad and Khan (2019) examined the impact of energy use, FDI, capital and CO_2 emissions on the economic growth of 34 Asian host and 115 source economies from 2001 to 2012. The study findings reveal that all these indicators contribute consider-

ably to the output of these two groups of countries. From the viewpoint of growth, the study suggests encouraging FDI in both host and source economies. Pan et al. (2020) examined the qualitative role of FDI on energy efficiency in 30 provinces of China during 2003–2016. The study used slacks-based measure data envelopment analysis (SBM-DEA) first for estimating energy efficiency and then used seemingly unrelated regression (SUR) technique for empirical estimation to investigate the impact of FDI quality on energy efficiency. The study finds that FDI quality has a significant role in promoting energy efficiency from the national level perspective, and this contribution of FDI is also true in coastal and inland areas from the regional-level viewpoint in China.

Lin and Kwan (2016) explored the level of FDI spillover in geographic areas and spatial diffusion by using the data of Chinese companies. The result depicted that FDI benefits domestic firms mainly in their neighbouring areas via knowledge spillovers that have broader geographical capacity. Khatun and Ahamad (2015) investigated the causal linkages between FDI and energy as well as the power sector, and output of Bangladesh from 1972 to 2010. It found a strong positive and unidirectional short-run causal association from FDI to energy use and also from energy use to GDP growth. Empirical results also revealed a causal linkage for the equation of energy use in the long run. Using questionnaires and semi-structured interviews, Mahbub and Jongwanich (2019) investigated the determinants of the FDI firms for making decisions in the energy sector. Their findings indicate that among regulatory, economic and financial, political, and societal aspects, only regulatory aspects are the most influential for FDI-firms.

The above literature shows both the positive and negative relationship between FDI and energy use in the context of different economies. But FDI is highly effective in the rising economies as they are utilizing the potential of FDI in their growth process. Although Bangladesh is an emerging economy in terms of its growth, this sort of shortage of literature leads us to carry out this study, which will fill the paucity of literature in this particular context in Bangladesh.

Model, Data and Methodology

In this section, the empirical model specification is detailed with the rationalization of variable inclusion in the model, including their sources as well as the elaborated methodology (i.e. ARDL bound testing techniques).

MODEL

Earlier literature highlighted mixed evidence on the nexus of energy and FDI. Smyth and Narayan (2015) stated that this result is desired given the 'differences in econometric approaches, institutional characteristics in specific countries, model specification, variable selection and time period.' The same statement is also given by Coers and Sanders (2013), who illustrated that the indicators of energy consumption 'are very sensitive to model misspecification and careful testing of specifications is required.' To control these issues, we have followed the combined energy-FDI-income-trade model suggested by Salim et al. (2017):

$$\text{EC} = f(\text{FDI}, \text{Y}, \text{TO}), \tag{1}$$

where EC denotes energy consumption in per capita form, FDI stands for the FDI inflow, Y represents real income in per capita form and TO is trade openness. For the purpose of empirical estimation, equation 1 is transformed into a linear form that gives:

$$\text{LEC}_t = \beta_1 + \beta_2 \text{LFDI}_t + \beta_3 \text{LY}_t + \beta_4 \text{LTO}_t + \mu_t. \tag{2}$$

Here the subscript t and μ_t denote the studied time and the stochastic errors, respectively. The association of the letter 'L' in equation 2 illustrates that all variables are transformed into natural logarithms, and β embodies the long-run elasticities, which is to be estimated.

The study attempts to scrutinize the association between energy consumption and inward FDI within the purview of income and trade openness. The existing literatures argue that this nexus is mostly subject to the level of economic growth an economy possesses. FDI represents an influential dynamics of energy consumption in our model. The extant literature review reveals that if FDI provides a helpful diffusion instrument for international transmission of energy-conserving practices, we assume a negative β_2 coefficient in equation 2.

Such a trend represents the domination of the composition and technique impact on the scale effect (Salim et al. 2017). Since per capita income remains an increasing trend, it helps the people of the country to consume more energy. Thus, we presume the positive symbol of the β_3 coefficient in equation 2.

In addition, export promotion is significantly remarkable; it can impact the energy consumption level through direct and indirect channels in Bangladesh's economy. Directly, export promotion increases energy demand to assist growth in the production scale. Indirectly, exports in large

volumes include intermediate goods and raw materials to be transported to, and a higher volume of finishing exporting goods to be shipped from, the industrial production areas. All of these require more energy to energize the logistic functions of the export-oriented industry. In contrast, the existing literature argues that imports may be an effective tool to improve the worldwide flow of energy-efficient technology, contributing to a negative linkage between imports and energy use, in particular non-durable goods like transportation equipment and domestic appliances. To explain this scenario, the study calculates trade openness by the percentage of the total imports and exports to real GDP, as followed by Salim et al. (2017). Given the total amount of tradable items from Bangladesh to the international market, we anticipate the mark of the β_4 coefficient in equation 2 to be positive, showing the positive relationship between exports and energy use.

Data

In this study, we mainly use per capita energy consumption (EC) and foreign direct investment (FDI) data for Bangladesh to capture how inward FDI is contributing to the demand and supply of energy. It is obvious that, except for FDI, other variables could have a significant impact on energy consumption. So, ignoring those variables could result in estimation bias in understanding the energy-FDI scenario. From this viewpoint, the study includes per capita GNI (Y) and trade openness (TO) as control variables, following Salim et al. (2017), for controlling the omitted variable and simultaneity bias.

This paper examines the annual observations from Bangladesh of all variables spanning from the year 1971 to 2014 based on data availability: World Development Indicators (WDI) provides the data on per capita energy consumption only up to 2014, while the other variables are available up to 2020.

For uniformity in the definitions and data collection methods, we took all the data properties from the WDI database preserved by the World Bank (2019). Table 1 reveals detailed definitions, sources and descriptive properties of the studied variables.

The time-series data of per capita energy consumption and the inflows of foreign direct investment are depicted to inspect the movement of FDI inflow towards the energy consumption in Bangladesh in figure 3. Figure 4 shows the net inflows of foreign direct investment by major sectors during FY 2021 (in million US$) in Bangladesh.

TABLE 1   Variable Definition, Data Source and Descriptive Statistics

Variables	Definition	Source
EC	Energy consumption (kg of oil equivalent per capita)	WDI
Y	GNI per capita (in constant 2010 US$)	WDI
FDI	Foreign direct investment, net inflows (% of GDP)	WDI
TO	Trade (% of GDP)	WDI

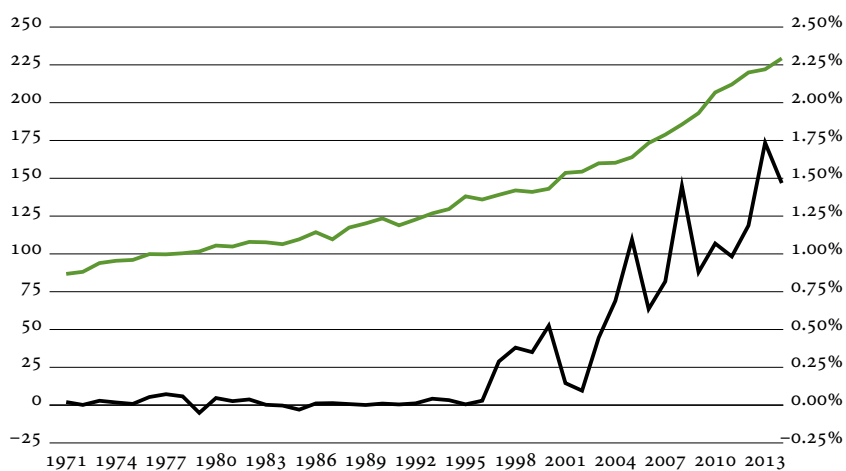| Descriptive Measures	LEC	LFDI	LY	LTO
Mean	4.8840	6.1974	−2.4210	3.2063
Standard Deviation	0.2731	0.3323	2.1929	0.3573
Minimum	4.4632	5.7969	−7.0570	2.3975
Maximum	5.4348	6.9216	0.5512	3.8735

FIGURE 3   Energy Consumption and FDI Scenario (green – energy use in kg of oil equivalent per capita, black – FDI, net inflows in percent of GDP)
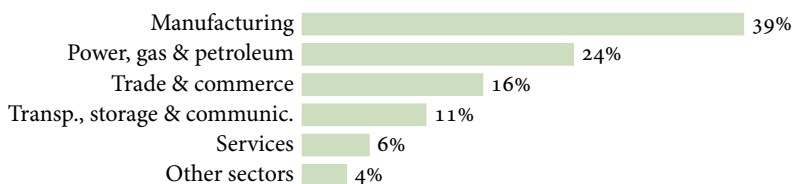

FIGURE 4   Net FDI Inflows (in million US$)

NOTES   Both agriculture and fishing and construction are included in the other sectors. Based on data from World Bank (2019) and Bangladesh Bank (2021).

Methodology

We employ the autoregressive distributive lag (ARDL) approach (Pesaran and Shin 1998; Pesaran, Shin, and Smith 2001) to find the short-run and long-run association between the variables. The ARDL procedure encompasses some advantages compared to the conventional cointegration techniques. Firstly, the method allows a mixed integration order of the modelled time series variables. As it controls specious regression to select the optimal lag, this general-to-specific modelling method maintains the long-run equilibrium association among the data variables. Secondly, an optimal structure of lag does not just check the serial correlation of errors but also offers a reliable estimation of the existence of endogenous variables. Thirdly, it yields consistent short-run and long-run estimates with a limited number of samples. Given the small sample size (44 samples), this method confirms effective hypothesis testing based on asymptotic theory. Lastly, a dynamic unrestricted error-correction model (ECM) incorporating short-run adjustment with long-run equilibrium can be obtained from the ARDL technique by following linear regression. The ARDL demonstration of equation 2 is written as follows:

$$\Delta \text{LEC}_t = \alpha_0 + \beta_1 \text{LEC}_{t-1} + \beta_2 \text{LFDI}_{t-1} + \beta_3 \text{LY}_{t-1} + \beta_4 \text{LTO}_{t-1}$$
$$+ \sum_{i=1}^{p} \gamma_i \Delta \text{LEC}_{t-i} + \sum_{j=0}^{p} \gamma_j \Delta \text{LFDI}_{t-j}$$
$$+ \sum_{k=0}^{p} \gamma_k \Delta \text{LY}_{t-k} + \sum_{l=0}^{p} \gamma_l \Delta \text{LTO}_{t-l} + \varepsilon_t \tag{3}$$

$$\Delta \text{LFDI}_t = \alpha_0 + \beta_1 \text{LEC}_{t-1} + \beta_2 \text{LFDI}_{t-1} + \beta_3 \text{LY}_{t-1} + \beta_4 \text{LTO}_{t-1}$$
$$+ \sum_{i=1}^{p} \gamma_i \Delta \text{LEC}_{t-i} + \sum_{j=0}^{p} \gamma_j \Delta \text{LFDI}_{t-j}$$
$$+ \sum_{k=0}^{p} \gamma_k \Delta \text{LY}_{t-k} + \sum_{l=0}^{p} \gamma_l \Delta \text{LTO}_{t-l} + \varepsilon_t \tag{4}$$

$$\Delta \text{LY}_t = \alpha_0 + \beta_1 \text{LEC}_{t-1} + \beta_2 \text{LFDI}_{t-1} + \beta_3 \text{LY}_{t-1} + \beta_4 \text{LTO}_{t-1}$$
$$+ \sum_{i=1}^{p} \gamma_i \Delta \text{LEC}_{t-i} + \sum_{j=0}^{p} \gamma_j \Delta \text{LFDI}_{t-j}$$
$$+ \sum_{k=0}^{p} \gamma_k \Delta \text{LY}_{t-k} + \sum_{l=0}^{p} \gamma_l \Delta \text{LTO}_{t-l} + \varepsilon_t \tag{5}$$

$$\Delta\text{LTO}_t = \alpha_0 + \beta_1\text{LEC}_{t-1} + \beta_2\text{LFDI}_{t-1} + \beta_3\text{LY}_{t-1} + \beta_4\text{LTO}_{t-1}$$

$$+ \sum_{i=1}^{p} \gamma_i\Delta\text{LEC}_{t-i} + \sum_{j=0}^{p} \gamma_j\Delta\text{LFDI}_{t-j}$$

$$+ \sum_{k=0}^{p} \gamma_k\Delta\text{LY}_{t-k} + \sum_{l=0}^{p} \gamma_l\Delta\text{LTO}_{t-l} + \varepsilon_t \tag{6}$$

Here Δ denotes the first difference operator, representing the error-correction dynamics, and β_i signifies the long-run relationship. We investigate possible cointegration in equation 3 through performing the significance of F-test on lagged level terms ($\text{H}_0: \beta_0 = \cdots = \beta_4 = 0$) and relate to the test statistics of two asymptotic critical bounds, e.g. lower and upper bounds, indicating that the variables are $1(0)$ and $1(1)$, correspondingly. We reject H_0 when the test statistics surpasses their relevant upper bound values and decide that there exists a long-run association between the variables. The validity of the study results through extracting the limited sample critical bounds supported by Narayan (2005).

If there exists a cointegration relationship in equation 3, our next step is to measure its equivalent dynamic unrestricted ECM. Thus, it unites short-run adjustment with long-run stability. In this study, we measure a dynamic unrestricted ECM of equation 3 as follows:

$$\Delta\text{LEC}_t = \alpha_0 + \sum_{i=1}^{p} \gamma_i\Delta\text{LEC}_{t-i} + \sum_{j=0}^{p} \gamma_j\Delta\text{LFDI}_{t-j} + \sum_{k=0}^{p} \gamma_k\Delta\text{LY}_{t-k}$$

$$+ \sum_{l=0}^{p} \gamma_l\Delta\text{LTO}_{t-l} + \lambda\text{EC}_{t-1} + \varepsilon_t \tag{7}$$

Here EC_{t-1} represents the lagged term of error-correction emanating from the long-run co-integrating vector. In addition, Engle and Granger (1987) revealed that causality in co-integrated ECM can also derive from EC (if $\lambda \neq 0$). From the perspective of our study, the former represents the long-run association and the latter shows the short-run dynamics. So, λ's statistical significance divulges that there appears to be an error-correction mechanism to push the variables back after a temporary shock to their equilibrium.

Lastly, the study has performed some diagnostic tests and the selected model is found to be robust against serial correlation, normality and heteroscedasticity. The model's stability is investigated using the cumulative

TABLE 2   Unit Root Tests

Variables	Augm. Dickey-Fuller (ADF) Test		Phillips-Perron (PP) Test		Order of int.
	Intercept	Int. and trend	Intercept	Int. and trend	
LEC	1.6790 (0.9995)	−1.0016 (0.9331)	2.1257 (0.9999)	−1.0016 (0.9331)	
LY	3.9130 (1.0000)	0.0318 (0.9955)	5.5549 (1.0000)	0.0318 (0.9955)	
LFDI	−2.7522 (0.0738)	−3.9907 (0.0164)	−2.5945 (0.1019)	−4.0521 (0.0141)	I(0)
LTO	−1.1336 (0.6938)	−3.3716 (0.0687)	−0.6907 (0.8383)	−3.3716 (0.0687)	
ΔLEC	−8.2525 (0.0000)	−8.6564 (0.0000)	−8.2552 (0.0000)	−9.0149 (0.0000)	I(1)
ΔLY	−2.8737 (0.0000)	−10.166 (0.0000)	−6.8509 (0.0000)	−9.7912 (0.0000)	I(1)
ΔLFDI	−5.4622 (0.0001)	−5.3985 (0.0004)	−9.8337 (0.0000)	−9.6765 (0.0000)	
ΔLTO	−8.3145 (0.0000)	−8.2973 (0.0000)	−9.5748 (0.0000)	−10.002 (0.0000)	I(1)

NOTES   Values in parenthesis represent *p*-values.

(CUSUM) and cumulative sum of square (CUSUMSQ) plot. Just as importantly, the fully modified ordinary least square (FMOLS) estimator developed by Phillips and Hansen (1990), the dynamic ordinary least square (DOLS) estimator by Stock and Watson (1993) and canonical cointegration regression (CCR) by Park (1992) are also estimated for ensuring the consistency of the model's long-run estimate.

Empirical Results

This section will comprise a detailed discussion on measures undertaken for analytical purposes, such as unit root tests, the estimates of the ARDL bound testing method, and the estimation output of robustness checking.

UNIT ROOT TESTS

We start our analysis by verifying the integration order for the study variables. This phase is significant as the tabularized critical bounds in ARDL bounds testing are solely relevant to variables which are I(0) and I(1). To check the order of integration of the study variables, the study employs familiar unit root tests such as the Augmented Dickey-Fuller (Dickey and Fuller 1979) and Phillips-Perron (Phillips and Perron 1988) tests.

Both ADF and PP test results are reported considering intercept and intercept with a trend in table 2. All variables are transformed into natural logarithms. A visual investigation of the table depicts that all the selected variables exhibit a unit root at their level form except FDI. The logarithm of FDI remained stationary in all combinations. However, it implies that the other three variables become stationary only after their differencing. Hence, the order of integration of all variables are either I(0) or I(1).

ARDL BOUNDS TESTING

As all the chosen variables of the study are integrated at either level, i.e. I(0), or first difference, i.e. I(1), now we advance to bounds testing in the nexus of energy-FDI, including two control variables: national income and trade openness for Bangladesh. We start by determining the optimal lag structure. In particular, we focus on degrees of freedom by control-ling the maximum lag length to 2 prior to the identification of the lag structure using the Akaike information criterion (AIC). Table 3 represents the results of bounds testing, showing that co-integration exists among the variables except for trade openness. Our calculated *F*-statistics are 15.05, 9.44, 17.65 and 7.958, while energy consumption, income growth, FDI, and trade openness are considered as dependent variables.

ARDL LONG-RUN AND SHORT-RUN ESTIMATES

After establishing the co-integration relationship between the targeted variables (energy consumption and FDI) in their respective models, we test the model estimates for equation 3 depicted in table 3. We find a negative (the coefficient is –0.016) and a significant relationship between energy consumption and FDI in the long run. Our empirical result shows that a 1% increase in FDI decreases energy consumption by 0.016%, containing all things constant, which supports the hypothesis that the energy-saving technology of FDI reduces energy consumption, as FDI does not posit any positive impact on energy consumption. The nega-tive linkage may partially take place because FDI in developing countries like Bangladesh may lag behind in automation and industrialization. In addition, the positive spillover effect of FDI through diffusion of new technology or know-how in the energy intensive industries is not prop-erly realized as expected. In the case of explanatory variables, our results depict that per capita income affects the level of energy consumption positively and significantly, indicating that energy consumption of peo-ple rises due to economic growth in Bangladesh. Finally, trade openness is positively associated with energy consumption of people.

The short-run coefficient estimates of equation 3 on the basis of opti-mal lag structure reveal the negative effect of FDI on energy consumption in the short run at the 1% significance level that is also obtained from the long-run result. The contribution of two explanatory variables, such as GNI and trade openness, are not expressed in the short-run due to their short-run insignificance found in the estimation. Furthermore, the co-efficient of the error correction mechanism (ECT_{t-1}) is found to be neg-

TABLE 3 Bound Test Results, Estimated ARDL Long-Run and Short-Run Coefficients

Dependent Variable	F_{LEC} (LEC\LFDI, LY, LTO)	Level of Significance	1%	5%
Optimal Lag Structure	ARDL(2, 0, 0, 0)	I(0)	3.65	2.79
F-statistic	15.05474			
Decision	Cointegration exist	I(1)	4.66	3.67
Long-run coefficient estimates	Constant		−0.272749	(0.3165)
	LFDI		−0.016127	(0.0117)
	LY		0.753625	(0.0000)
	LTO		0.157290	(0.0272)
Short-run coefficient estimates	ΔLEC (−1)		−0.321495	(0.0057)
	ΔECT$_{t-1}$		−0.401399	(0.0000)
Diagnostic test results	Adjusted R-squared		0.472391	
	Jarque-Bera normality test		1.151390	(0.5623)
	Breusch-Godfrey Serial Correlation LM		0.197457	(0.6274)
	Heteroscedasticity test: ARCH		0.427957	(0.5047)
	Ramsey RESET test		2.906998	(0.0971)

NOTES Diagnostic tests result based on F-statistic; coefficient and tests result p-values are in parenthesis.

atively significant at the 1% level in equation 7. This situation confirms the speed of readjustment from any short-run unstable way to long-run equilibrium between the variables. As the ECT$_{t-1}$ coefficient found in the estimation for the short-run dynamic is lower than 1 (−0.40), it indicates the mild (in between lower and medium) speed of adjustment to correct any short-run disequilibrium to long-run stability among the variables used in the model.

The diagnostic tests result reveals that the ARDL model (where energy consumption is the outcome variable) produces the value of adjusted R-square (0.472391), which describes the 47% variation in the economic growth, FDI, and trade openness used in the model. In addition, the other tests such as Jarque-Bera, heteroscedasticity, Breusch-Godfrey (serial correlation), and Ramsey RESET tests are employed to check for normality, autocorrelation, residual error, and omitted variable bias, respectively, among the variables.

In the case of all these sensitivity tests, the p-values are required to be insignificant based on the F-statistic values. As the estimated F-statistic values depict the insignificance at 5% level of significance, it indicates that the studied model is accurately specified and the residuals are distributed normally, not heteroscedastic, and not auto-correlated. CUSUM
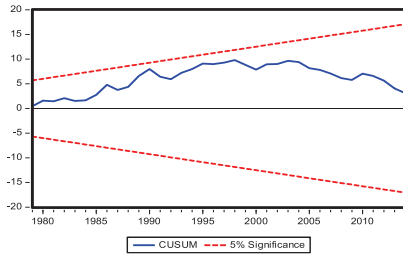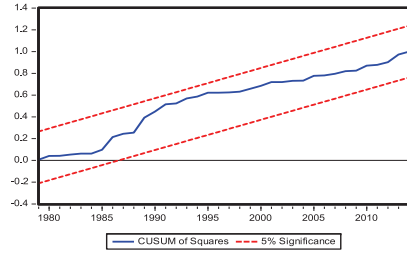
FIGURE 5   Plot of CUSUM Test

FIGURE 6   Plot of CUSUM of Square Test

and CUSUMSQ tests are also employed to check the model stability. Both CUSUM and CUSUMSQ tests in recursive errors report that the blue line stays within the red line representing a 5% significance, implying the structural constancy in the residuals (figures 5 and 6). Moreover, the outcomes of diagnostic and stability tests show the model's goodness of fit; hence, the co-integration exists in the energy consumption-FDI nexus for Bangladesh.

ROBUSTNESS CHECKS

We also estimate the long-run sensitivity of the study result for equation 3 using three different techniques, namely FMOLS, DOLS and CCR.

Among these estimation procedures, DOLS is treated as more authentic as it includes both leads and lags to rectify autocorrelations and heteroscedasticity (Salim et al. 2017). Table 4 reports that these alternative estimators' coefficient magnitude is somewhat smaller and nearer to their ARDL equivalents. The study result of a negative energy-FDI relationship, and a positive income energy-growth nexus and trade openness-energy nexus stays robust to these techniques.

Table 5 presents Granger causality test results where the null hypothesis, which represents that the energy consumption does not Granger-cause the FDI, was rejected at the 5% level in the short-run, is in line with

TABLE 4   Estimated Long-Run Coefficients to Different Measurements

Variable	ARDL		FMOLS		DOLS		CCR	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
LFDI	−0.016127	0.0117	−0.008179	0.0821	−0.017969	0.0069	−0.009107	0.1007
LY	0.753625	0.0000	0.793835	0.0000	0.762567	0.0000	0.788221	0.0000
LTO	0.157290	0.0272	0.053308	0.3085	0.181580	0.0347	0.063298	0.3256
Constant	−0.272749	0.3165	−0.225363	0.3261	−0.427525	0.0908	−0.224985	0.3691

TABLE 5 Granger Causality Test

LEC does not Granger-cause LFDI			LFDI does not Granger-cause LEC		
Lag	*F*-statistic	Prob.	Lag	*F*-statistic	Prob.
1	8.48240	0.0058*	1	1.40608	0.2427
2	4.90612	0.0129*	2	0.59417	0.5572
3	2.53151	0.0734**	3	0.62432	0.6042
4	2.25893	0.0854**	4	0.54635	0.7030

NOTES   * Significance at 5% level. ** Significance at 10% level.

the findings by Lu et al. (2021). But the reserve scenario is not true which indicates that energy-efficient technologies are not still fully functional to reduce energy consumption level since no causation runs from FDI to energy consumption. So, the existence of a unidirectional causal relationship from energy consumption to FDI signifies the existing institutional strength in the energy sector of Bangladesh that may attract foreign investments in the upcoming future.

Discussions

The study results obtained depict that FDI has a significantly negative effect on energy consumption both in the short and long run in Bangladesh's economy. Generally, FDI is considered a significant component of globalization. Theoretically, globalization's influence via FDI on energy consumption is typically analysed in three ways: 'scale effect,' 'technique effect,' and 'composition effect' (Shahbaz et al. 2018a; Islam and Islam 2021). Globalization via scale effect channels expands economic activities and, thus, energy consumption if ceteris paribus (Cole 2006). The technique effect of FDI fosters lower energy usage in economies through importing sophisticated technologies, and finally, it authorizes for accomplishing more economic activities (Antweiler, Copeland, and Taylor 2001; Dollar and Kraay 2004). Lastly, the globalization/FDI-laden composition effect on energy consumption occurs when energy use reduces with the growing economic activities (Stern 2007). From the theoretical perspective, Bangladesh has been experiencing the composition effect of FDI that downsizes the level of energy consumption amid its spectacular growth momentum.

From the empirical point of view, on the other hand, spillover effects, structural effects of factor inputs, and competitive effects can influence the industry structure of the importing country. Bangladeshi industries, particularly the manufacturing sector, are core grounds of FDI employ-

ment. The uneven allocation of FDI in each industry negatively impacts the industry structure. This is why the negative impact on Bangladesh's reduction in energy consumption intensity is more significant than the favourable impact (Islam et al. 2021). Furthermore, FDI is largely concentrated in the sphere of high-energy consumption industries. In this case, adopting energy-saving technologies raises the manufacturing costs, which contradicts the FDI premise of profit maximization (Yue, Long, and Zuang 2011).

The negative influence of FDI on energy consumption is consistent with Doytch and Narayan's (2016) findings that FDI harms non-renewable energy consumption in low-income countries and favours high-income ones. If we assume energy consumption as a proxy for economic growth, the findings of this study also support our hypothesis. Suppose we discuss the results obtained for real GDP and FDI. In that case, we can see that the results converge towards the intrinsically developed and imported environmentally degrading production technologies used in Bangladesh. Thus, Bangladeshi policymakers have introduced negative externalities by lowering environmental quality, and existing policies have failed to internalize those externalities. According to Pazienza (2019), this scenario is coherent with the OECD countries where FDI-cultivated energy consumption negatively influences environmental quality. In addition, FDI-related energy infrastructure in Bangladesh incurs a significant amount of expenditure and utility costs. However, sector-wise deployment of the FDI has taken place in Bangladesh due to institutional authorities' lack of resources mobilization. Therefore, relevant institutions are responsible for the misuse of or unused expenses and logistics in the energy infrastructure of industrial production (Islam, Ali, et al. 2022; Islam, Irfan, et al. 2022). Thus, FDI inflow negatively impacts the level of energy consumption in Bangladesh.

Our empirical findings of the negative nexus between energy consumption and FDI may also somewhat reveal the Bangladesh-based foreign investors' domination in the labour-intensive sector, which requires less energy compared to their capital-induced correspondents as expressed by Cole, Elliot, and Zhang (2011) and Huang (2003) in the context of China. Bangladesh is an open economy in terms of trade-related capital and labour utilizations for the sake of higher-level industrial production. Despite this, restrictions on the capital-intensive sector may, to some extent, demonstrate low-level energy consumption arising from FDI corresponding to state-owned enterprises (SOEs), which is ar-

gued by Elliott, Sun, and Chen (2013), and Herrerias, Cuadros, and Orts (2013). In addition, international diffusion of energy-saving technologies and techniques imported by utilizing FDI might have a significant contribution to inducing an adverse connection between energy consumption and FDI in any economy (Fisher-Vanden et al. 2006; Hübler 2011). FDI affects energy consumption negatively in different developing economies like Bangladesh due to the lack of absorptive abilities. Till now, we have fallen short of utilizing hi-tech technologies brought by FDI from developed countries because of our less institutional capability, hence, Bangladesh is lagging behind in automation and industrialization. The study result is consistent with Mielnik and Goldemberg (2002), Antweiler, Copeland, and Taylor (2001), Hübler (2009), Lee (2013), and Adom, Kwakwa, and Amankwaa (2018). In contrast, the outcome of a negative FDI-energy consumption nexus contradicts the previous study by Khatun and Ahamad (2015) in the context of Bangladesh.

The policymakers of Bangladesh should ensure a friendly environment for foreign investors by managing the bottlenecks that exist in the industrial sector. Trade and industry-related capital stemming from FDI should be exploited for increasing energy consumption in the growth process. Moreover, policymakers should enhance the absorption and utilization capacity of sophisticated technologies and other industrial raw materials brought through FDI for the industrial development of the country. Industrialization requires the increasing demand of energy, which would help augment the level of energy consumption in Bangladesh.

The study result also reveals the positive relationship between output and energy consumption, which is in line with Alam et al. (2012), who studied this nexus in Bangladesh. Although developed economies alone have witnessed a positive relationship between energy consumption and economic growth since World War II (Kraft and Kraft 1978), developing and emerging countries have captured global attention by consuming energy in their growth path. Thus, the proper use of all industry-based inputs of Bangladesh should increase to accelerate economic growth, and hence, it would lead to the efficient consumption of energy. Trade openness impacts energy consumption positively in the context of Bangladesh, and this finding is supported by Nasreen and Anwar (2014). They examined the causal relationship between trade openness, economic growth and energy consumption for 15 Asian countries from 1980 to 2011. Trade openness in any economy impacts the level of energy consumption by

way of direct and indirect channels. Trade openness includes the total trade volume as a share of its GDP in percent. Export growth enhances energy demand directly by helping the production scale of growth. Incidentally, a large volume of exports includes raw materials, intermediate goods to be transported, and a higher volume of finishing goods to be shipped from the manufacturing places. This process requires a high energy intensity to fuel the logistic functions of the export-oriented industry.

In contrast, imports can effectively improve the worldwide flow of energy-efficient technology, contributing to a negative linkage between energy use and imports, in particular non-durable products such as transportation equipment and domestic appliances (Salim et al. 2017). However, importing intermediate goods and raw materials for industrial production can help augment energy consumption. Moreover, the economic growth of Bangladesh is mainly export-dependent, though a trade deficit exists due to more imports than exports. In this regard, proper utilization of imported goods and services is critical for Bangladesh to promote trade-led growth; and more export promotion would thus impact energy consumption positively by increasing the energy demand.

Concluding Observations and Policy Recommendations

This study inspects the dynamic linkage between energy consumption and FDI within the purview of income growth and trade openness, covering time-series data from 1971 to 2014 in the case of Bangladesh. Employing the ARDL approach, the empirical results divulge the co-integration among the study's variables. More importantly, we explore the negative impact of FDI on energy consumption both in the short and long run. The results are explored in line with the statement that the impacts of technique and composition effects of FDI illustrate the long-run adaptation towards less energy usage and low carbon in the future economy of Bangladesh. In contrast, the scale effects tend to fuel economic activities that increase energy consumption in the short run (Salim et al. 2017).

As a developing country, Bangladesh intends to achieve energy sufficiency by materializing its vision to be a developed economy by 2041. Apart from internal finance/investment, the country seeks foreign finance/investment to generate more energy to reach the desired growth trajectory. As empirical results reveal that FDI impacts energy consumption, it requires several policy implications. Since FDI negatively affects

energy consumption, higher FDI does not lead to greater energy consumption in Bangladesh because of the positive externalities of FDI in energy-conserving practices through the diffusion of new technology. Therefore, we should adopt unified energy-saving and emission-reducing mandates for foreign-invested (FIE) and domestic enterprises while considering FDI scale expansion.

Meanwhile, Bangladesh should increase the proportion of foreign investment, particularly in the technology-intensive industries, and encourage foreign-invested enterprises (FIES) and FDIS to use and exchange advanced energy-saving technologies. However, more importantly, Bangladesh is yet to enjoy the positive externalities of FDI in the energy sector. Therefore, policymakers should direct their utmost concentration to reduce other non-policy level constraints, such as decision-making delays, political instability, inefficiency in human resource management, lack of good governance, and corruption. Also, policymakers ought to be critical of profit repatriation, rate of investment, and incorporation of local private ownership in the investment process to internalize FDI-relevant positive spillover in energy conservation. In this case, Bangladesh has no alternative but to utilize the resource mobilization potentials of reliable institutions that can be helpful to ease the adverse effect of FDI deployment on the energy consumption level of Bangladesh.

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Language Management Strategies and Slovenian SMES: An Update on Recent Developments

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In line with numerous studies, export success of small and medium-sized enterprises (SMES) could be considerably improved were companies aware of the importance of foreign language skills among their employees. In other words, many business opportunities are lost within the European Union because of the lack of language skills. Many authors report that adopting a language management strategy is linked to a significant increase in companies' export sales. The ELAN (Effects on the European Economy of Shortages of Foreign Language Skills in Enterprise) findings should also be considered because of the relatively high importance of SMES in providing employment. This article investigates, by means of a questionnaire sent to 1499 Slovenian exporting SMES from various industries, how aware these companies are of the ELAN findings, and which language strategies they have implemented in their business operations. The findings of our 2021 study revealed that Slovenian exporting SMES are slowly becoming more aware of the benefits of language management strategies, but that some improvements are nevertheless still possible.

Key Words: ELAN study, foreign language skills, language management strategies, SMES
JEL Classification: L1, Z13

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Introduction

When the European Commission published the ELAN study (Effects on the European Economy of Shortages of Foreign Language Skills in Enterprise) in which the connection between foreign language skills and exporting success of European small and medium-sized enterprises (SMES) was discussed (European Commission 2006a), recommendations were given for action at the local, regional, national and European level. Based

on the survey of nearly 2000 SMEs from 29 European states it was discovered that a substantial amount of business is being lost because of lack of language skills. Surveyed enterprises reported the loss of contracts or potential contracts despite the fact that 15 companies in the 29 states claimed to have a language strategy. Across the sample, 22% of enterprises said that they recruit native speakers and more than 50% of enterprises had adapted their websites. In addition, between 4% (in Ireland) and 84% (in Lithuania) of enterprises used translators and interpreters. A high proportion of surveyed enterprises (48%) reported offering language training to their employees (except for the UK with only 20%). On the other hand, only in four companies had employees undertaken some sort of language training in the three previous years.

According to David Crystal, a British linguist, academic and a well-known author who has written, co-authored or edited more than 120 books on a variety of language-related subjects, in today's business environment, 'knowing a foreign language is like having an extra instrument or one more piece of software to use' (Crystal 2003). The European Union is aware of this fact, which can be seen from several documents that were published during the last 15 years or so (European Commission 2006a; 2006b).

The importance of foreign languages for exporting SMEs has also been thoroughly discussed by Williams (2011), Lee (2012), Sauter (2012) and Crick (1999), who emphasized the importance of learning foreign languages for international business.

Interestingly, the Global Entrepreneurship Monitor, the world's study which publishes yearly studies of entrepreneurship, never explicitly mentions linguistic obstacles in their annual global reports. During the last ten years only the 2012 Global Report stated that 'language and cultural barriers may limit employment opportunities . . .' (Global Entrepreneurship Monitor 2013). The world's most important and longitudinal study of entrepreneurial activities, that struggles to understand entrepreneurship in its entirety, appears to have disregarded the important issue of foreign language skills in world-wide entrepreneurial activities. Similarly, Slovenian GEM reports have never emphasized the significance of language skills for companies or the connection between foreign language skills and company performance.

A language management strategy mainly tackles different language-related matters relevant to different markets. Enterprises trying to enter new markets are advised to adapt such a strategy. The following seven language strategies are likely to bring benefits to exporting companies when

doing business on foreign markets: recruitment of native speakers from your target markets, appointing company employees who already possess appropriate foreign language skills, using professional translators and/or interpreters, developing a language plan or strategy for handling communication barriers before you start exporting to a particular country, language training for staff, collaboration with universities, and multilingual websites.

Research from 2015 carried out by Conversis (2015) reveals that many UK and US enterprises struggle to expand internationally because of inadequate language skills. According to the report, one in four companies examined in the UK said they had lost business opportunities due to the lack of foreign language skills.

Rižnar and Kavčič (2017) and Rižnar and Rybnicek (2017) showed in their 2016 study that 58% of Slovenian SMES (and 77% of Austrian SMES) believed there is a link between the use of foreign language skills and export performance. 53% of Slovenian and 48% of Austrian SMES believed that their investment in language skills has a significant return. A small percentage of companies in the studies had a formal language management strategy (20% of Slovenian and 18% of Austrian SMES). In 2016, only 15% of Slovenian and 49% of Austrian SMES employed native speakers. One fifth of Slovenian SMES used local agents for their language needs, whereas more than half of Austrian SMES used local agents. Professional translators and interpreters were used by only 10% of surveyed Slovenian small and medium-sized companies. On the other hand, a third of Austrian companies used such services. Slightly more than one third of Slovenian enterprises hired staff with language skills to match their foreign market needs as compared to 50% of Austrian enterprises. Only 8% of Slovenian and 7% of Austrian SMES thought they had lost business contracts due to the lack of foreign language skills. 94% of Slovenian respondents said that they had multilingual websites (compared to less than 40% of Austrian SMES). Finally, 65% of Slovenian and 43% of Austrian enterprises believed that English was not enough for their export activities. Among other outliers in our surveys conducted in 2016, there was a considerably higher percentage of Slovenian SMES that used the 'I do not know' answer as their response. Slovenian respondents did not know if they had lost any business contracts (60%) and almost half of them were unaware if they used the services of translators and interpreters.

In her article, Ingela Bel Habib clearly suggests that multilingualism provides export benefits (Habib 2011). In her research, it was found that SMES are missing exporting opportunities when they believe that English

is enough. Data from six European countries revealed that companies using fewer languages have a higher percentage of missed export contracts. On the other hand, having a multilingual export strategy helps small and medium-sized enterprises to penetrate foreign markets.

This research aims at finding out if the situation in the field of foreign languages and Slovenian SMES has changed for better or worse.

Methods

In this research endeavour we wanted to find out how Slovenian SMES that are actively involved in exporting activities on international markets confront language barriers. Our intention was also to compare the results of this study with the results of our previous research that was carried out in 2016. While we used the same set of questions as in the 2016 survey, the number of respondents was considerably larger in the 2021 survey (almost 15 times larger). Moreover, in the 2016 sample, more than half of the respondents were not anonymized, whereas the 2021 survey was comprised only of anonymized respondents.

The questionnaire was sent to 1499 Slovenian SMES and was distributed by electronic mail between 24th of November and 8th of December 2021. The companies that participated in the survey can be found in the Database of Slovenian Exporters (SLOEXPORT). 1031 of these companies had eleven to fifty employees, 262 companies had fifty-one to one hundred employees and 206 had more than one hundred employees. We received 328 questionnaires from Slovenian SMES, of which 235 could be used in further analysis. The 93 questionnaires that were excluded from the analysis were either not fully filled in or the SMES were not exporting companies. The response rate was 21.88%.

The closed questionnaire that was sent to the surveyed companies was based on the ELAN study and contained 13 questions. All except one question were in the form of multiple choice with three to five provided answers. One question was in the check-all-that-apply format. Being aware of the fact that respondents are very likely to be reluctant about taking surveys, we wanted to make our questionnaire as short as possible and still get valuable data for our research activity.

Results and Discussion

The questionnaire sent to SMES in 2021 was based on the ELAN study questionnaire prepared for our 2016 study, because we wanted to see if our findings in the present study are in any way similar to the findings of

our 2016 study. Below are the findings of our 2021 study and a comparison with the 2016 study. At the end of this section, there is a summary of the most important differences between the two surveys.

Most Slovenian SMES surveyed in 2016 belonged to the group of companies that export between 21% and 40% of their turnover (39%). This group was followed by companies that belonged to the group that exported between 1% and 10% of their turnover (28%). The third group of companies exported more than 40% of their turnover (20%). Only 13% of surveyed companies exported between 11% and 20% of their turnover.

As for the research conducted in 2021, the largest group of SMES comprised those companies that exported more than 80% of their turnover (45%). The second group of companies exported between 51% and 80% (23%), followed by companies that export between 26% to 50% of their turnover (19%). The fourth group of companies exported less than 10% (7%), and the fifth group exported between 11% and 25% (6%).

The results are:

1. 65% of surveyed SMES in 2016 and 52% of surveyed SMES in 2021 believed that the English language is not enough for their export activities. The results for the same question show that 35% of companies surveyed in 2016 believed, and 46% of companies surveyed in 2021 still believe, that English as a foreign language met all their communication needs regarding exporting. While in 2016 no one chose the option 'Do not know,' in 2021 it was chosen by 2% of respondents.

2. 73% of surveyed companies in 2016 believed that there is a link between the use of foreign languages and export performance, while results in 2021 show that 85% of SMES believe that such a link exists. In both the 2016 and 2021 surveys, 10% of respondents do not see such a link. In 2016, 17% of respondents did not know whether such a link exists, while in the 2021 survey, only 5% answered the same.

3. In 2016, 53% of SMES believed that the company's investment in language skills has a significant return. In 2021 the percentage is much higher, at 87%. 14% of companies in 2016 and 6% of companies in 2021 do not believe that. While in 2016 one third (33%) of surveyed enterprises did not know if this is the case, in 2021 only 7% of those surveyed do not know if the company's investment in language skills has a significant return.

4. 15% of Slovenian SMES in 2016 and 17% in 2021 employ native speak-

ers. 46% of surveyed SMEs in 2016 did not employ native speakers as compared to 81% in 2021. A big difference between the years can be seen in the 'Do not know' answer. In 2016, as many as 39% of respondents said they did not know if they had hired a native speaker, and in 2021 only 2% answered the same.

5. One-fifth of surveyed companies in Slovenia in both 2016 (19%) and 2021 (20%) used local agents and/or distributers who speak their own native language in their foreign markets. 44% of Slovenian SMEs in 2016 did not use local agents, compared to 76% of SMEs in 2021. In 2016, 37% of surveyed companies did not know whether they used local agents. In 2021 this number is much lower, at 4%.

6. In 2016, professional translators and interpreters were used by only 10% of Slovenian SMEs. 38% of surveyed companies did not use the services of professional translators/interpreters and 52% did not know if they used such services. On the other hand, 32% of enterprises in 2021 used professional translators and interpreters; 64% of them do not use their services and only 4% do not know if they use translators and interpreters.

7. Just over one-third of Slovenian SMEs (34%) in 2016 hired staff with language skills to match their foreign markets. In 2021 the percentage was higher, at 42%. 28% of surveyed companies in 2016 and 52% of them in 2021 had never acquired staff with specific language skills due to export needs. 38% in 2016 and only 5% in 2021 did not know whether such staff have been hired.

8. As for lost contracts due to the lack of foreign language skills, only 8% of Slovenian SMEs in 2016 believed that they have lost contracts due to language barriers. In 2021 the percentage is almost twice as high (15%). In 2021, 67% of surveyed SMEs believe that their company never missed an opportunity of winning an export contract due to lack of language skills. In 2016, 30% of respondents gave the same answer. Almost 62% of companies in 2016 and 18% of companies in 2021 did not know whether they have ever lost contracts because of the lack of language skills.

9. Only 20% of Slovenian SMEs in 2016 had a formal language management strategy. 49% of enterprises stated that they did not have such a strategy and 31% of the companies do not know whether such a strategy exists in their company. The results in 2021 show that 22% of Slovenian SMEs have a formal language management strategy,

followed by 70% of companies that do not have it and 8% of SMEs that do not know whether such a strategy exists in their company.

The analysis of the results shows that the share of SMEs that consider foreign language skills as important for their export performance increased considerably over the five-year period, which is clearly shown as an increase in SMEs which see a link between foreign language skills and export performance (85% in 2021 compared to 73% in 2016). In addition, more SMEs also believe that investments in language skills are a viable business strategy that yields significant returns (87% in 2021 vs 53% in 2016). On the other hand, only one fifth of companies have a formal language management strategy in place, which is broadly unchanged compared to the 2016 survey.

In the present study, more exporting enterprises see English language knowledge as sufficient compared to the 2016 survey, although still less than half of the surveyed companies (46%) use only English when communicating with their business partners.

It is good to see that the share of companies employing translators and recruiting staff with specific language skills increased compared to the 2016 survey (from 10% in 2016 to 32% in 2021 regarding translators and interpreters and from 34% to 42% regarding recruiting staff with specific language skills).

Notably, the share of native speakers (a change from 15% in 2016 to 17% in 2021) and the share of companies hiring local agents with foreign language skills remained largely unchanged (a change from 19% in 2016 to 20% in 2021).

Last but not least, there is a large difference in regard to 'Do not know' answers between the 2016 and 2021 survey. This, in our opinion, can be attributed to the sample size and anonymity of respondents. The 2016 sample was comprised of a considerably smaller sample of non-anonymous respondents who might not have been so willing to search for the right answer and easily admitted that they did not know the answer, whereas a 15 times bigger sample in the 2021 survey was completely anonymous and perhaps more willing to provide the answers based on available data within the enterprise.

Companies that have a formal language management strategy were asked three additional questions, the results of which are described below.

In 2016, 75% of Slovenian SMEs believed that there is a correlation be-

TABLE 1   Comparison of the Results of the 2016 Survey and the 2021 Survey

Questions	Answers	2016	2021
Is English language enough for your export activities?	Y	35	46
	N	65	52
	D	0	2
Do you think there is a link between the use of foreign languages and export performance in your company?	Y	73	85
	N	10	10
	D	17	5
Do you think that your company's investment in language skills has a significant return?	Y	53	87
	N	14	6
	D	33	7
Have you ever employed native speakers full time in your company who support your foreign trade?	Y	15	17
	N	46	81
	D	39	2
Have you ever used local agents and/or distributors who speak your own native language in your foreign markets?	Y	19	20
	N	44	76
	D	37	4
Have you ever employed external translators/interpreters for foreign trade?	Y	10	32
	N	38	64
	D	52	4
Have you acquired staff with specific language skills due to export needs?	Y	34	42
	N	28	52
	D	38	5
Is there any possibility that your company ever missed an opportunity of winning an export contract due to lack of foreign language skills?	Y	8	15
	N	30	67
	D	62	18
In order to deal with customers abroad, does your company have a formal language management strategy?	Y	20	22
	N	49	70
	D	31	8

NOTES   Answers: Y – yes, N – no, D – do not know. In percent.

tween having a language strategy and a company's performance and 25% did not know if that was the case. In 2021 similar results show that 73% of enterprises see such a correlation, 6% do not see it and 21% do not know whether such a correlation exists.

More than 12% of surveyed companies in 2016 had a formal language

strategy contained in a written document, the same percentage of companies did not possess such a document and 75% did not know if such a document existed. Results of the research made in 2021 show that only 9% of surveyed Slovenian SMEs who have a language management strategy also keep the strategy contained in a written document. 4% of companies surveyed in 2021 do not know whether such a document exists and 87% of SMEs do not have a formal written document for their language strategy.

The vast majority of Slovenian SMEs in 2016 (94%) had a multilingual website. The second most important strategy was appointing people who already possess language skills (87%), followed by the use of professional translators and interpreters (56%). The recruitment of native speakers from the company's target markets and the development of a language plan or strategy prior to export activities in new markets is an activity shared by 37% of surveyed enterprises. Language training for staff is provided by 31% of companies. Only 6% mentioned cooperation with universities.

The results of the survey in 2021 show that the most important strategy for Slovenian SMEs is appointing company employees who already possess language skills (77%), followed by language training for staff (66%) and multilingual websites (57%). The use of professional translators or interpreters and employee mobility is an activity shared by 43% of companies. Translation of promotional, sales and technical texts is provided by 51% and the recruitment of native speakers from the company's target markets is provided by 17%. 6% of companies mentioned cooperation with universities and only 4% mentioned employment of foreign students. One company added that it has sales offices in various markets, employing industry experts who speak the official language of the country.

Research Contributions, Research Limitations and Further Research

The contribution of appropriate foreign language skills to competitiveness is too obvious to be questioned. Most likely, English will keep its leading role as the world lingua franca in international business, but knowing other foreign languages certainly gives individual employees and SMEs a competitive edge.

The economics of multilingualism is a nascent research field trying to reveal how foreign language skills affect other economic variables. Researchers from the University of Geneva and the University of Montreal

(Grin, Sfreddo, and Vaillancourt 2010) found that Swiss multilingualism contributed 9% of Swiss GDP.

According to the study led by James Foreman-Peck and Yi Wang of Cardiff Business School, it has been estimated that the lack of foreign language skills in Great Britain costs the economy £48 billion (almost €55 billion), or 3.5% of GDP annually (Foreman-Peck and Wang 2013). A lack of foreign language skills may, of course, not always lead to direct losses, but may certainly dissuade enterprises from entering new markets.

Many other related documents that have been produced by different institutions of the European Union within the last decade are not enough to solve the problem. Many SMEs are not aware of funding possibilities available within many community programmes, other SMEs believe that application procedures are too burdensome and time consuming; others, micro enterprises and nascent enterprises, simply lack funds to invest in language education or appropriate language management strategies. In the years to come, foreign language skills are going to become even more important. There will likely be an increase in learning Mandarin, Arabic, Russian, Spanish, Portuguese or Turkish or any other language spoken in territories that are presently considered to be emerging markets. This will help businesses and individuals in their efforts to better understand each other, as well as to increase our awareness of cultural diversity (Kohonen et al. 2001).

This study proves, once again, that it is necessary to raise awareness among SMEs of the significance of using language strategies. Companies unwilling to invest in foreign language skills are at risk of becoming less competitive. As seen from the result analysis, our 2021 research was carried out on a much larger sample of Slovenian SMEs that operate in several industries and have headquarters in different locations than the research from 2016. In our previous research, slightly more than half of the surveyed enterprises were non-anonymous, whereas the present research only included anonymized enterprises, which is why no advanced econometric analysis could be carried out.

Future research should focus either on one region or a single industry or try to find out if there are any sectors in which foreign language skills are either particularly important or underdeveloped. Future research endeavours could also try to figure out if there are any patterns in cases of relatively low response rates or if companies with a formal language management strategy are more likely to employ native speakers and interpreters than those enterprises without such a strategy in place.

Both our research endeavours (2016 and 2021) were limited to Slovenian exporting SMEs, with the initial one analysing only a small sample of around 100 enterprises from different industries. From the perspective of the 2021 research, our 2016 research was also limited by the non-anonymized and slightly unreliable respondents who too frequently selected 'Do not know' as an answer. By increasing the size of the sample, our 2021 survey seems to be much more trustworthy and reliable in this respect.

Our study showed that even though language pervades every aspect of company life, Slovenian enterprises sometimes pay little attention to it, as they rarely decide to develop language management strategies which would help them in their efforts to enter new markets.

In addition, the study proved that English may not be enough, neither for multibillion-dollar companies nor for small and medium-sized Slovenian companies trying to enter neighbouring and global markets. If Slovenian SMEs want to remain competitive, the least they should do is develop linguistic and cultural awareness at all levels, provide language training and education for their employees, and hire qualified language consultants more often, as well as native speakers and staff with specific language skills.

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Appendix: Questionnaire

Dear Sir/Madam,

My name is Anja Puntar and I am a master's student at the Faculty of
Management in Koper, Slovenia. Together with my teacher, associate
professor dr. Igor Rižnar, we are conducting research on how small and
medium-sized enterprises which are active in some form of international
activity, adopt language management strategies.

According to the ELAN study, a significant amount of business is being
lost in the EU due to a lack of language skills. Based on these findings we
compiled a questionnaire with which we want to research if the results are
in any way similar to the findings of the ELAN study.

In order to find out how Slovenian small and medium-sized enterprises
tackle language barriers, we invite you to participate in this research by
completing the following survey. The survey consists of 10 or 13 questions
in the form of multiple choice; therefore, it should take a couple of
minutes to complete it.

The data we collect will be used only for this research and your responses
are completely anonymous. If you want to receive the results of the

research when finished, you can provide your email at the end of the survey.

Thank you for taking the time to complete this survey. We are extremely grateful for your contributing your valuable time and your honest information.

Best regards, Authors

Please choose one of the options below:

1. What percentage of your company's sales turnover are exported?
   ☐ 0%, ☐ 1–10%, ☐ 11–20%, ☐ 21–40%, ☐ >40%

2. Is the English language enough for your export activities?
   ☐ Yes, ☐ No, ☐ Do not know.

3. Do you think there is a link between the use of foreign languages and export performance in your company?
   ☐ Yes, ☐ No, ☐ Do not know.

4. Do you think that your company's investment in language skills has a significant return?
   ☐ Yes, ☐ No, ☐ Do not know.

5. Have you ever employed native speakers full time in your company who support your foreign trade?
   ☐ Yes, ☐ No, ☐ Do not know.

6. Have you ever used local agents and/or distributors who speak your own native language in your foreign markets?
   ☐ Yes, ☐ No, ☐ Do not know.

7. Have you ever employed external translators/interpreters for foreign trade?
   ☐ Yes, ☐ No, ☐ Do not know.

8. Have you acquired staff with specific language skills due to export needs?
   ☐ Yes, ☐ No, ☐ Do not know.

9. Is there any possibility that your company ever missed an opportunity of winning an export contract due to lack of foreign language skills?
   ☐ Yes, ☐ No, ☐ Do not know.

10. In order to deal with customers abroad, does your company have a formal language management strategy?
    ☐ Yes, ☐ No, ☐ Do not know.

Questions for those that answered Yes on the 10th question:

11. Is there a correlation between having a language strategy and your company's performance?
    □ Yes,   □ No,   □ Do not know.

12. Does your company keep a formal language strategy contained in a written document?
    □ Yes,   □ No,   □ Do not know.

Please choose one or more options below:

13. Which of the language strategies stated below do you use to bring benefits to exporting enterprises? (multiple choice question)
    □ Appointing company employees who already possess language skills
    □ Language training for staff
    □ Cooperation with universities
    □ Multilingual websites

If you want to receive the results of the research when finished, you can provide your email here:

_____

Teorije trajnostnega financiranja
Peterson K. Ozili

Prispevek poskuša oblikovati nove teorije trajnostnega financiranja in vzpostaviti nabor predlogov, ki nam lahko pomagajo razumeti vedenje in dejanja gospodarskih subjektov v smeri trajnostnega financiranja. Za oblikovanje teoretičnega razmerja med trajnostnim financiranjem in dejanji gospodarskih subjektov smo v prispevku uporabili pregled literature. Prispevek predlaga šest teorij trajnostnega financiranja, in sicer teorijo prioritete, teorijo virov, teorijo posnemanja vrstnikov, teorijo življenjske dobe, teorijo pozitivnega signaliziranja in teorijo sistemskih motenj trajnostnega financiranja. Te teorije ponujajo verjetne razlage vedenja in dejanj gospodarskih subjektov v smeri trajnostnega financiranja. Za akademike, politike, ekonomiste, raziskovalce in študente pa bodo te teorije zelo uporabne pri njihovem delu v zvezi s trajnostnim financiranjem.

Ključne besede: teorije trajnostnega financiranja, teorija prioritet, teorija virov, teorija posnemanja vrstnikov, teorija življenjske dobe, teorija pozitivne signalizacije, teorija sistemskih motenj, gospodarski subjekti, zelene obveznice, zeleno financiranje
Klasifikacija JEL: Q01, Q21, G28
Managing Global Transitions 21 (1): 5–22

Dokazi o učinkih J-krivulje na ravni industrije v regiji SACU
Simba Mhaka, Ronney Ncwadi in Andrew Phiri

Naša raziskava proučuje kointegracijsko razmerje med gibanjem menjalnega tečaja in trgovinskimi bilancami v petih južnoafriških državah članicah Južnoafriške carinske unije (Southern African Customs Union – SACU) med letoma 1995 in 2020. Trgovinsko dejavnost razčlenjujemo na ravni industrije za 19 skupin izdelkov in nato ugotavljamo, ali imajo industrije v obdobjih depreciacije valute koristi, ali pa se jim položaj slabša tako kratko- kot dolgoročno. Z aplikacijo kointegracijske cenilke na osnovi skupin združenega povprečja (PMG, pooled mean group cross sectional cointegration estimators) na panelnoregresijske specifikacije J-krivulje na ravni industrije smo ugotovili, da bi bila depreciacija menjalnih tečajev koristna za 8 od 19 skupin izdelkov v regiji SACU, medtem ko bi preostalim 11 industrijam škodila. V strogem, teoretskem smislu najdemo učinke J-krivulje samo v šestih od 19 industrij, v katerih je

depreciacija tečajev na začetku škodila trgovinskim bilancam in se nato »prilagodila« dolgoročnim pozitivnim učinkom. Na splošno nosilcem politik v državah SACU svetujemo, naj razmislijo o uvedbi (i) izvozno usmerjene politike za industrije, katerih trgovinska bilanca je z depreciacijo valute okrepljena, in (ii) uvozno substitucijske politike ter strategije za ublažitev valutnega tveganja za industrije, katerih trgovinska bilanca je zaradi depreciacije valute oslabljena.

Učinek neposrednih tujih naložb na porabo energije: empirični dokazi

Sima Rani Dey in Monirul Islam

Članek raziskuje povezavo med neposrednimi tujimi naložbami (NTN) in porabo energije v okviru liberalizacije trgovine ter gospodarske rasti med letoma 1971 in 2014 v Bangladešu, pri čemer uporabi ARDL model. Rezultat raziskave prikazuje negativen vpliv NTN na porabo energije tako dolgo- kot kratkoročno. Poleg tega so rezultati raziskave robustni tudi z uporabo alternativnih meritev in cenilcev. Enosmerni vzročni odnos, ki prehaja od porabe energije k neposrednim tujim naložbam, podpira institucionalno moč energetskega sektorja. Zato bi nosilci politik morali zavzeti pragmatično politiko, s katero bi kar najbolje uporabili NTN v energetskem sektorju in okrepili absorpcijsko sposobnost lokalnih podjetij za ponotranjenje informacij, izhajajočih iz NTN, pri varčevanju z energijo.

Jezikovne strategije in slovenska MSVP: posodobljena ocena stanja na obravnavanem področju

Anja Puntar in Igor Rižnar

Skladno s številnimi raziskavami bi bilo izvozno uspešnost malih in srednje velikih podjetij (MSVP) mogoče precej izboljšati, če bi se podjetja zavedala pomembnosti znanja tujih jezikov. Z drugimi besedami, v Evropski uniji so zaradi pomanjkljivega jezikovnega znanja izgubljene

številne poslovne priložnosti. Številni avtorji poročajo, da je sprejetje jezikovne strategije povezano z znatnim povečanjem izvoznih aktivnosti podjetij. Upoštevati bi morali tudi ugotovitve raziskave Učinki nezadostnega znanja tujih jezikov v podjetjih na evropsko gospodarstvo (Effects on the European Economy of Shortages of Foreign Language Skills in Enterprise – ELAN). Ugotovitve te raziskave bi veljalo upoštevati tudi zaradi relativno velikega pomena MSVP pri zagotavljanju zaposlenosti. Prispevek s pomočjo vprašalnika, poslanega 1.499 slovenskim izvoznim podjetjem iz različnih panog, raziskuje, koliko so ta podjetja seznanjena z ugotovitvami raziskave ELAN in katere jezikovne strategije so implementirala v svoje poslovanje. Naša raziskava iz leta 2021 je pokazala, da se slovenska izvozna MSVP počasi začenjajo zavedati pomena jezikovnih strategij, vendar so nekatere izboljšave še zmeraj mogoče.