Institutions and Economies
Vol. 17, No. 4, October 2025, pp. 1-26 https://doi.org/10.22452/IJIE.vol17no4.1

Challenges in Integrating Visually Impaired Persons into Employment in Malaysia: An Exploratory Analysis

Dennis Teo Wei Xiang[a] and Thirunaukarasu Subramaniam[b]

Abstract: *Malaysia has performed dismally in the 1% job placement quota policy for persons with disabilities (PWDs). As visually impaired persons (VIPs) show a higher degree of unemployment than other disability types, this study investigates how to integrate VIPs into the Malaysian labour market. In-depth personal interviews were conducted among VIPs in Klang Valley. The research sample consists of VIPs aged between 25 years to 50 years with tertiary education. Six VIPs were employed (four in the public sector, two in the private sector) and two were unemployed. The qualitative data obtained was analysed using thematic analysis. While employers are reluctant to hire VIPs considering the costs in the form of facility provision and lost productivity, they need to value the strengths VIPs possess. This requires raising employers' awareness regarding the value of VIPs to their organisations. The main challenges VIPs face include access to information and infrastructure. Access to information can be improved through assistive technology to perform tasks efficiently. Adopting inclusive recruitment and hiring practices, raising awareness and educating employers on the importance of inclusivity in the organisation and implementing accessibility standards can better integrate VIPs into the labour market.*

Keywords: Visually impaired persons, Discrimination, Unemployment, Assistive technology, Malaysia
JEL Classification: J60, J71, J81

[a] Department of Southeast Asian Studies, Faculty of Arts and Social Sciences, Universiti Malaya, Kuala Lumpur. *Email: dennisteo789@gmail.com*
[b] Corresponding author. Department of Southeast Asian Studies, Faculty of Arts and Social Sciences, Universiti Malaya, Kuala Lumpur. *Email: stkarasu@um.edu.my*. ORCID ID: 0000-0003-4334-8026

1. Introduction

There are approximately 674,548 persons with disabilities (PWDs) in Malaysia from a total population of about 32.7 million (as of 2022), with the physical disability category being the highest (36.3%) followed by learning disability (35.1%), visually impaired (8.8%) and mental disability (8.2%) (DOSM, 2023). These figures are based on the total number of PWDs registered with Department of Social Welfare Malaysia (JKM) and given a PWD registration card. According to the Persons with Disabilities Act 2008, PWDs include those who have long term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society. Currently, JKM lists disabilities into seven categories: hearing impairment, visual impairment or blindness, speaking disability, physical disability, learning disability, mental disorder and multiple disabilities. PWDs, like other citizens, have the right to a quality life, earn a living, pursue education and contribute to nation-building. They are also entitled to have equal rights to enter the labour market without any discrimination and have access to all facilities, including job opportunities.

In 2008, the Malaysian government decided that the civil service must allocate 1% of jobs to PWDs, amounting to approximately 14,000 government sector jobs opportunities (Disability:IN, 2023). After five years, however, the 1% quota has not been met, with the country's performance being rather dismal. In the public sector, only 581 PWDs have been employed since 2008 (Disability:IN, 2023). The main perception is that PWDs would affect the productivity of an organisation. Such myths can result in losses to the country. The failure to integrate PWDs into the Malaysian workforce is estimated to result in losses between USD1.68 and USD2.38 million to the GDP (Disability:IN, 2023), dispelling the myth that the disabled are less productive.

Even if the 1% public sector job quota policy is implemented, there exist substantial barriers to employment which hinder the labour market participation of PWDs. Barriers may emerge in three forms: self-encountered barriers, organisational barriers and situational barriers. Self-encountered barriers comprise PWDs' own disabilities and a lack of education and training (BLS, 2020) leading to inadequate skills, an inability to overcome technological barriers, and a lack of logistical and mental preparedness.

Organisational barriers may involve company policies and hiring practices that do not favour PWDs. This may take the form of discrimination, negative attitudes from employers, and a lack of social support from the government (Morwane et al., 2021). Situational barriers may include built environment inequality (Hwang, 2022), unfair treatment, and a lower level of support from supervisors and coworkers (Qiu et al., 2023) due to negative perception that PWDs reduce productivity.

Visually impaired persons (VIP) face even greater challenges to enter the workforce upon completing tertiary education. The greatest challenge they face is obtaining the trust and confidence of employers that they are just as capable as other employees. These dynamics are explained by the social model of disability based on three main principles (Hosking, 2008): that disability is social construct and not the consequence of impairment; the interrelationship between impairment, how individuals respond to impairment and the social environment; and the social disadvantages disabled people experience are due to the failure of physical, institutional and attitudinal environment to meet the needs of those considered 'abnormal'.

In this study, the challenges encountered by VIPs in pre-employment and employment in the public and private sectors are analysed. We also investigate challenges encountered by unemployed VIPs as they engage in the job search process. Through this investigation, solutions and strategies to effectively integrate VIPs into the Malaysian labour market are suggested. This will help ensure that their employability increases, and more importantly, eradicate poverty among PWDs and reduce their dependency on others.

2. Literature review

2.1 Perception of employers towards PWDs

The unemployment rate among PWDs is significantly higher in Malaysia (Lee et al., 2011; Ang, 2017) and globally (Olsen et al., 2022; Morwane et al., 2021) when compared to the general population. Some employers have negative perceptions of PWDs, believing that they are less productive (Nagtegaal et al., 2023; Lengnick-Hall et al., 2007), less reliable, and more costly to employ. These negative perceptions lead to discrimination (Narayanan, 2018), making it difficult for them to find and maintain

employment. A growing body of literature suggests otherwise. Studies have shown that PWDs are just as productive, reliable and trustworthy as non-disabled workers (ILO, 2016). Some studies show that PWDs can even be more productive and dedicated (Pulrang, 2019) than non-disabled workers due to higher levels of motivation (Aichner, 2021). Despite all this evidence, negative perceptions towards PWDs persist, which can be a barrier to employment (Zamalia & Rosli, 2009; Gasper et al., 2020). Employers' negative perceptions towards PWDs are due to lack of awareness (Kaye et al., 2011) about their actual ability and the fear of the unknown. This leads to stereotyping and eventually discrimination (ILO, 2012), which limits employment opportunities. These negative perceptions need to be addressed so as to create a more inclusive labour market.

According to Yusof et al., (2015), employers that hire youth workers with disabilities in Malaysia identified certain strengths, such as them being hardworking, responsible, compliant, honest, and sociable. Hennigusnia (2017) finds the same in Indonesia but adds that workers with disabilities also have low self-confidence, high sensitivity, and are easily influenced by negative elements. Tiun et al., (2011) highlight that in the northern states of Peninsular Malaysia, most employers favour employing PWDs. However, few of these employers have enabling policies or mechanism to handle PWD issues or an accessible built environment. Several concerns raised by the authors include PWDs' ability to comprehend and follow orders, and the costs involved to employ and train them. The cost factor involved may also include increased health insurance or worker's compensation premiums (Kaye et al., 2011; Lengnick-Hall et al., 2007).

Different kind of disabilities have different limitations and capabilities, and the perception of employers towards PWDs may differ depending on disability. Boman et al., (2015) show that the highest probability of employment is among respondents with hearing disabilities, while those with psychological disabilities are least likely to be employed. The hearing impaired are more easily employed compared to VIPs (Crudden et al., 1998). This indicates that severity of the disability may determine the chances of securing employment. La Grow and Daye (2005) identify five main categories of barriers to employment among VIPs. These are factors arising from the vision impairment itself, access to jobs and environments, discrimination from employers or co-workers, personal characteristics, as well as ignorance on the part of employers as to the potential capabilities of

blind and/or vision-impaired workers. Wolffe and Candela (2002) also point out that employers are also concerned about the perceived expenses that are associated with workplace accommodations, delays that VIPs workers may experience in reaching full productivity, and potential difficulties in terminating subpar disabled workers.

2.2 Obstacles and challenges faced by PWDs in the labour market

Despite the progress made in recent years, PWDs continue to face significant obstacles. Moore and Wolffe (1997) identify several reasons that explain the underrepresentation of VIPs in the labour force, including the negative attitudes of employers toward VIPs; lack of employment and employment-related skills; lack of motivation for employment; government-generated work disincentives, such as entitlement programs that provide welfare or disability benefits; lack of housing and family support; lack of transportation; and lack of access to information. These obstacles and challenges appear at three stages: the human capital investment stage, pre-employment stage and employment stage.

In the first stage (human capital investment), the lack of access to education and training is one of the main challenges faced by PWDs, including by VIPs in Malaysia (Amin et al., 2021). Lamichhane (2013) also points out that participants in Nepal with hearing impairment were found to be more vulnerable to barriers to education, and they had fewer years of schooling than their counterparts with visual and physical impairments. In the second stage (pre-employment), challenges encountered include access to information on employment opportunities and communicating with others (Donaldson, 2017), employer bias or discrimination during interviews (Bonaccio et al., 2019; Dammeyer & Chapman, 2018); discrimination during the hiring process (Vedeler, 2023), and familiarising with their surroundings. In the third stage (employment), PWDs face challenges such as familiarity with new surroundings, physical barriers like disabled-unfriendly workplaces and difficulties commuting to the workplace (Crudden et al., 1998; Moore & Wolffe, 1997), use of assistive technology (Crudden et al, 2005), workplace discrimination (Jones et al., 2008), unfriendly co-workers (Santilli, 2023), and the negative perceptions of employers and colleagues (Crudden et al., 1998; Moore & Wolffe, 1997).

According to Narayanan (2018), disabled people are still being

discriminated against in the workplace in various forms. Inaccessible physical environments, lack of relevant assistive technology, and negative attitudes towards disability are the challenges they face. Similarly, Manaf et al. (2019) indicate that among the crucial issues affecting the employability of PWDs are the negative perceptions of employers and peers, accessibility, lack of training, lack of family support and personal attributes. With regards to the labour market participation of VIPs, Salminen and Karhula (2014) find that young VIPs face challenges regarding mobility, domestic life, interpersonal interaction and relationships, major life areas, and leisure activities.

Even though assistive technologies are very important in the workplace, better integration of PWDs and their connectedness to the use of and access to specialised devices is needed. Nierling et al., (2018) state that in the case of visual impairment, access to IT applications is crucial; in the case of hearing impairment, web-based sign language interpretation is a vital support tool; and for autism spectrum disorders (ASD), augmented reality applications are needed to train for real-life situations in the workplace.

Raja (2016) points out that digital technologies have the power to break traditional barriers to communication, interaction, and access to information for PWDs and accelerate employment opportunities. However, many of the managers surveyed by Nasir et al., (2019) are not aware of assistive devices and software, related laws, return-to-work programmes and incentives provided by the government to VIPs. While the benefits of digital technologies for PWDs are unquestionable, those in low- and middle-income countries face significant challenges to acquire assistive devices due to the cost and availability of standalone specialised equipment (WHO & World Bank, 2011).

2.3 Strategies to integrate disabled people into the Malaysian labour market

Barriers such as individual abilities, employer and social attitude, and the availability of support services affect the employment of disabled people. Despite such barriers, the International Labor Organization (ILO, 2016) recognises that PWDs can have positive impact on a company's bottom line, because they make good, dependable employees, who have often been found to perform on par with non-disabled coworkers, represent an untapped source of employees who have many skills and traits employers desire, have comparable or better safety records, have better retention rates reducing costs

related to recruitment and retraining of replacements, and have comparable to better attendance records compared to their non-disabled peers.

Yusof et al., (2015) assert that employers should be educated about the capabilities and competencies of disabled youth workers, as well as their benefits, such as their ability to contribute to productivity and national development through tax payments. Kaye et al., (2011) also recommend that the government should provide incentives to employers who hire youth workers with disabilities through tax breaks or subsidies for accommodation.

Narayanan (2018) suggests several potential solutions to improve the situation of disabled workers in Malaysia. These include establishing internal policies such as prioritising hiring PWDs in line with government policy, appointing a diversity specialist who deals with disability issues to avoid mishandling by other non-experienced staff, establish a written company policy or guidelines of non-discrimination which includes disability, and providing training to organisations intending to hire PWDs. Additionally, the government can play a role in supporting disabled workers by providing financial incentives for employers who hire them (Kaye et al., 2011; Yusof et al., 2015) and implement policies that promote equal opportunities in the workplace through inclusive workplaces (UNDP, 2022). Countries with more success in disability-inclusive employment have also combined quota systems with employment support services to address some of the difficulties faced by the private sector in employing PWDs (UNDP, 2022). The present study as such focuses on integrating VIPs into the labour market, as they remain among the most vulnerable groups, compared to other PWDs, such as the physically disabled and the hearing impaired.

3. Research methodology

3.1 Respondent selection and questionnaire design

The present research is a qualitative inquiry. The research sample consists of VIPs aged 25 to 50 years old with tertiary education. The respondents are classified into three groups. Group 1 comprises four VIPs employed in public sector (respondents A, B, C, D); group 2 consists of two VIPs employed in the private sector (respondents E, F) and group 3, two unemployed VIPs (respondents I, J). A total of two women and six men were interviewed. Table 1 details the respondents' demographic profile.

Table 1: Respondents' Demographic Profile

Respondent	Age	Gender	Highest educational attainment	Sector	Occupation
Group 1: Visually impaired employees					
A	34	Male	Master's	Public	Administrative officer
B	38	Female	Bachelor's	Public	Social development officer
C	34	Male	Bachelor's	Public	Administrative officer
D	45	Male	Master's	Public	Psychology officer
Group 2: Visually impaired employees					
E	28	Male	Bachelor's	Private	Section manager
F	33	Female	Bachelor's	Private	Teacher
Group 3: Unemployed visually impaired respondents					
I	38	Male	Doctorate	–	–
J	33	Male	Bachelor's	–	–

Questions pertaining to integrating disabled people into the Malaysian labour market via semi-structured interviews were administered. These include issues VIPs face during the pre-employment and employment stages, perceptions of and treatment received from employers and colleagues, and the strategies to integrate them into the Malaysian labour market. Impromptu questions were asked when necessary to probe further. The interviews were digitally recorded and transcribed for data processing.

3.2 Data analysis

Braun and Clarke (2006) outline six steps in conducting thematic analysis: familiarising oneself with the data, generation of initial codes, searching themes, reviewing themes, defining themes defining, and integrating these themes into a coherent and meaningful narrative to represent the data. For the present study, the thematic analysis was done manually, as Braun and Clarke (2006) suggest. The themes were extracted based on the frequency of occurrence in the transcripts given by interviewees. The themes are searched based on the narratives available in the account of data sets, which involves careful reading and rereading of the transcribed data through the identification of themes (King, 2004; Rice & Ezzy, 1999). Some of the advantages of thematic analysis include flexibility (Braun & Clarke, 2006), and allowing examination of various perspectives of different

research participants, by highlighting similarities and differences, as well as generating unanticipated insights (Braun & Clarke, 2006; King, 2004).

4. Results

4.1 Challenges encountered and solutions - public sector

Visually impaired jobseekers prefer public sector employment as it is perceived to be more secure and permanent than the private sector. For the public sector, the jobseekers register themselves on an online platform known as the Public Service Commission (SPA) under the Public Service Department (JPA). Based on the data obtained through in-depth personal interviews with four visually impaired respondents, the challenges were commonly faced by VIPs in two stages—pre-employment (job search, application and interview) and employment—were explored.

4.1.1 Pre-employment stage

For public sector employment, VIPs must go through several stages of assessments and interview sessions before being shortlisted by SPA. VIPs encountered several challenges during this stage. According to Respondent A:

> *Firstly, I faced difficulties to access certain job portals or websites, since they are incompatible with the screen reader software I am using. Secondly, some of the job advertisements are on printed paper, posters or signboards that cannot be accessed easily by VIPs. Besides that, I discovered that there was lack of awareness amongst interviewers on the capability of VIPs.*

To overcome such challenges, Respondent A proposes that visually impaired jobseekers prepare themselves mentally and emotionally, as most private sector employers are profit-driven and expect their employees to be very productive.

Meanwhile, Respondent B encountered several challenges as a visually impaired jobseeker. According to her:

> *Firstly, when I was applying for jobs manually by sending letter or forms along with my resumé, I often did not receive any response or feedback from the employers who interviewed me, even though I waited for quite some time. Secondly, when I was called for an interview, I often encountered negative perception from the interviewers. Thirdly, when it comes to deciding whether to hire VIPs, there was no answer given and, in the end, we are not hired.*

Respondent B also stresses that she would inform the employers about her needs and demonstrate her ability to do certain tasks with the help of screen reader software. To overcome those challenges, she suggests the following:

> *Firstly, we must be prepared physically and mentally. Most employers are not ready or confident to employ VIPs, due to lack of understanding or awareness. Secondly, as jobseekers or VIPs, we must think positively whenever we face pressure and challenges. Then, we must not be too choosy of jobs we want to take. Lastly, we must be able to convince the employers that we are as capable as the non-disabled ones.*

Respondent C, who works in a government agency, also encountered several challenges at the pre-employment stage. These challenges were related to mobility and accommodation, especially when the interviews were held in unfamiliar places.

> *I was also rejected during phone interviews as the organisation only employs certain category of disabled persons and not blind persons.*

Respondent C also laments that he was rejected despite explaining his ability to perform given tasks with assistive technology.

> *I was not given even an opportunity to demonstrate my capabilities in doing certain tasks, especially the tasks related to computer operations through the skills I learned.*

He says this situation is unfair to all jobseekers who face similar disability as his. According to him:

> *The employers should give me a chance to prove my capabilities, at least by offering a short period of trial.*

To overcome those challenges, Respondent C says that he limits his prospects to companies that are more accessible via public transport and closer to his place of residence. He added that he filtered openings and only applied for positions he thought may be suitable. Respondent C also attempts to explain his condition and prepare himself to answer doubts from the interviewer by focusing on how he could perform tasks. In dealing with obstacles and challenges pertaining to job searches, applications and job interviews, Respondent C says:

> *Firstly, we have to widen our job search through online and offline platforms. Some companies advertise on newspapers and accept applications manually. If possible, apply for positions that are suitable to one's qualification, or what one can do. It is fine to start with a job not requiring a degree qualification although you are a university graduate.*

Respondent D, who is employed as an administrative officer, encountered several challenges at the pre-employment stage. One was the negative perception of employers toward VIPs.

> *Some of the employers often doubt the capability of blind people like whether they are able contribute to the organisation.*

Respondent D considers that to be normal, adding that it is difficult to expect employers to think positively toward VIPs. He further added that as optimistic VIPs, they must prove to employers their ability to work like their non-disabled colleagues. Another large challenge encountered by Respondent D was infrastructural barriers, in terms of accessibility of the workplace. Nevertheless, despite such challenges, he believes that VIPs must remain positive and optimistic.

> *For me, I overcame it by having positive thinking, patience and develop my communication skills. Besides that, I also did personal grooming and polished my skills. Sometimes the obstacles can*

> *be our own negative thoughts. For instance, we often create the mindset that most employers have negative perception towards VIPs, but it may not be true.*

Several challenges were raised by the VIPs interviewed. The main challenges are access to information or infrastructure (Respondents A and D). The second challenge emerged is negative perception of employers (Respondents B and D). Other challenges raised include lack of awareness (Respondent A), non-response (Respondent B) and rejection, and mobility (Respondent C). Raising awareness seems crucial as employers need to be equipped with knowledge about disability and the needs of VIPs, so that in the future employers can better understand their conditions and challenges. Employers also look for jobseekers with communication skills (Monogaran & Subramaniam, 2023). As such, developing this skill is essential as pointed out by Respondent D.

4.1.2 Employment stage

VIPs also encountered challenges at the employment stage. Normally, at this stage, they have to go through the process of onboarding, or adjusting and adapting themselves to the working environment and job scope. In-depth personal interviews with Respondents A, B, C and D reveal that there are several challenges they encounter at the employment stage. According to Respondent A:

> *I sometimes face difficulties or challenges when travelling to and from home to the workplace. At the beginning, I had difficulty adapting with the outside environment while travelling to and from the workplace. Since I am a fully blind person, I have to mobilise myself with the help of a white cane, which is used to navigate the surrounding environment.*

To overcome the obstacles and challenges encountered by VIPs, Respondent A suggests the following:

> *Firstly, all the jobseekers or employees with disabilities, especially VIPs, must always prepare themselves physically and mentally, in*

> *case if they face challenges in their workplace and working life. They must be able to do any tasks given by their employer and should not give up easily.*

Respondent B was also met with some challenges at the employment stage. One of these is the lack of confidence amongst her superiors on her capabilities. She sometimes moved from one department to another, as her superiors thought that she was not capable of doing certain tasks. This discouraged her and made her want to resign from her job. In dealing with challenges faced by VIPs at the employment stage, Respondent B suggests the following:

> *Firstly, they must be strong mentally and emotionally. They must constantly cultivate noble qualities, such as, patience, perseverance, self-control and positive thinking. Without those qualities, one might fall into despair or perhaps in worst situation decide to quit their job.*

Besides that, Respondent B also advised VIPs who face challenges to not give up easily and always be keen to learn new things. If given the chance to enhance skills and abilities by attending courses, she suggested that VIPs should not hesitate. Finally, if VIPs are given any tasks, she advises them to perform it to the best of their ability and seek guidance from their superiors or colleagues when they are unsure.

Respondent C also encountered certain challenges at the employment stage. According to him:

> *As most of the public sector is still dealing with pen and paper, it is inconvenient having to deal with letters and written notes. Fortunately, some of my colleagues which I seek help from are quite understanding.*

To overcome this challenge, Respondent C offers several suggestions.

> *Firstly, it is advisable to ask for help whenever needed, for example, asking someone to snap a photo of a letter and email the soft copy so that it can be read with assistive devices. Secondly, it is good to*

> *let one's immediate superior know things you cannot do. However, just be reasonable and not to put it in such a way that we can do very little things that has no impact to the organisation, because it may give bad impression as the employer may think that the organisation can still function without hiring VIPs.*

Respondent D also faced various challenges in his job. Occasionally he had to go to certain places far away from his workplace. He was sometimes given the task to deal with other agencies or ministries or go to different states and countries like Japan for job purposes. Since he is a person with visual impairment under the B1 (totally blind) category, it was quite challenging for him to travel alone. He still must perform all tasks assigned and thankful that he has managed to do so successfully. In response to such challenges, he proffers a few recommendations to disabled jobseekers or VIPs.

> *Firstly, to overcome the challenge of going far for job purposes, they must be able to do so even though they have certain limitations like blindness. Secondly, they must act proactively. They should inform their bosses or colleagues if they need certain assistance or assistive tools in order to ease their job.*

In summary, some of the challenges raised during the employment stage include mobility problems (Respondents A and D), accessibility to information (Respondent C), difficulty to adapt (Respondent A) and lack of confidence (Respondent B).

4.2 Challenges encountered and solutions: Private sector

While public sector employment is preferred, some of the VIPs found opportunities in the private sector. There are many job application platforms such as Jobstreet, MyFutureJobs and Indeed offering permanent, part-time and freelance jobs accessible to VIPs. Employment opportunities provided by the private sector also enable them to enhance their economic status leading to better social status and self-esteem.

4.2.1 Pre-employment stage

VIPs employed in the private sector face challenges like their counterparts in public sector. Suitable job opportunities provided by private sector, unfortunately, are limited. This is mainly due to their sensory disability and lack of confidence and awareness about their capabilities in doing certain tasks without assistive technology. Two respondents employed in the private sector explained the challenges faced at pre-employment stage. According to Respondent E:

> *I had difficulty finding a suitable job. I noticed that suitable jobs for the blind are very limited. At that time, I often felt afraid that the jobs which I applied may not be suitable and I only looked for companies that had blind employees or employed blind people before.*

Respondent E added that even though he submitted many job applications, none of the employers gave a positive response. He also noted that he wanted to look for jobs that were not synonymous with VIPs, like working in customer service and call centres. In order to deal with these challenges, Respondent E advised the following:

> *Do not be too conservative and selective when comes to searching and applying for jobs. Besides that, do not be passive. Instead, be courageous and always be prepared to face obstacles or challenges related to employment.*

Respondent F also faced several challenges when she was at the job search and application stage. One of the challenges she faced was the inaccessibility of certain job websites, noting that some of the website interfaces are not accessible because they are not VIP-friendly. Due to that, she says she faced difficulty applying jobs by herself. In one interview session, she said she was not well prepared and not able to answer the questions asked by the interviewers. She was rejected and she felt she failed to convince her interviewers of her capabilities.

To overcome the challenges Respondent F faced, she suggests that during a job hunt, one must search and think carefully before applying. She

admits that searching and applying for jobs is not easy for VIPs, noting that they are "victims of misconception and discrimination." As for VIPs attending job interviews, she agrees that they have to be well-prepared and learn how to manage time well. She added that they must also prepare themselves by doing personal grooming, researching the organisation that has called them for an interview, and trying to figure out the potential questions the interviewers may ask. This is to ensure that they are able to convince the interviewers of their abilities.

During pre-employment, challenges encountered include limited jobs opportunities (Respondent E) and inaccessibility of certain websites (Respondent F). Visual impairment causes them not to be able to do many jobs done by non-disabled workers causing them to have limited job opportunities. However, technological advancement to a certain extent has minimised information inaccessibility.

4.2.2 Employment stage

VIPs in the private sector also encountered challenges at the employment stage. At the initial stage, most employees, including those with visual impairment, are in the learning phase and have to adapt themselves to new working environment and job scopes. They have to acquire new knowledge and skills from their superiors and along the way, they may face job-related obstacles and challenges.

According to Respondent E, he was sometimes unsure how to carry out certain assigned tasks. He adds that this is normal for most VIPs at the initial stage of employment. To deal with that kind of challenge, he suggests the following:

> *VIPs who are still at the initial stage of employment require the spirit of learning, patience and endurance, and continue to learn new things. They must always be humble and not hesitate to request for guidance from their superiors or seniors. By doing so, they will be able to improve themselves and be more useful and productive employees.*

Respondent F said that she had difficulty adapting to a new job scope as a telemarketer at the initial employment stage. She had to get used to the work

which required her to make several phone calls and managing the database with the assistance of screen reader software installed in her computer. She added that she also received rude clients when making phone calls. Initially, she found it quite challenging which caused her to feel frustrated and want to quit. As a category B1 person, it was challenging for her to move around and get use to the workplace. As she says:

> *I received help from sighted person to assist me to move around the office and other essential places like washroom and cafeteria.*

To overcome those challenges, Respondent F says:

> *One must always be strong and courageous and do not easily give into negative thoughts which emerges from challenging circumstances.*

Instead, she contends that one must remain calm and try to deal with all those obstacles or challenges with patience and endurance.

Some of the challenges that emerged include being unsure how tasks are done (Respondent E) and adaptation to the new job scope (Respondent F). Different job scopes can be challenging to VIPs, but assistance can be obtained from people in their surroundings. Usage of assistive technology enables them to perform their tasks efficiently compared to when they are dependent on braille machines.

4.3 Challenges encountered by unemployed VIPs

VIPs remain as the most marginalised group among PWDs. In-depth personal interviews with two currently unemployed VIPs reveal that there are several challenges they face during job search and application. According to Respondent I:

> *One of the main challenges is not knowing how to find or search for jobs. However, to search for jobs, as a VIP nowadays, most of us are already IT literate. We can search and apply for jobs but the challenge is that how sure that we can get the job. Another challenge we face is how to remain in an organisation.*

Respondent I further added that:

> *Employers in the private sector especially have no confidence in VIPs due to their lack of awareness of our capabilities even with the assistance of technology.*

He further contended that lack of skills especially in IT amongst VIPs can be a hindrance. He agrees that although quite a few VIPs are equipped with such knowledge and skills, there are some who are not quite talented or interested in acquiring such skills, especially those who are in the category of adult blind, or those who become blind in adulthood.

According to Respondent J:

> *One of the major challenges I encountered when it comes to job search and application is not having the skill set required by employers.*

As a 30-year-old graduate, he says he no longer qualifies for graduate associate programmes, which is limited to people aged 28 and below. He further added that he prefers to widen his job experience and is planning to apply for internships.

Two main challenges encountered include how to search for jobs (Respondent I) and not having the required skills (Respondent J). Like non-disabled people, those who are visually impaired do face limitations such as age limit (Respondent J) to enter certain fields of employment. There is also a lack of awareness among employers (Respondent I) on the capabilities of VIPs.

5. Discussion

VIPs must not expect the non-disabled, including employers, to understand them and their needs, as some are unfamiliar with VIPs. Instead, they must inform the potential employers about their needs and challenges. This enables employers to be equipped with such knowledge. Raising the awareness of the employers is essential (Kaye et al., 2011; Narayanan, 2018) in the public as well as private sectors.

The challenges faced by VIPs at the employment stage in public sector include mobility (Respondents A and D), lack of confidence (Respondent B) and accessibility of materials (Respondent C) and location. The solutions suggested include physical and mental preparation (Respondents A and B), inculcating positive life qualities (Respondents B and D) and lastly seeking help when needed (Respondent C). The problem of accessibility in terms of information (Moore & Wolffe, 1997) and mobility limited by physical barriers (Narayanan, 2018; Crudden et al., 1998; Moore & Wolffe, 1997) remain as one of the main challenges faced by VIPs. As such they require assistance from public while travelling (Salminen & Karhula, 2014) or colleagues while at workplace.

The challenges faced by VIPs at the employment stage in the private sector are like those in the public sector. These challenges are mainly related to mobility and accessibility. The solutions suggested include seeking guidance from superiors and asking for assistance from sighted colleagues. In addition, VIPs also need to build their confidence and endurance to weather the challenges at their workplaces. The role of technology through assistive tools remains significant (Nierling et al., 2018; Narayanan, 2018).

Unemployed VIPs also highlighted that awareness regarding their ability is relatively low among employers. Many employers also seem to be unaware of the role of assistive technologies, which can enhance the performance of VIPs at the workplace (see Nierling et al., 2018; Nasir et al., 2019). As such, creating and raising awareness among stakeholders is very important to ensure that visually impaired jobseekers can be easily integrated into the labour market.

The accessibility (information and location) limitations and lack of awareness highlighted in this study are in line with social model of disability, which asserts that disabled people experience social disadvantage due to failure of physical, institutional and attitudinal environment to meet their needs. As such, raising awareness of the potential employers in public and private sectors on the capabilities of PWDs, especially VIPs, will enable the realisation the targeted 1% employment of PWDs in Malaysia. The expectation is that if there any visually impaired job applicants in the future, employers are better able to understand and interact with their conditions and challenges.

6. Conclusion

This study has uncovered various challenges VIPs face in their employment journey. The main findings from this study can be summarised as follows. Firstly, at the pre-employment stage in public sector, the main challenges faced are access to information or infrastructure and negative perception of employers. Others include lack of awareness, non-response, rejection and mobility. Secondly, at the employment stage in the public sector, challenges raised include mobility issues, accessibility to information, difficulty adapting and a lack of confidence. Thirdly, at the pre-employment stage in the private sector, the challenges encountered include inaccessibility of certain websites and limited jobs opportunities. Fourthly, at the employment stage in the private sector, some of the challenges that emerged include being unsure how tasks are done and adaptation to new job scopes. Finally, three main challenges encountered by unemployed VIPs include how to search for jobs without ICT knowledge, not having the required skills, and lack of awareness among employers on the capabilities of VIPs.

For VIPs who are employed and unemployed, the main challenges are access to information and infrastructure. The former can be overcome using assistive technology, which enables VIPs to perform tasks efficiently compared to when they are dependent on braille machines. Access to infrastructure can be improved when more disabled-friendly facilities are provided. While employers may be reluctant to hire VIPs considering the costs that may emerge in form of facility provision and lost productivity, employers should value the strengths VIPs possess. More importantly, this requires raising awareness among employers about the needs of VIPs and their potential value to the organisations. The mindset of able-bodied people towards VIPs need to change. Policy implications proposed include adopting inclusive recruitment and hiring practices, raising awareness and educating employers on the importance of inclusivity in the organisation, as well as implementing accessibility standards.

Ethics Approval

This study obtained ethics approval from the Universiti Malaya Research Ethics Committee (UMREC) with the following reference number: UM.TNC2/UMREC_1060

References

Ang, M. C. H., Ramayah, T., & Teong, K. V. (2013). Hiring disabled people in Malaysia: An application of the theory of planned behaviour. *Journal of International Social Research*, *6*(27), 50–64.

Ang, M. C. H. (2017). The challenges and benefits of employing persons with disabilities: The Japanese multinational corporations' perspective. *International Journal of Innovation, Management and Technology*, *8*(5), 359–366. https://doi.org/10.18178/ijimt.2017.8.5.754

Aichner, T. (2021). The economic argument for hiring people with disabilities. *Humanities and Social Sciences Communications*, *8*, 22. https://doi.org/10.1057/s41599-021-00707-y

Amin, A. S., Sarnon, N., Akhir, N. M., Zakaria, S. M., & Badri, R. N. F. R. Z. (2021). Main challenges of students with visual impairment at higher education institutions. *International Journal of Academic Research in Business and Social Sciences*, *10*(1), 734–747. http://doi.org/10.6007/IJARPED/v10-i1/9682

Boman, T., Kjellberg, A., Danermark, B., & Boman, E. (2015). Employment opportunities for persons with different types of disability. *Alter*, *9*(2), 116–129. https://doi.org/10.1016/j.alter.2014.11.003.

Bonaccio, S., Connelly, C. E., Gellatly, I. R. Jetha, A., & Martin Ginis, K. A. (2020). The participation of people with disabilities in the workplace across the employment cycle: Employer concerns and research evidence. *Journal of Business and Psychology*, *35*, 135–158. https://doi.org/10.1007/s10869-018-9602-5

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*, 77–101. https://doi.org/10.1191/1478088706qp063oa

Crudden, A., McBroom, L. W., Skinner, A. L., & Moore, J. E. (1998). *Comprehensive examination of barriers to employment among persons who are blind and visually impaired*. Mississippi State University Rehabilitation Research and Training Center on Blindness and Low Vision. https://www.blind.msstate.edu/sites/www.blind.msstate.edu/files/2020-04/Comprehensive_Examination_of_Barriers.pdf

Crudden, A., Sansing, W., & Butler, S. (2005). Overcoming barriers to employment: Strategies of rehabilitation providers. *Journal*

of Visual Impairment and Blindness, *99*(6), 325–335. https://doi.org/10.1177/0145482X0509900602

Department of Statistics Malaysia (DOSM) (2023). *Social statistics bulletin Malaysia*. DOSM.

Dammeyer, J., & Chapman, M. A. (2018). National survey on violence and discrimination among people with disabilities. *BMC Public Health*, *18*, 355. https://doi.org/10.1186/s12889-018-5277-0

Disability:IN (2023). Malaysia. https://disabilityin.org/country/malaysia/

Donaldson, N. (2017). *Visually impaired individuals' perspectives on obtaining and maintaining employment* [Doctoral dissertation]. Walden University, Minnesota.

Gasper, J., Muz, B., & Palan, M. (2020). *Employer practices and attitudes toward the employment of people with disabilities*. US Department of Labor. https://www.dol.gov/sites/dolgov/files/OASP/evaluation/pdf/58803_DOL_PolicyBrief_%233.pdf

Hennigusnia, H. (2017). Persepsi pengusaha atau pemberi kerja terhadap pekerja disabilitas. *Jurnal Ketenagakerjaan*, *12*(2), 126–138. https://journals.kemnaker.go.id/index.php/naker/article/view/15

Hosking, D. L. (2008, September 2–4). *Critical disability theory* [Conference presentation]. 4th Biennial Disability Studies Conference, Lancashire, United Kingdom. https://www.lancaster.ac.uk/fass/events/disabilityconference_archive/2008/papers/hosking2008.pdf

Hwang, J. (2022). A factor analysis for identifying people with disabilities' mobility issues in built environments. *Transportation Research Part F: Traffic Psychology and Behaviour*, *88*, 122-131. https://doi.org/10.1016/j.trf.2022.05.016

International Labour Organization (ILO) (2012). *Disabilities and decent work in the Pacific: The case of disability inclusive employment*. https://www.ilo.org/publications/disabilities-and-decent-work-pacific-case-disability-inclusive-employment

International Labor Organization (ILO) (2016). *The competitive advantage of hiring persons with disabilities: An employer's guide to disability inclusion at the workplace*. https://www.ilo.org/publications/competitive-advantage-hiring-persons-disabilities

Islam, R. (2015). Rights of person with disabilities (PWDs) in relation to social inclusion. *International Journal of Social Science and Humanity*, *5*(3), 299–305. https://www.ijssh.org/papers/470-H10019.pdf

Jones, J., Ouellette-Kuntz, H., Vilela, T., & Brown, H. (2008). Attitudes of community developmental services agency staff to-ward issues of inclusion for individuals with intellectual disabilities. *Journal of Policy and Practice in Intelletcual Disabilities*, *5*, 219–226. https://doi.org/10.1111/j.1741-1130.2008.00183.x

Kaye, H. S., Jans, L. H., & Jones, E. C. (2011). Why don't employers hire and retain workers with disabilities? *Journal of Occupational Rehabilitation*, *21*(4), 526–536. https://doi.org/10.1007/s10926-011-9302-8

King, N. (2004). Using templates in the thematic analysis of text. In C. Cassell & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 257–270). Sage. https://doi.org/10.4135/9781446280119

La Grow, S.J., & Daye, P. (2005). Barriers to employment identified by blind and vision-impaired persons in New Zealand. *Social Policy Journal of New Zealand*, *26*, 173–185. https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/journals-and-magazines/social-policy-journal/spj26/26-pages173-185.pdf

Lamichhane, K. (2013). Disability and barriers to education: Evidence from Nepal. *Scandinavian Journal of Disability Research*, *15*(4), 311324. http://doi.org/10.1080/15017419.2012.703969

Lee, M. N., Abdullah, Y., & See, C. M. (2011). Employment of people with disabilities in Malaysia: Drivers and inhibitors. *International Journal of Special Education*, *26*(1), 112–124. https://eric.ed.gov/?id=EJ921195

Lengnick-Hall, M. L., Gaunt, P.M., & Brooks, A. A. R. (2007). *Why employers don't hire people with disabilities: A survey of the literature*. Cerebral Palsy Research Foundation (CPRF). https://www.cprf.org/studies/why-employers-dont-hire-people-with-disabilities-a-survey-of-the-literature/

Manaf, A. R. A., Othman, S. Z., Isa, M. F. M., Noor, W. S. M. M., & Azizan, N. (2019). Employment challenges among persons with disabilities in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, *9*(10), 139–148. http://doi.org/10.6007/IJARBSS/v9-i10/6469

Monogaran, M., & Subramaniam, T. (2023). Skills acquisition and employability among arts and social sciences interns in a Malaysian public university. *Institutions and Economies*, *15*(2), 59–86. https://doi.org/10.22452/IJIE.vol15no2.3

Moore J. E., & Wolffe, K. E. (1997). Employment considerations for adults with low vision. In A. Corn & A. Koenig (Eds.), *Foundations of low vision: Clinical and functional perspectives* (pp. 340–362). American Foundation for the Blind.

Morwane, R.E., Dada, S., & Bornman, J. (2021). Barriers to and facilitators of employment of persons with disabilities in low- and middle-income countries: A scoping review. *African Journal of Disability*, *22*(10), 833. https://doi.org/10.4102/ajod.v10i0.833

Narayanan, S. (2018). A study on challenges faced by disabled people at workplace in Malaysia. Proceeding - 5th Putrajaya International Conference on Children, Women, Elderly and People with Disabilities. Retrieved from: https://www.ijcwed.com/wp-content/uploads/2018/07/IJCWED5_39.pdf

Nasir, M.N.A., Wong, Y.L., Chin, Y.C., Wong, H.S., & Choo, S.C. (2019). The inclusion of persons with visual impairment in private sector: Are we destined to remain in this mess? *International Journal of Business, Economics and Law*,*18*(5), 320–329.

Nagtegaal, R., de Boer, N., van Berkel, R. Derks, B., & Tummers, L. (2023). Why do employers (fail to) hire people with disabilities? A systematic review of capabilities, opportunities and motivations. *Journal of Occupational Rehabilitation*, *33*, 329–340. https://doi.org/10.1007/s10926-022-10076-1

Nierling, L., Maia, M. J., Čas, J., Capari, L., Krieger-Lamina, J., Wolbring, G., Bratan, T., Fischer, P., Hennen, L., & Mordini, E. (2018). *Assistive technologies for people with disabilities: Perspectives on assistive technologies*. https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/603218/EPRS_IDA(2018)603218(ANN3)_EN.pdf

Olsen, J. (2022). Employers: Influencing disabled people's employment through responses to reasonable adjustments. *Disability and Society*, *39*(3), 791–810. https://doi.org/10.1080/09687599.2022.2099251

Pulrang, A. (2019, November 4). How to make workplaces more welcoming for employees with disabilities. *Forbes*. https://www.forbes.com/sites/andrewpulrang/2019/11/04/how-to-make-workplaces-more-welcoming-for-employees-with-disabilities/?sh=4c0534cb53d8

Qiu, N., Jiang, Y., Sun, Z., & Du, M. (2023). The impact of disability-related deprivation on employment opportunity at the neighborhood level: Does

family socioeconomic status matter? *Frontiers in Public Health*, *11*, 1232829. https://doi.org/10.3389/fpubh.2023.1232829

Raja, D.S. (2016). *Bridging the disability divide through digital technologies*. World Bank. https://thedocs.worldbank.org/en/doc/123481461249337484-0050022016/original/WDR16BPBridgingtheDisabilityDividethroughDigitalTechnologyRAJA.pdf

Rice, P., & Ezzy, D. (1999). *Qualitative research methods: A health focus*. Oxford University Press.

Salminen, A. L., & Karhula, M. E. (2014). Young persons with visual impairment: Challenges of participation. *Scandinavian Journal of Occupational Therapy*, *21*(4), 267–276. https://doi.org/10.3109/11038128.2014.899622

Santilli, S., Ginevra, M.C., & Nota, L. (2023). Colleagues' work attitudes towards employees with disability. *European Journal of Investigation in Health, Psychology and Education*, *13*(1), 130–140. https://doi.org/10.3390/ejihpe13010009

Tiun, L. T., Lee, L. W., & Khoo, S. L. (2011). Employment of people with disabilities in the northern states of Peninsular Malaysia: Employers' perspective. *Disability, CBR and Inclusive Development Journal*, *22*, 79–94. http://doi.org/10.5463/dcid.v22i2.28

United States Bureau of Labour Statistics (BLS) (2020, July 29). Barriers to employment for people with a disability. BLS. https://www.bls.gov/opub/ted/2020/barriers-to-employment-for-people-with-a-disability.htm

Vedeler, J.S. (2023). How is disability addressed in a job interview? *Disability & Society*. http://doi.org/10.1080/09687599.2022.216286

World Health Organization (WHO) & World Bank (2011). *World report on disability*. http://www.who.int/disabilities/world_report/2011/report.pdf

Wolffe, K., & Candela, A. (2002). A qualitative analysis of employers' experiences with visually impaired workers. *Journal of Visual Impairment & Blindness*, *96*, 622–635. http://doi.org/10.1177/0145482X0209600903

Yusof, A. M., Ali, M. M., & Salleh, A. M. (2015). Youth workers with disabilities: The views of employers in Malaysia. *Procedia: Social and Behavioral Sciences*, *204*, 105–113. http://doi.org/10.1016/j.sbspro.2015.08.122

Zamalia, M., & Rosli A.R. (2009). Employers' perceived attitude towards hiring disabled persons and an investigation into the barrier-free

environment at workplace in Selangor and Federal Territory. *Journal of Administrative Science*, *6*(1), 51–72. https://jas.uitm.edu.my/images/2009_JUNE/3.pdf

Institutions and Economies
Vol. 17, No. 4, October 2025, pp. 27-54 https://doi.org/10.22452/IJIE.vol17no4.2

Determinants of Environmental Degradation in Bangladesh: A Dynamic ARDL Framework

Tamanna Siddiqua Ratna,[a] Tanzin Akhter,[b] Adnan Chowdhury,[c] and Ferdous Ahmed[d]

Abstract: *Bangladesh, as an emerging developing country, has been using energy intensively in various industrial and socioeconomic sectors without much consideration of environmental sustainability. Therefore, this research aims to explain the impact of tourism, urbanisation, and energy consumption on carbon dioxide emissions, used here as an indicator variable of environmental degradation. A dynamic time series analysis is applied in this study by considering yearly data from Bangladesh over the period of 1995 to 2019. After confirming the stationary status of the study variables, an autoregressive distributed lag (ADRL) bounds test is applied, which reveals the long-run association among the variables. Then, following the dynamic ARDL framework, the effects of targeted variables were fixed in short and long-run periods. The findings reveal that all variables are significant positive drivers of environmental pollution over the long run, save for energy consumption. Moreover, the short-run results indicate that tourism and energy consumption are both active contributors to pollution. The empirical findings of this study will help policymakers to develop a sustainable urbanisation and tourism expansion policy to minimise pollution levels. Finally, this study also supports reducing carbon dioxide (CO_2) emissions from the sectors targeting SDG 13, Climate Action by 2030.*

Keywords: CO_2 emission, Tourism, Energy consumption, Urbanisation, ARDL bounds test
JEL Classification: JQ2, JQ3, JQ4, JQ5

[a] Department of Quantitative Sciences, International University of Business Agriculture and Technology (IUBAT), Dhaka, Bangladesh. *Email: tamanna.siddiqua@iubat.edu* ORCID ID: 0000-0001-9867-4713

[b] Department of Quantitative Sciences, International University of Business Agriculture and Technology (IUBAT), Dhaka, Bangladesh. *Email: tanzin.akhter@iubat.edu* ORCID ID: 0000-0001-7371-4651

[c] Bangladesh Bank Head Office, Dhaka, Bangladesh. *Email: adnan.chowdhury@bb.org.bd.* ORCID ID: 0000-0002-5617-2675

[d] Corresponding author. Department of Environmental Science, International University of Business Agriculture and Technology (IUBAT), Dhaka, Bangladesh. *Email: ferdous.ahmed@iubat.edu*. ORCID ID: 0000-0001-8737-8142

1. Introduction

As a delta nation, Bangladesh has always been vulnerable to the effects of global warming. Greenhouse gas (GHG) emissions are a major contributor to both global warming and environmental deterioration, with carbon dioxide having the greatest environmental impact. Due to globalisation, both wealthy and developing nations now contribute to GHG emissions. The International Energy Agency (IEA) (2021) claims that carbon dioxide (CO_2) emissions increased by 6% worldwide in 2021 because of the global economic recovery following the Covid-19 pandemic. Numerous social and economic causes, including the speed of industrialisation, ease of travel, urban development, loss of forests, etc., can explain the large change in carbon emissions (Mitić et al., 2023; Nielsen et al., 2021)

Bangladesh, as a rising developing country, faces accountability for carbon emissions despite historically lower contributions compared to developed nations. Investigating current and future emissions is crucial for several reasons. Rapid economic growth, with its heavy reliance on fossil fuels for power generation, is a key driver of rising emissions (World Bank, 2024). Industries like steel and textiles contribute significantly to national emissions (CPD, 2024). Urbanisation further escalates energy demand for buildings and transportation, necessitating sustainable urban planning strategies, as emphasised by the United Nations Department of Economic and Social Affairs (UNDESA) (UN, 2012). Moreover, Bangladesh's vulnerability to climate change underscores the importance of understanding emission sources to develop targeted reduction strategies outlined in the country's Climate Change Strategy and Action Plan (Ministry of Finance Bangladesh, 2023). Investigating accountability strengthens Bangladesh's position in international climate negotiations, facilitating resource acquisition from developed nations to address climate change impacts (UNFCC, n.d.). Therefore, investigating the accountability of Bangladesh' CO_2 emissions is crucial for environmental sustainability.

The promising economic growth of Bangladesh during the past decade is indicative of expanding industries in several areas, urbanisation, and an overall rise in living conditions, all of which may affect carbon emissions either indirectly or directly. Notably, the country produces 0.21% of the world's CO_2 emissions, although the situation has been worsening quickly. According to historical data, Bangladesh's CO_2 emissions rose 7.52%

per year from 3.3 million metric tons in 1971 to 108.5 million in 2020. According to the country's amended Nationally Determined Contributions (NDCs), its GHG emissions will increase from 169.06 million metric tonnes in 2021 to 409.41 million metric tons in 2030. In addition, per capita emissions were 0.05 tonnes in 1971, 0.34 tonnes in 2010, 0.51 tonnes in 2018, and 0.64 tonnes in 2020. Bangladesh's energy consumption is increasing rapidly, and as a result, CO_2 emissions per capita are increasing at an average yearly rate of 5.48 %. The energy industry is the largest source of CO_2 emissions, with 93.09 metric tonnes, representing 55.07 % of total emissions (Haque, 2022).

Urbanisation is a prominent environmental concern in Bangladesh. Since 1970, the country's urban population has increased rapidly. A constantly rising native urban population, territorial extension of existing urban areas by converting rural areas to urban, redefinition of urban regions, and rural to urban migration cause rapid urban growth. Undoubtedly, migration has played a significant role in the growth of metropolitan areas. Implementing the United Nations (UN) Sustainable Development Goals (SDGs) is challenging due to the environmental issues caused by urbanisation. Rapid urbanisation encroaches on waterways, woods, and hills due to population growth and area expansion, directly affecting the environment. Even though such acts are illegal, the pressure is uncontrollable. Due to urbanisation and economic growth, structure demand rises (higher household income) which may also lead to pollution. In turn, this boosts the need for bricks. With current technology, the production of bricks has two disadvantages: first, it depletes topsoil from agricultural land, and second, it causes air pollution in metropolitan areas because brick kilns are located nearby. Studies have indicated that CO_2-emitting brick kilns are the primary cause of Dhaka's air pollution. Population growth and economic development both increase the demand for and supply of automobiles, which exacerbates traffic congestion and air pollution in cities. Lifestyle changes like reckless air conditioning effect city microclimates and elevate temperatures. Metropolitan regions are more likely to experience natural disasters due to climate change. In short, climate change is a huge challenge.

Bangladesh has abundant resources. The world's longest natural sea beach lies in southern Bangladesh, a tourist destination. Tea gardens, marshy forests, waterfalls, and more abound in the northeast. Low travel costs and natural resources make the country a great travel destination. Between

2018 and 2019, approximately 16.4 million visitors visited Bangladesh, 80.28% of whom were non-resident Bangladeshis and the rest foreigners. In 2019, according to the Bangladesh Bureau of Statistics (BBS), the contribution of travel and tourism was 3.02% of the GDP, with 8.07% of overall employment associated to tourism (Byron & Hasan, 2021). Though Bangladesh's travel and tourism contribution to the GDP has fluctuated significantly in recent years, it has tended to climb from 2000 to 2019. Compared to 2019, Bangladesh's tourism earnings decreased by 44.3% in December 2020, although it increased by 9.5% in 2019 (CEIC Data, 2020). Although there are several examples of the positive effects of tourism on the economy, this industry also responsible for environmental pollution—from airplane flights and boat journeys to souvenirs and hotels, several activities add to the carbon footprint of tourism.

The tourism industry, despite its economic benefits, is a notable contributor to GHG emissions, primarily through various operational aspects. In terms of transportation, commercial air travel and cruise ships heavily reliant on fossil fuels significantly contribute to emissions. Ground transportation within destinations also adds to emissions, especially in regions heavily dependent on fossil fuels (EPA, 2024; Jaz et al., 2023). Accommodation establishments such as hotels and resorts consume substantial energy, with research highlighting a correlation between hotel size and energy consumption. Additionally, adventure tourism activities and increased waste generation by tourists further exacerbate GHG emissions, directly releasing pollutants and straining waste management systems (Borowski et al., 2022). Tourism frequently exerts strain on natural resources through overconsumption, frequently in areas where resources are scarce. Tourism places a significant strain on local land use, which can result in soil erosion, increased pollution, the destruction of natural habitats, and greater pressure on endangered species (Gupta & Dutta, 2018).

Energy is the fundamental driving force behind the new contemporary way of living. Energy use also explicitly linked to environmental catastrophe (Chen et al., 2016; Yılmaz, 2023; Bildirici & Çoban, 2023). Bangladesh, being an emerging developing nation, relies heavily on energy as a fundamental resource for promoting trade and industrial development. Industrialisation has led to more pollution in developing countries because green policies were not yet adopted. Energy, of course, is essential for every nation's economy, and the industry contributes to pollution in emerging

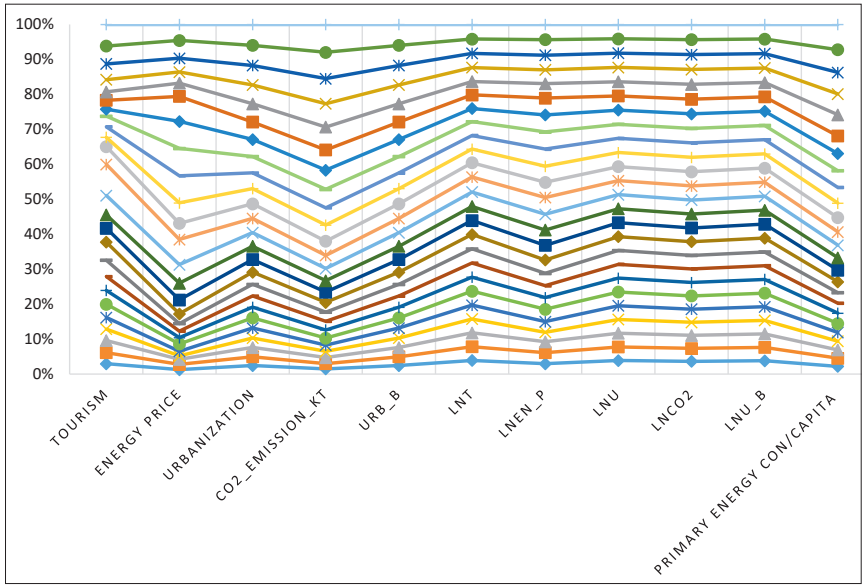
nations (Apergis & Gangopadhyay, 2020; Sreenu, 2022). Therefore, the prices of energy may also play a significant role in overall energy use and the level of pollution in Bangladesh, which inspired this study to examine the impact of energy use on pollution.

Several studies have already been conducted to assess the impact of energy use on environmental pollution in Bangladesh, but most use electricity consumption as a proxy for energy use. Rahaman et al. (2022) finds a positive impact of electricity use on environmental pollution in Bangladesh. Recent studies have examined the impact of energy use on pollution in Bangladesh and note a significant association between energy use and pollution in long- and short-run dynamics (Raihan et al., 2022d; Islam et al., 2021). The onset of urbanisation has occurred concurrently with the acceleration of industrialisation. Over the past five decades, Bangladesh has undergone an important phase of urbanisation. The urban population of Bangladesh increased from 8.6% in 1972 to 39.7% in 2022 (Kneoma, 2022). Pollution is more significantly impacted by the substantial improvement in urbanisation (Raza et al., 2023; Kahouli et al., 2022). Energy use and urbanisation both contribute significantly to the pollution of any developing country since these are unavoidable byproducts of economic development (Kirikkaleli & Kalmaz, 2020). Rising energy demand due to urbanisation also results in pollution (Raihan et al., 2022c). Kirikkaleli and Kalmaz (2020) use fully modified ordinary least squares (FMOLS) and dynamic OLS (DOLS) to identify the effect of energy use and urbanisation on environmental pollution, which exhibit a significant positive effect of both variables on pollution. By investing in clean energy technologies and policies that promote energy efficiency, we can break this cycle and reduce our reliance on oil, leading to a healthier planet and potentially even more stable oil prices (Alam, 2023). This paper addresses these macroeconomic issues and tries to bridge the literature gap of previous studies by considering a new set of economic variables that impede sustainability in developing nations like Bangladesh.

This analysis regresses urbanisation, energy consumption and tourism to explain environmental degradation. In addition, the % age-based yearly growth of the study variables is displayed in Figure 1, which illustrates the simultaneous growth of urbanisation, energy consumption and tourism activities along with CO_2 emission. In this study, CO_2 emission is used as an indicator variable to represent environmental pollution. CO_2 is commonly

acknowledged as the most prominent GHG resulting from human activities (EPA, 2023). Hence, the primary aims of this research are to substantiate the accountability of the rapid urbanisation, energy consumption, and the tourism industry in Bangladesh for environmental degradation by examining of both long- and short-run associations.

Figure 1: Growth of Variables, 1995-2019 (%)



2. Literature Review

In 1950, focus on environmental pollution started with the establishment of the environment Kuznets curve (EKC) hypothesis by Simon Kuznets. This EKC hypothesis holds an inverted-U relationship between environmental pollution and income. Later, empirical investigation into the association between economic development and energy consumption began in the late 1980s, led by Kraft and Kraft (1978). They investigated the causal association between GNP and gross energy use and found a unidirectional causality from economic growth to energy use. Moreover, Shafik and Bandyopadhyay (1992) also examine environmental quality and economic growth. With the 1997 Kyoto Protocol, the world focused on mitigating

environmental pollution and was concerned about the effect of GHGs. As a result, in the last two decades, the world has been intensely concerned about environmental pollution. Researchers also significantly contributed to pollution-based research works where they had considered other macroeconomic variables. Zou (2018) examines the impact of energy prices on environmental pollution using data on crude oil prices, CO_2 emissions, and GDP in the United States from 1983 to 2013 and discovers that oil price fluctuations have a significant impact on CO_2 emissions both in the long and short run. Amin and Atique (2021) conducted a panel study across South Asia regarding the impact of urbanisation and tourism together on environmental degradation and assert that urbanisation and tourism both have a positive influence on carbon emissions in the long run. According to Abbasi et al. (2021), energy prices are a significant factor in increasing environmental pollution. They conducted a panel dynamic analysis of 18 top complexity indexed countries, taking into account the effects of tourism, economic complexity, and energy prices on pollution. By using the autoregressive distributed lag (ARDL) method, they confirm that the price of energy has a positive effect on pollution.

Kahouli and Chaaben (2022) investigate the link among energy consumption, environmental degradation, trade, FDI, and economic growth of GCC countries by adopting the ARDL framework, and their findings support the significant effect of all study variables towards environmental degradation. Uzair Ali et al. (2022) conducted a panel ARDL analysis considering CO_2 emissions, fossil fuel consumption, economic growth, and population density in Bangladesh, Pakistan, and India. Their findings suggest that population density, and fossil fuel consumption accelerated CO_2 emissions in the long run. Usman et al. (2022) investigated the effect of urbanisation and energy consumption on environmental pollution, considering some other macroeconomic variables such as trade and economic growth in G7 countries. Using an ARDL model, they reveal that trade and urbanisation have a positive impact on pollution in the long run. Martial et al. (2023) investigate the impact of tourism, GDP, renewable energy, and electricity consumption on environmental pollution in 26 low-income countries, including Bangladesh, by adopting the generalized method of moments (GMM). They show that due to increasing economic growth, tourism is not harmful to the environment. Voumik et al. (2024) investigate the impact of tourism on environmental pollution along with

other macro-economic variables (GDP, renewable energy, energy intensity, and urbanisation) in 40 Asian countries using cross-sectional ARDL (CS-ARDL) method, which reveals that tourism can help mitigate CO_2 emissions, unlike urbanisation. Akther et al. (2024) examine the role of agriculture production, fertiliser use, tourism, and renewable energy on CO_2 emissions in South Asia using GMM, over the time span of 1991 to 2019. They find that all variables are responsible for increasing CO_2 emissions, except for the use of renewable energy.

Substantial research has been conducted on Bangladesh's environmental pollution, with several macroeconomic variables used to explain the pollution in early 1990s. Initially, Khan and Qayyum (2007) examined time series data for South Asia from 1972 to 2004 using ARDL to find a causal relationship between energy consumption and GDP in all economies. Later, Ahamad and Islam (2011) studied the energy consumption-growth nexus of Bangladesh using the vector error correction model (VECM) and discover a bidirectional relationship flowing from electricity consumption to economic growth in the long-run. Many studies have since been conducted on the environmental crisis. If we look back to the most recent studies on Bangladesh, researchers have concentrated their attention on explaining this environmental crisis by more associated macro-economic variables. Kashem and Rahman (2019) examine data from 1975 to 2015 in Bangladesh investigate the impact of urbanisation, GDP, and population density on CO_2 emissions. They discover a long-term equilibrium relationship and a bidirectional causal link between urbanisation and CO_2 emissions. Murshed et al. (2021) investigate the impact of renewable energy, energy use, and economic growth on the environmental pollution of Bangladesh between 1972 and 2015 and find a significant long-term association. Islam et al. (2021) examine the impact of globalisation, FDI and energy consumption on carbon emissions, while also taking into account other macroeconomic variables such as trade, innovation, etc. Rahman and Alam (2021) include urbanisation in their dynamic econometric model to assess its effect on environmental pollution in Bangladesh along with some other macroeconomic variables. Adopting an ARDL framework, they reveal that urbanisation has a detrimental effect on pollution. Using ADRL bounds testing and DOLS, Raihan et al. (2022a) investigate the nexus between some macroeconomic variables, including urbanisation and economic growth, and environmental pollution in Bangladesh. Taking the time series data from

1992 to 2019, they find that urbanisation and economic growth are both responsible for increasing CO_2 emissions. Rahaman et al. (2022b) also study the effects of FDI, tourism, electricity consumption, and economic growth on CO_2 emissions in Bangladesh, and reveal that except for tourism, other study variables have a positive effect on CO_2 emissions in the long run.

Due to different time limits and different macroeconomic variables set for separate mathematical methods, the output of studies varies. Islam et al. (2023) reinvestigate the EKC hypothesis for Bangladesh, considering economic growth and pollution along with other macroeconomic variables, but find no evidence of an EKC, and that urbanisation does not mitigate pollution. Raza et al. (2023) examine the contribution of economic growth, urbanisation and energy consumption on environmental pollution between 1980 and 2020, and find that all variables contribute to pollution.

Though different researchers have considered different sets of macro-economic variables in investigating environmental pollution in Bangladesh, the proposing variable set was not considered together. As rapid urbanisation requires intense energy use, and since the promising tourism sector may contribute towards environmental pollution, the present study tries to minimise the gap and explores the nexus among the variables using econometric analysis. In particular, this research considers the change in environmental degradation due to the variation of the selected set of independent variables: energy consumption, urbanisation, and tourism.

3. Data Description, Model Specification and Methodology

3.1 Data description

This study uses yearly time series data on energy consumption, tourism, urbanisation, and CO_2 emissions, covering the period between 1995 to 2019. Here, the number of international tourist arrivals is applied as a proxy variable for tourism (Amin et al., 2020); urban population is an indicator variable for urbanisation (Al-Mulali, 2015); primary energy consumption per capita is a reference variable for energy consumption; and CO_2 emissions is used as a proxy variable for environmental pollution (Raza et al., 2023; Islam et al., 2023; Rahman and Alam, 2021). More specifications of our selected variables are given in the following table:

Table 1: Descriptions of Variables

Variables	Description	Indicator	Source
CO_2 emission	Carbon dioxide emissions (Kt)	$lnCO_2$	WDI, World Bank
International tourism, number of arrivals	International inbound tourists (overnight visitors, thousands of individuals)	*lnTO*	WDI, World Bank
Urban population	Urban population (thousands of individuals)	*lnUR*	WDI, World Bank
Energy consumption	Primary energy consumption per capita (kWh/person)	*lnEC*	US Energy Information Administration

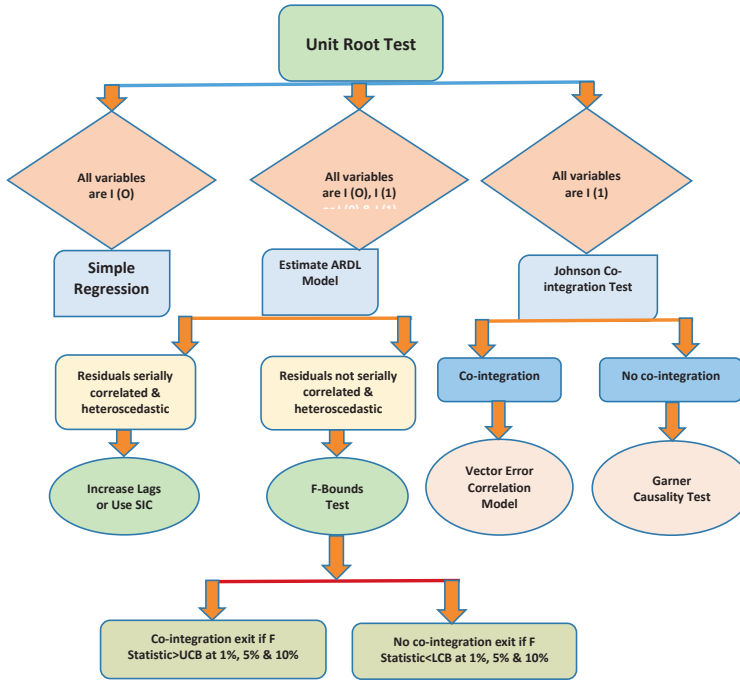
Note: ln refers the natural logarithm of study variables.

The analysis uses the following ordinary experimental model:

$$lnCO2 = f(lnT, lnU, lnEC) \quad (1)$$

Where $lnCO2$ refers to the logarithm of CO_2 emissions, the dependent variable; and lnT, lnU, $lnEC$ represent the logarithm of international tourism, number of arrivals, urban population and energy consumption respectively, the independent variables. The major problem of time series data is its non-stationary status, and basic dynamic econometric analysis starts with confirming the unit root test. Considering the unit root status of the variables, this study proceeded with further time series analysis. The model specification procedure is shown in Figure 2.

Figure 2: Flow Chart of Model Selection Criteria



3.2 ARDL model structure

To scrutinise the impact of tourism, urbanisation, and energy prices on CO_2 emissions, we used the symmetric ARDL method (Pesaran et al. 1997; 2001). The ARDL methodology has several benefits over other cointegration techniques. This method is suitable whether the regressors are purely *I*(*0*), I(*1*), or mutually integrated, but for *I*(2) series this approach is inapplicable (Ilyas et al., 2010; Meo et al., 2018). Therefore, to ensure order of integration of the involved variables, we employ the augmented Dickey-Fuller (ADF) stationary test (Dickey & Fuller, 1979). Further, as reported by Jalae et al. (2019) and Nkoro and Uko (2016), this model provides better results with small samples. Moreover, the ARDL approach is a single equation framework, and it allows uneven lag orders for different variables. To capture the relationship amongst variables the following ARDL framework is incorporated:

$$\Delta lnCO2_t = \beta_0 + \sum_{j=1}^{p} \beta_1 \Delta lnCO2_{t-1} + \sum_{j=0}^{p} \beta_2 \Delta lnTO_{t-1} + \sum_{j=0}^{p} \beta_3 \Delta lnUR_{t-1} + \sum_{j=0}^{p} \beta_4 \Delta lnEC_{t-1} + \gamma_1 lnCO2_{t-1} + \gamma_2 lnTO_{t-1} + \gamma_3 lnUR_{t-1} + \gamma_4 lnEC_{t-1} + \epsilon_t \quad (1)$$

Where *lnCO2*, *lnT*, *lnU* and *lnEC* represent the logarithm of CO_2 emissions, international tourism, number of arrivals, urban population and energy consumption respectively; Δ represents the first difference operator; *p* represents the lag length; ϵ_t represents stochastic error correction term; and *βs* & *γs* indicate short run and the long-run parameters. The Schwarz Bayesian criterion (SBC) is used for optimal lag structure. To ascertain the appearance of a long-run relationship, we applied ARDL bounds testing procedure for co-integration (Pesaran et al., 2001). The bounds test methodology is founded on the joint F statistic of all lagged regressors, and null hypothesis of no linear relationship is present among variables, i.e., $\gamma_i = 0$, is carried out against the alternative hypothesis, i.e., $\gamma_i \neq 0$, *i*=1,2,3,4. The following error correction model estimates the short-run dynamics once co-integration has been achieved.

$$\Delta lnCO2_t = \beta_o + \sum_{j=1}^{p} \beta_1 \Delta lnCO2_{t-1} + \sum_{j=0}^{p} \beta_2 \Delta ln\,TO_{t-1} + \sum_{j=0}^{p} \beta_3 \Delta lnUR_{t-1} + \sum_{j=0}^{p} \beta_4 \Delta lnEC_{t-1} + \varphi ECM_{t-1} + \varepsilon_t \quad (2)$$

Where ECM_{t-1} is the lagged error correction term and *φ* is the component of ECM_{t-1} and other study variables (*lnCO2*, *lnT*, *lnU* and *lnEC*) are symbolised by the previously defined indicator. Subsequently, we applied several diagnostic tests to check the reliability of the dynamic model.

Additionally, to evaluate the robustness of the ADRL model, this study uses the DOLS regression technique (Stock & Watson, 1993). When the sample size is small, DOLS performs better because it encompasses the first difference of nonstationary regression coefficients along with the leads

and lags of the first difference regressors, which eliminates endogeneity and serial correlation among the parameters (Kalmaz & Kirikkaleli, 2019; Abumunshar et al., 2020). The main advantage of the DOLS technique is that it also considers the mixed order of integration of study variables (Raihan & Tuspekova, 2022a; Pattak et al., 2023).

4 Empirical Findings

4.1 Findings from ARDL framework

Prior to utilising ARDL approaches to examine the influence of the study variables on environmental contamination, Table 2 provides descriptive statistics and variance inflation factor (VIF) results. As the values of VIF are all below 10, they provide evidence that our independent variables do not exhibit multicollinearity.

Table 2: Descriptive Statistics and VIF Results

Variable	***lnCO2***	***lnTO***	***lnUR***	***lnEC***
Number of observations	25	25	25	25
Mean	10.56	12.19	17.50	7.32
Standard deviation	0.54	0.33	0.28	0.35
Minimum	9.71	11.55	17.05	6.81
Maximum	11.38	13.05	17.95	7.97
VIF	-	1.01	1.76	1.72

ARDL does not involve the pre-testing of variables (Nkoro & Uko, 2016). However, to ensure the integration level of the variables, we employed the ADF stationary test because the estimated F-statistic will be improper in the presence of the *I*(*2*) variable. The results of the ADF test are displayed in Table 3. The null hypothesis of the ADF test is there is a unit root, and the alternative hypothesis implies its absence. The results indicate that all the variables involved hold a unit root at levels but become stationary at the first difference. Thus, this result assists us in performing the ARDL bounds testing procedure for co-integration to check the long-run association among the variables.

Table 3: Results of ADF Unit Root Test

	lnCO2	*lnTO*	*lnUR*	*lnEC*
Level	0.72306 (0.9897)	-1.9514 (0.3047)	-1.3739 (0.5749)	3.7898 (1.0000)
1st difference	-4.1064 (0.0191)**	-4.0452 (0.0216)**	-24.9082 (0.0001)**	-5.3115 (0.0023)**
Decision	I(1)	I(1)	I(1)	I(1)

Note: ** refers to significance at 5% levels.

The results of co-integration are reported in Table 4. As the F-statistic value of 14.61 is greater than the upper critical bound (UCB) of 3.67 at the 5% significance level, we can therefore state that there exists a long-run connection among variables. The summary of estimated long run and short run coefficients shown in panel A and panel B, respectively, of Table 4.

Table 4: Summary of ARDL Bounds Test for Co-Integration Based on Schwarz Bayesian Criterion

Model	**F-Statistic**	**Critical value**		**Significance**	**Summary**
		LCB	**UCB**	**level**	
F_{CO2}	7.25	2.79	3.67	5%	Co-integration

The long-run results of the ARDL assessment are displayed in Panel A of Table 5. The study identifies tourism, urbanisation, and energy consumption as significant variables for CO2 emissions in Bangladesh. At the 1% level, the long-run coefficients of urbanisation and tourism are both significant and positive. The findings indicate that tourism and urbanisation have a detrimental impact on the ecological sustainability of Bangladesh. Conversely, the long-run coefficient of energy consumption exhibits a statistically significant negative relationship at the 1% level, suggesting that it contributes to green sustainability in Bangladesh by reducing emissions of CO2.

In terms of tourism, CO2 emissions in Bangladesh rise by 0.223 units for every unit change in tourism activity, similar to the results obtained by Jayasinghe and Selvanathan (2021), Selvanathan et al. (2021), and Raihan et al. (2022a), and contradicting Rahaman (2022). Increased tourism activities have a detrimental effect on the climate as it accelerates

environmental damage. The tourism sector has the potential to contribute to environmental contamination by emitting nitrogen oxides into the atmosphere and releasing methane because of inefficient disposal methods. However, transportation associated with tourism, especially air travel, is a major source of CO_2 emissions that contribute to climate change and have consequences for regional as well as international ecosystems. Moreover, tourism infrastructure may also emit CO_2 through deforestation or land use adjustments. Tourism in Bangladesh is an expanding sector. Thus, ecologically conscious travel, green technology, and destination management are essential for reducing CO_2 emissions from tourism.

The findings suggest that urbanisation has a greater long-term impact on the deterioration of Bangladesh's environmental sustainability compared to tourism, as seen by its higher coefficient value of 2.581. This observation clarifies the potential negative impact of the swift expansion of urban populations on the long-term prospects of sustainable environmental goals. The agglomeration of business, industrial, and residential activities within metropolitan regions of Bangladesh typically leads to heightened energy requirements. To fulfil the energy requirements of various sectors such as construction, transportation, and manufacturing, the combustion of fossil fuels, notably coal, oil, and natural gas, is commonly employed, resulting in the release of CO_2 into the atmosphere. The findings of our study align with previous studies conducted in Bangladesh, e.g., Kashem and Rahman (2019), Rahman and Alam (2021), Islam et al. (2021), and Raihan et al. (2022b; 2022c). However, our research outcomes do not align with the results reported by Raza et al. (2023), who reveal significant adverse effects of urbanisation on CO_2 emissions. Moreover, the results of the current investigation align with the outcomes reported by Adebayo and Kalmaz (2021), Amin and Atique (2021), Raihan (2022a; 2022b; 2022c), Sufyanullah et al. (2022), and Voumik et al. (2023).

Eventually, our research reveals that energy consumption exerts a deleterious influence on CO_2 emissions. If energy consumption rises by one unit, it will cut CO_2 emissions by 0.463 units in the long run. This indicates that an increase in energy consumption is improving the ecosystem of Bangladesh. The present study's result aligns with the research conducted by Tvinnereim and Mehling (2018) as well as Umar et al. (2021). However, it contradicts the conclusions reported by Raza et al. (2023) with regard to the context of Bangladesh.

Additionally, Panel B of Table 5 shows the results of short-run dynamics. The coefficient is -0.87, which is less than one, negative, and significant at the 5% significance level. Therefore, it is a sign of long-run adjusted equilibrium among the involved variables. Hence, it indicates that 87% of the disequilibrium of the previous year has converged to equilibrium in the present year. From Panel B, we notice that in the short run, tourist arrivals and energy prices are significantly positive and related to CO_2 emissions.

Table 5: Summary of ARDL Estimation

Panel A: Long run coefficient		**Panel B: Short run coefficient**	
Dependent Variable: *lnCO2*		**Dependent Variable: Δ *lnCO2***	
Variables	**Coefficient**	**Variables**	**Coefficient**
lnTO	0.223 (0.0041)	Δ*lnTO*	0.123 (0.0000)
lnUR	2.581 (0.0000)	Δ*lnUR*	0.178 (0.0031)
lnEC	-0.463 (0.0015)	Δ*lnEC*	0.254 (0.0263)
		ECM_{t-1}	-0.855 (0.0000)
		R^2a	0.87
Panel C: Diagnostic test of residuals			
χ^2_{Norm}	1.70 (0.426)	χ^2_{Het}	0.538 (0.837)
χ^2_{LM}	2.55 (0.131)	$\chi^2_{R\text{-}R}$	4.05 (0.068)

Note: **p**-values are in brackets.

Table 6: Summary of DOLS Technique

Variables	**Coefficient**	**Standard error**	***p*-value**
lnTO	0.152	0.0954	0.0033
lnUR	2.241	0.1141	0.0134
lnEC	-0.781	0.0481	0.0391

Table 6 presents the results of DOLS techniques. The results are similar to the ARDL findings. To uphold the reliability of our model, we have utilized the Jarque-Bera test (Jarque & Bera, 1987) for normality, the Breusch-Godfrey test (Breusch, 1978) for autocorrelation, and the autoregressive conditional heteroskedasticity (ARCH) test (Engle, 1982) of lag 1 for heteroscedasticity. Additionally, the Ramsey regression equation specification error test (RESET) test (Ramsey, 1969) adopted in a study to

confirm the model specification. The findings report in panel C of Table 4 and suggest that there is no problem of non-normality of residuals, serial correlation, heteroscedasticity, or misspecification of the model.

In addition, we have applied cumulative sum (CUSUM) methods to check the parameter stability of our dynamic model. From Figure 3, it can be concluded that the estimated parameters are stable as the CUSUM lines remain within the upper and lower bounds of the graph.

Figure 3a: CUSUM Approach for Parameter Stability

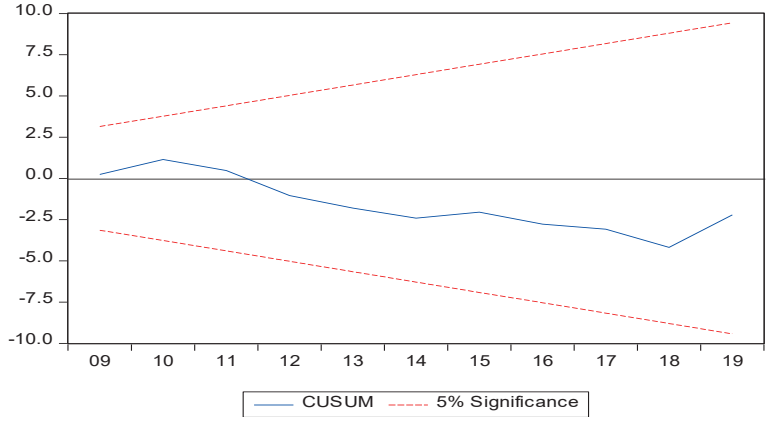
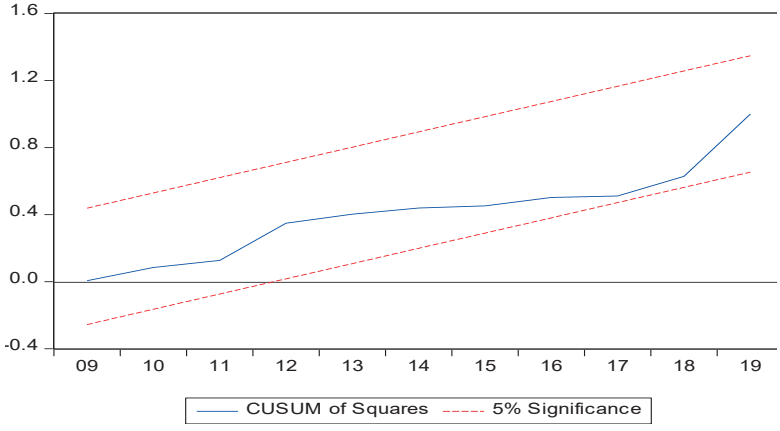


Figure 3b: CUSUMSQ Approach for Parameter Stability



5. Discussion and Conclusion

This study addresses the question of whether tourism, urbanisation, and energy consumption are responsible for environmental pollution in Bangladesh. The empirical evidence in the long run shows a significant impact of all study variables on environmental pollution. As tourism becomes more common and accessible to all, as urbanisation becomes a more prominent factor, and as energy consumption increases, CO_2 emissions will increase at a significant rate. This result also supports the claims of several previous studies that urbanisation and tourism cause CO_2 emissions.

However, it is apparent that urbanisation is an inclusive term for a country's advancement in several aspects. With the economic and social advancement of a country, many people tend to concentrate in certain areas, which results in the transformation of the land for residential, commercial, industrial, and transportation purposes. Hence, CO_2 emissions increase in more urbanised areas. On the other hand, people tend to use more and more energy with the development of living standards. Initially, people may utilise energy in unsustainable ways. However, when economic progress occurs, there will be an increasing awareness regarding the environment, as depicted in the EKC hypothesis. So, after a certain period, users will be concerned about environmental sustainability and search for alternative sources of energy that may depend on renewable energy, which may reduce CO_2 emissions in the long run. This also help Bangladesh to achieve SDG 7, which is affordable and clean energy. However, in the short run, energy consumption has a substantial positive influence on CO_2. We assume that for users, it may be difficult to switch suddenly to alternative energy. That may contribute to rising CO_2 emissions. Hence, with the change in energy prices, CO2 emissions change in both cases.

In this age of globalisation, tourism has become a prolific sector. The development of the industry and the influx of tourists require many accommodation setups and transportation facilities, which leads to a sufficient amount of energy use and indirectly affects CO_2 emissions. Based on these outcomes, this study suggests that policymakers focus their attention on constructing an organised and eco-friendly urban area. They can focus on spreading the scope to build sustainable industries and other facilities in rural areas that may reduce massive, unplanned urbanisation. Tourism also contributes a lot to pollution, so policymakers should be

concerned with making a tourism policy that is good for the environment. Bangladesh has a highly dense population, explaining why urbanisation is increasing drastically and increasing CO_2 emission levels. At the same time, the number of local tourists also rising dramatically as their socioeconomic condition is improving. Therefore, government should plan properly how to impose carbon neutrality, or a carbon tax based that would help us to have some polity measures for Climate Action, which is our target by 2030.

6. Policy recommendations

Considering the study's findings, the following are some policy recommendations to address environmental pollution caused by tourism, urbanisation, and energy consumption in Bangladesh. To promote sustainable urban development, eco-friendly city planning with green spaces, public transportation systems, and energy-efficient buildings should be encouraged. This can be achieved through tax breaks for developers who follow these principles. Eco-friendly tourism practices can be promoted, such as responsible waste management, homestays in rural areas, and minimising transportation emissions. This could involve certification programs for eco-friendly tourism businesses.

There should be greater investment in renewable energy sources like solar, wind, and hydro power to reduce reliance on fossil fuels and CO_2 emissions. This could involve subsidies or tax breaks for renewable energy projects. The government should also consider implementing a carbon tax or carbon neutrality policies for specific sectors. This would put a price on CO_2 emissions and incentivise businesses to reduce their carbon footprint, which may secure sustainable environment and mitigate the adverse impact of climate change. Public education campaigns are also crucial to raise awareness about environmental issues and encourage sustainable living practices.

The implementation of sustainable urban development and carbon pricing measures can promote the establishment of a sustainable environment. Ensuring a sustainable environment helps reduce the detrimental impact of climate change, which aligns with SDG 13. Hence, these suggestions also contribute to the attainment of the SDG objectives in the foreseeable future.

7. Limitations

The study has been conducted with few macroeconomic variables such as tourism, urbanisation and energy prices. However, there is a wider scope to consider other relevant macroeconomic variables which accelerate environmental pollution. Further, this study has considered CO_2 emissions as a proxy of environmental degradation. Other responsible GHGs (sulphur dioxide, nitrogen dioxide, etc.) also can be considered as indicator of environmental pollution. Moreover, uniform dataset for carbon neutrality and carbon tax for climate action is missing in Bangladesh. The government has no concrete policy to follow for the extension of urbanisation and tourism sector. Therefore, Bangladesh is still far from achieving the Climate Action (SDG 13) target by 2030.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Abbasi, K. R., Lv, K., Radulescu, M., & Shaikh, P. A. (2021). Economic complexity, tourism, energy prices, and environmental degradation in the top economic complexity countries: Fresh panel evidence. *Environmental Science and Pollution Research*, *28*(48), 68717–68731. https://doi.org/10.1007/s11356-021-15312-4

Abumunshar, M., Aga, M., & Samour, A. (2020). Oil price, energy consumption, and CO_2 emissions in Turkey. New evidence from a Bootstrap ARDL Test. *Energies*, *13*(21), 5588. https://doi.org/10.3390/en13215588

Adebayo, T. S., & Beton Kalmaz, D. (2021). Determinants of CO_2 emissions: Empirical evidence from Egypt. *Environmental and Ecological Statistics*, *28*, 239–262. https://doi.org/10.1007/s10651-020-00482-0

Ahamad, M. G., & Islam, A. K. M. N. (2011). Electricity consumption and economic growth nexus in Bangladesh: Revisited evidences. *Energy Policy*, *39*, 6145–6150. https://doi.org/10.1016/j.enpol.2011.07.014

Akther, T., Selim, M. M. I., Hossain, M. S., & Kibria, M. G. (2024). Synergistic role of agriculture production, fertilizer use, tourism, and renewable energy on CO_2 emissions in South Asia: A static and dynamic analysis. *Energy Nexus*, *14*, 100287. https://doi.org/10.1016/j.nexus.2024.100287

Al-Mulali, U., Ozturk, I., & Lean, H. H. (2015). The influence of economic growth, urbanization, trade openness, financial development, and renewable energy on pollution in Europe. *Natural Hazards*, *79*(1), 621–-644. DOI: https://doi.org/10.1007/s11069-015-1865-9

Alam, S. (2023, February 16). Clean energy will reduce our fiscal burden. *The Daily Star*. https://www.thedailystar.net/opinion/views/news/clean-energy-will-reduce-our-fiscal-burden-3248671

Amin, S. B., & Atique, M. A. (2021). The nexus among tourism, urbanization and CO2 emissions in South Asia: A panel analysis. *Tourism and Hospitality Management*, *27*(1), 63–82. https://doi.org/10.20867/thm.27.1.5

Amin, S. B., Kabir, F. A., & Khan, F. (2020). Tourism and energy nexus in selected South Asian countries: A panel study. *Current Issues in Tourism*, *23*(16), 1963–1967. https://doi.org/10.1080/13683500.2019.1638354

Apergis, N., & Gangopadhyay, P. (2020). The asymmetric relationships between pollution, energy use and oil prices in Vietnam: Some behavioural implications for energy policy-making. *Energy Policy*, *140*, 111430. https://doi.org/10.1016/j.enpol.2020.111430

Bildirici, M., & Çoban Kayıkçı, F. (2023). Energy consumption, energy intensity, economic growth, FDI, urbanization, PM2.5 concentrations nexus. *Environment, Development and Sustainability*, *1–19*. https://doi.org/10.1007/s10668-023-02923-9

Borowski, M., Zwolińska, K., & Czerwiński, M. (2022). Energy consumption patterns in a hotel building: A case study. In *CLIMA 2022 The 14th REHVA HVAC World Congress*. https://doi.org/10.34641/clima.2022.187

Breusch, T. S. (1978). Testing for autocorrelation in dynamic linear models. *Australian Economic Papers, 17*(31), 334–355. https://doi.org/10.1111/j.1467-8454.1978.tb00635.x

Byron, R. K., & Hasan, M. (2021, November 28). Tourism's share 3.02% in GDP. *The Daily Star.* https://www.thedailystar.net/business/economy/industries/tourism/news/tourisms-share-302pc-gdp-2904556

CEIC Data (2020). Bangladesh tourism revenue growth. *CEIC Data*. https://www.ceicdata.com/en/indicator/bangladesh/tourism-revenue-growth

Chen, K. H., Yang, H. Y., Lee, J. M., & Chi, C. F. (2016). The impact of energy prices on energy consumption and energy efficiency: Evidence from Taiwan. *Energy Efficiency*, *9*(6), 1329–1349. https://doi.org/10.1007/s12053-016-9426-y

Center for Policy Dialogue (CPD) (2024). Securing green transition of the textile and readymade garments sector in Bangladesh. *CPD*. https://cpd.org.bd/publication/securing-green-transition-of-the-textile-and-readymade-garments-sector-in-bangladesh/

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366a), 427–431. https://doi.org/10.1080/01621459.1979.10482531

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica*, *50*(4), 987–1007. https://doi.org/10.2307/1912773

Gupta, M. R., & Dutta, P. B. (2018). Tourism development, environmental pollution and economic growth: A theoretical analysis. *Journal of International Trade and Economic Development*, *27*(2), 125–144. https://doi.org/10.1080/09638199.2017.1346139

Haque, M. M. (2022, January 27). Carbon emission scenario: Following the right path for climate mitigation in Bangladesh. *The Business Standard*. https://www.tbsnews.net/supplement/carbon-emission-scenario-following-right-path-climate-mitigation-bangladesh-363013

Ilyas, M., Ahmad, H. K., Afzal, M., &Mahmood, T. (2010). Determinants of manufacturing value added in Pakistan: An application of bounds testing approach to cointegration. *Pakistan Economic and Social Review*, *48*(2), 209–223. https://www.jstor.org/stable/25825362

International Energy Agency (IEA) (2022, March 8). Global CO2 emissions rebounded to their highest level in history in 2021. *IEA*. https://www.iea.org/news/global-co2-emissions-rebounded-to-their-highest-level-in-history-in-2021

Islam, M., Khan, M. K., Tareque, M., Jehan, N., & Dagar, V. (2021). Impact of globalization, foreign direct investment, and energy consumption on CO_2 emissions in Bangladesh: Does institutional quality matter? *Environmental Science and Pollution Research*, *28*(35), 48851-48871. https://doi.org/10.1007/s11 356-021-13441-4

Islam, M., Alam, M., Ahmed, F., & Al-Amin, A. Q. (2023). Economic growth and environmental pollution nexus in Bangladesh: Revisiting the environmental Kuznets curve hypothesis. *International Journal of Environmental Studies*, *80*(1), 68–92. https://doi.org/10.1080/00207233.2021.2017169

Jalaee, S. A., Lashkary, M., &GhasemiNejad, A. (2019). The Phillips curve in Iran: Econometric versus artificial neural networks. *Heliyon*, *5*(8), e02344. https://doi.org/10.1016/j.heliyon.2019.e02344

Jarque, C. M., &Bera, A. K. (1987). A test for normality of observations and regression residuals. *International Statistical Review*, *55*(2), 163–172. https://doi.org/10.2307/1403192

Jayasinghe, M., &Selvanathan, E. A. (2021). Energy consumption, tourism, economic growth and CO2 emissions nexus in India. *Journal of the Asia Pacific Economy*, *26*(2), 361–380. https://doi.org/10.1080/13547860.2021.1923240

Jaz, N. A. A., Habibullah, M. S., Ngah, W. A. S. W., & Kaliappan, S. R. (2023). Does tourism lead to environmental impact? Cross-national static and dynamic evidence from the ecological footprint. *Institutions and Economies*, *15*(2), 115–141. https://doi.org/10.22452/IJIE.vol15no2.5

Kashem, M. A., & Rahman, M. M. (2019). CO_2 emissions and development indicators: A causality analysis for Bangladesh. *Environmental Processes*, *6*, 433–455. https://doi.org/10.1007/s40710-019-00365-y

Kahouli, B., &Chaaben, N. (2022). Investigate the link among energy consumption, environmental pollution, foreign trade, foreign direct investment, and economic growth: Empirical evidence from GCC countries. *Energy and Buildings*, *266*, 112117. https://doi.org/10.1016/j.enbuild.2022.112117

Kahouli, B., Miled, K., & Aloui, Z. (2022). Do energy consumption, urbanization, and industrialization play a role in environmental degradation in the case of Saudi Arabia? *Energy Strategy Reviews*, *40*, 100814. https://doi.org/10.1016/j.esr.2022.100814

Knoema (2022). Bangladesh: Urban population as a share of total population. *Knoema*. https://knoema.com/atlas/Bangladesh/Urban-population

Khan, A. M., & Qayyum, A. (2007). Dynamic modelling of energy and growth in South Asia. *Pakistan Development Review*, *46*, 481–498. https://www.jstor.org/stable/41261178

Kraft, J., & Kraft, A. (1978). On the relationship between energy and GNP. *Journal of Energy and Development*, *3*(2), 401–403. https://www.jstor.org/stable/24806805

Kalmaz, D. B., & Kirikkaleli, D. (2019). Modeling CO_2 emissions in an emerging market: Empirical finding from ARDL-based bounds and wavelet coherence approaches. *Environmental Science and Pollution Research*, *26*(5), 5210–5220. https://doi.org/10.1007/s11356-018-3920-z

Kirikkaleli, D., & Kalmaz, D. B. (2020). Testing the moderating role of urbanization on the environmental Kuznets curve: Empirical evidence from an emerging market. *Environmental Science and Pollution Research*, *27*(30), 38169-38180. https://doi.org/10.1007/s11356-020-09870-2

Martial, A. A. A., Dechun, H., Voumik, L. C., Islam, M. J., & Majumder, S. C. (2023). Investigating the influence of tourism, GDP, renewable energy, and electricity consumption on carbon emissions in low-income countries. *Energies*, *16*(12), 4608. https://doi.org/10.3390/en16124608

Meo, M. S., Chowdhury, M. A. F., Shaikh, G. M., Ali, M., & Masood Sheikh, S. (2018). Asymmetric impact of oil prices, exchange rate, and inflation on tourism demand in Pakistan: New evidence from nonlinear ARDL. *Asia Pacific Journal of Tourism Research*, *23*, 408– 422. https://doi.org/10.1080/10941665.2018.1445652

Mitić, P., Fedajev, A., Radulescu, M., & Rehman, A. (2023). The relationship between CO_2 emissions, economic growth, available energy, and employment in SEE countries. *Environmental Science and Pollution Research*, *30*(6), 16140–16155. https://doi.org/10.1007/s11356-022-23356-3

Ministry of Finance Bangladesh (2023). *Climate financing for sustainable development: Budget report 2023-24*. https://mof.portal.gov.bd/sites/default/files/files/mof.portal.gov.bd/page/6e496a5b_f5c1_447b_bbb4_257a2d8a97a1/Climate%20English.pdf

Murshed, M., Ahmed, Z., Alam, M. S., Mahmood, H., Rehman, A., & Dagar, V. (2021). Reinvigorating the role of clean energy transition for achieving a low-carbon economy: evidence from Bangladesh. *Environmental Science and Pollution Research*, *28*, 67689–67710. https://doi.org/10.1007/s11356-021-15352-w

Nielsen, K. S., Nicholas, K. A., Creutzig, F., Dietz, T., & Stern, P. C. (2021). The role of high-socioeconomic-status people in locking in or rapidly

reducing energy-driven greenhouse gas emissions. *Nature Energy*, *6*(11), 1011–1016. https://doi.org/10.1038/s41560-021-00900-y

Nkoro, E., & Uko, A. K. (2016). Autoregressive distributed lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63–91. https://www.scienpress.com/Upload/JSEM/Vol%205_4_3.pdf

Pattak, D. C., Tahrim, F., Salehi, M., Voumik, L. C., Akter, S., Ridwan, M., Sadowska, B., & Zimon, G. (2023). The driving factors of Italy's CO_2 emissions based on the STIRPAT model: ARDL, FMOLS, DOLS, and CCR approaches. *Energies*, *16*(15), 5845. https://doi.org/10.3390/en16155845

Pesaran, M. H., Shin, Y.J., & Smith, R. P. (1997). Pooled estimation of long-run relationships in dynamic heterogeneous panels. *Cambridge Working Papers in Economics*, *9721*. https://www.econ.cam.ac.uk/people-files/emeritus/mhp1/jasaold.pdf

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. https://doi.org/10.1002/jae.616

Rahman, M. M., & Alam, K. (2021). Clean energy, population density, urbanization and environmental pollution nexus: Evidence from Bangladesh. *Renewable Energy*, *172*, 1063–1072. https://doi.org/10.1016/j.renene.2021.03.103

Rahaman, M., Hossain, M., & Chen, S. (2022). The impact of foreign direct investment, tourism, electricity consumption, and economic development on CO_2 emissions in Bangladesh. *Environmental Science and Pollution Research*, *29*(25), 37344–37358. https://doi.org/10.1007/s 11356-021-18061-6

Raihan, A., & Tuspekova, A. (2022a). The nexus between economic growth, energy use, urbanization, tourism, and carbon dioxide emissions: New insights from Singapore. *Sustainability Analytics and Modeling, 2*, 100009. https://doi.org/10.1016/j.samod.2022.100009

Raihan, A., & Tuspekova, A. (2022b). Dynamic impacts of economic growth, renewable energy use, urbanization, industrialization, tourism, agriculture, and forests on carbon emissions in Turkey. *Carbon Research*, *1*(1), 20. https://doi.org/10.1007/s44246-022-00019-z

Raihan, A., Muhtasim, D. A., Pavel, M. I., Faruk, O., & Rahman, M. (2022a). Dynamic impacts of economic growth, renewable energy use,

urbanization, and tourism on carbon dioxide emissions in Argentina. *Environmental Processes*, *9*(2), 38. https://doi.org/10.1007/s40710-022-00590-y

Raihan, A., Muhtasim, D. A., Farhana, S., Pavel, M. I., Faruk, O., Rahman, M., & Mahmood, A. (2022b). Nexus between carbon emissions, economic growth, renewable energy use, urbanization, industrialization, technological innovation, and forest area towards achieving environmental sustainability in Bangladesh. *Energy and Climate Change*, *3*, 100080. https://doi.org/10.1016/j.egycc.2022.100080

Raihan, A., Muhtasim, D. A., Farhana, S., Hasan, M. A. U., Pavel, M. I., Faruk, O., Rahman, M. & Mahmood, A. (2022c). Nexus between economic growth, energy use, urbanization, agricultural productivity, and carbon dioxide emissions: New insights from Bangladesh. *Energy Nexus*, *8*, 100144. https://doi.org/10.1016/j.nexus.2022.100144

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society*, *31*(2), 350–371. https://doi.org/10.1111/j.2517-6161.1969.tb00796.x

Raza, M. Y., Hasan, M. M., & Chen, Y. (2023). Role of economic growth, urbanization and energy consumption on climate change in Bangladesh. *Energy Strategy Reviews*, *47*, 101088. https://doi.org/10.1016/j.esr.2023.101088

Selvanathan, E. A., Jayasinghe, M., & Selvanathan, S. (2021). Dynamic modelling of inter-relationship between tourism, energy consumption, CO2 emissions and economic growth in South Asia. *International Journal of Tourism Research*, *23*(4), 597-610. https://doi.org/10.1002/jtr.2429

Shafik, N., & Bandyopadhyay, S. (1992). Economic growth and environmental quality: Time-series and cross-country evidence. *World Bank.* https://documents.worldbank.org/en/publication/documents-reports/documentdetail/833431468739515725/economic-growth-and-environmental-quality-time-series-and-cross-country-evidence

Sreenu, N. (2022). Impact of FDI, crude oil price and economic growth on CO_2 emission in India: Symmetric and asymmetric analysis through ARDL and non-linear ARDL approach. *Environmental Science and Pollution Research*, *29*(28), 42452–42465. https://doi.org/10.1007/s11356-022-19597-x

Stock, J. H., & Watson, M. W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica*, *61*(4), 783–820. https://doi.org/10.2307/2951763

Sufyanullah, K., Ahmad, K. A., & Ali, M. A. S. (2022). Does emission of carbon dioxide is impacted by urbanization? An empirical study of urbanization, energy consumption, economic growth and carbon emissions—Using ARDL bound testing approach. *Energy Policy*, *164*, 112908. https://doi.org/10.1016/j.enpol.2022.112908

Tvinnereim, E., & Mehling, M. (2018). Carbon pricing and deep decarbonisation. *Energy Policy*, *121*, 185–189. https://doi.org/10.1016/j.enpol.2018.06.020

Umar, B., Alam, M., & Al-Amin, A. Q. (2021). Exploring the contribution of energy price to carbon emissions in African countries. *Environmental Science and Pollution Research*, *28*(2), 1973–1982. https://doi.org/10.1007/s11356-020-10641-2

United Nations. (2012). Addressing the sustainable urbanization challenge. *UN*. https://www.un.org/en/chronicle/article/addressing-sustainable-urbanization-challenge

United Nations Climate Change (UNFCC). (n.d). Introduction to Climate Finance. *UNFCC*. https://unfccc.int/topics/introduction-to-climate-finance

United States Environmental Protection Agency (EPA) (2023). Greenhouse gases: What are the trends in greenhouse gas emissions and concentrations and their impacts on human health and the environment? *EPA*. https://www.epa.gov/report-environment/greenhouse-gases

United States Environmental Protection Agency (EPA) (2024). Carbon pollution from transportation. *EPA*. https://www.epa.gov/transportation-air-pollution-and-climate-change/carbon-pollution-transportation

Usman, M., Jahanger, A., Makhdum, M. S. A., Radulescu, M., Balsalobre-Lorente, D., & Jianu, E. (2022). An empirical investigation of ecological footprint using nuclear energy, industrialization, fossil fuels and foreign direct investment. *Energies*, *15*(17), 6442. https://doi.org/10.3390/en15176442

Uzair Ali, M., Gong, Z., Ali, M. U., Asmi, F., & Muhammad, R. (2022). CO_2 emission, economic development, fossil fuel consumption and population density in India, Pakistan and Bangladesh: A panel investigation.

International Journal of Finance and Economics, *27*(1), 18–31. https://doi.org/10.1002/ijfe.2134

Voumik, L. C., Mimi, M. B., & Raihan, A. (2023). Nexus between urbanization, industrialization, natural resources rent, and anthropogenic carbon emissions in South Asia: CS-ARDL approach. *Anthropocene Science*, *2*(1), 48–61. https://doi.org/10.1007/s44177-023-00047-3

Voumik, L. C., Islam, M. A., & Nafi, S. M. (2024). Does tourism have an impact on carbon emissions in Asia? An application of fresh panel methodology. *Environment, Development and Sustainability*, *26*(4), 9481–9499. https://doi.org/10.1007/s10668-023-03104-4

World Bank (2024). The World Bank in Bangladesh. *World Bank.* https://www.worldbank.org/en/country/bangladesh/overview

World Data Atlas (2019). Bangladesh - Contribution of travel and tourism to GDP as a share of GDP. *Knoema*. https://knoema.com/atlas/Bangladesh/topics/Tourism/Travel-and-Tourism-Total-Contribution-to-GDP/Contribution-of-travel-and-tourism-to-GDP-%-of-GDP

Yılmaz, A. (2023). Carbon emissions effect of trade openness and energy consumption in Sub-Saharan Africa. *SN Business and Economics*, *3*(2), 41. https://doi.org/10.1007/s43546-022-00380-6

Zou, X. (2018). VECM model analysis of carbon emissions, GDP, and international crude oil prices. *Discrete Dynamics in Nature and Society*, 1–11. https://doi.org/10.1155/2018/5350308

Institutions and Economies
Vol. 17, No. 4, October 2025, pp. 55-80 https://doi.org/10.22452/IJIE.vol17no4.3

Roles of Working Capital Management and Corporate Tax Avoidance on Firm Performance Amid Economic Policy Uncertainty

Hossain Mohammad Reyad[a] and Mohd Ashhari Zariyawati[b]

Abstract: *: This study examines the impact of global economic policy uncertainty (GEPU) on working capital management (WCM) and, in turn, on firm performance. This study also investigates the impact of the interaction between corporate tax avoidance (CTA) and WCM on overall firm performance. Utilising a dynamic panel data methodology with a two-step generalized method of moments (GMM) approach, the analysis encompasses a robust sample of 7,645 firms from the United States (US), 1,107 from the United Kingdom (UK), 681 from Germany, and 4,403 from China spanning the period of 2006 to 2020. This study reveals a significant negative correlation between GEPU and the cash conversion cycle (CCC). Additionally, the interaction effects between CCC and GEPU demonstrate a significant positive association with return on assets (ROA). Remarkably, the interaction between CCC and CTA consistently exerts a significant and positive impact on ROA across firms in all countries. Upon closer examination of individual countries, a distinct pattern emerges: a negative impact is discerned for US firms, in contrast to the positive impact observed for firms in the UK, Germany, and China. Therefore, the holistic optimisation of CCC and CTA presents significant potential for improved cash flow efficiency, financial stability, and enhanced firm performance.*

Keywords: Working capital management; Corporate tax avoidance; Firm performance; Economic policy uncertainty
JEL Classification: G3, H2, E6

[a] Corresponding author. Faculty of Business and Entrepreneurship, Department of Innovation and Entrepreneurship, Daffodil International University, Dhaka, Bangladesh. *Email: hossain.die@diu.edu.bd*, *reyad736@gmail.com*. ORCID ID: 0000-0002-1217-0539

[b] School of Business and Economics, Universiti Putra Malaysia, Serdang, Malaysia. *Email: zariyawati@upm.edu.my*. ORCID ID: 0000-0003-3202-7446

1. Introduction

Working capital management (WCM) has attracted increasing attention for businesses due to its sensitivity toward a firm's financial efficiency and health (Sawarni et al., 2020). WCM is a strategic approach that aims to maintain sufficient liquidity for the day-to-day operations of a business. It enables a firm to sustain its activities by effectively managing its operational expenses and short-term debts (Boisjoly et al., 2020). WCM is also found to be a significant predictor of firm performance (Boisjoly et al., 2020). For example, Lyngstadaas (2020) observes that the greater financial performance of publicly-traded firms in the United States is correlated with efficient management of working capital (WC). Hence, it is imperative for firms to efficiently manage their WC to enhance overall firm performance.

However, enhancing and sustaining the efficiency of WCM poses a constant challenge for most firms. The severity of the challenge intensifies when firms are confronted with numerous challenges, such as economic policy uncertainty (EPU). EPU stems primarily from the uncertainty of whether existing policies will change in the future or if newly formed policies will have unprecedented effects on the economy and the private sector (Baker et al., 2016). Since EPU arises from government regulatory, monetary, and fiscal policy changes, it is considered a significant stimulator of aggregate risk that the world has witnessed during several global crises (Rehman et al., 2021).

EPU wields a significant impact on the intricate dynamics of supply chains, financial liquidity, and WCM within firms. Consequently, it exerts pressure on key components of WCM like inventory, accounts receivables, accounts payables, and the cash conversion cycle (CCC). As evidenced by Dbouk et al. (2020), heightened EPU challenges accurate cost estimations for businesses, especially in predicting inventory demand. This misalignment contributes to an upward surge in daily inventory outstanding. Subsequently, a prolonged inventory turnover cycle results in unwarranted inventory backlog, storage expenses, and adverse impacts on profitability (Cheng, 2019). Moreover, the upswing in EPU exposes banks to considerable financial risk, given their susceptibility to economic policy shifts (Danisman et al., 2021). As a response, financial institutions frequently impose stricter credit access and elevate loan costs to mitigate default risk expenses (Ashraf & Shen, 2019). This tightening of lending conditions can exacerbate

financial constraints for firms, augmenting their dependence on trade credit to alleviate the financing gap. The convergence of economic literature and financial theory shows that fluctuations in aggregate economic activity can result in significant firm-level financial constraints (Bernanke et al., 1996). Financial constraints stand as a major challenge for businesses (Bhatia & Chakrabarti, 2022). However, amid these challenges, hedging strategies emerge as potent tools for navigating financial constraints (Hoberg & Moon, 2017).

Modigliani and Miller's (1958) theory posits that, in perfect capital markets, firms remain indifferent to internal versus external financing. However, market imperfections give rise to financial constraints, compelling firms to grapple with difficulties in securing external finance. This limitation stems from the challenges or high costs linked to obtaining external funds. Consequently, firms are compelled to heavily rely on internal funds, sourced from core operations or efforts to minimise tax liability (Mayberry, 2012).

As such, this study posits that corporate tax avoidance (CTA), by providing additional capital to firms, could indirectly aid in mitigating the risks associated with WCM during times of EPU. The notion of using CTA as a means to bolster capital for operational needs aligns with the idea that a stronger financial position can help buffer the impacts of economic uncertainties (Ozdemir et al., 2023). Building upon this notion, Alm et al. (2019) note that firms encountering financial constraints frequently turn to participating in tax avoidance practices. Similarly, Edwards et al. (2016) reveal that financially constrained firms are more likely to evade taxes than non-financially constrained firms due to their inability to access external financing. This is primarily due to the fact that tax avoidance provides them with a means to reduce tax cash outflows during economic downturns. Tax avoidance may potentially impact a company's present and future cash flows due to its ability to reduce tax liabilities, hence increasing cash inflows (Khuong et al., 2020). If a company can find ways to reduce its taxable income, it may reinvest those savings in its core business (Minh Ha et al., 2021).

However, in comparison to the focus on WCM, several prior investigations have primarily explored the impact of CTA on distinct elements of firms' capital structure (Goh et al., 2016; Lee et al., 2023). In contrast, this study takes a novel approach, utilising CTA as a hedging technique, to explore its effects on both WCM and firm performance.

Therefore, the primary objective of this study is to explore how EPU affects WCM and subsequently impacts firm performance. Additionally, the current study investigates how the interaction between WCM and CTA influences overall firm performance.

The subsequent sections of this paper are structured as follows: Section 2 discusses existing literature and develops hypotheses. Section 3 elaborates on the research methodology. Section 4 presents the research findings in detail, while Section 5 provides a concise conclusion for the entirety of the paper.

2. Literature Review

2.2 WCM, firm performance, and EPU

The importance of WCM on firm performance is widely acknowledged by researchers (e.g., Braimah et al., 2021; Zariyawati & Reyad, 2022). Research shows that the adoption of WCM yields improved firm performance, which positively affects the firm's absolute and relative market value (Boisjoly et al., 2020). The impact of WCM on firm performance is manifested by its components. For instance, Fernández-López et al. (2020) state that firm profitability is negatively linked to the daily inventory outstanding (DIO), daily payable outstanding (DPO), and CCC. Correspondingly, Sawarni et al. (2020) report that inventory conversion and payable periods are inversely related to firm performance. Firm profitability is negatively associated with the receivables collection period. On the other hand, Braimah et al. (2021) indicate an inverted U-shaped association between the receivables collection period and firms' profitability. They also reveal a positive link between the payable period and profitability and a negative relation between the inventory conversion period and CCC.

Nevertheless, the established connection between WCM and firm performance might deviate during periods of EPU. In this context, existing findings may not hold true due to the variable nature of the relationship. To illustrate, recent studies have highlighted the persistently elevated levels of EPU across global markets, which has had detrimental repercussions on firm performance (Dhole et al., 2021; Iqbal et al., 2020). The heightened volatility in EPU disrupts the predictability of future cash flows for businesses, consequently impeding their capacity to forecast expected financial inflows. Consequently, a decline in firm performance ensues. Exemplifying this, Hu

and Zhang (2021) reveal that EPU stemming from events like the Covid-19 pandemic erodes investments, escalates cost of capital, and ultimately diminishes overall firm valuation. The adverse influence of EPU becomes evident in its impact on crucial performance metrics such as return on assets, return on equity, net profit margin, and Tobin's Q, all of which serve as well-established proxies for assessing firm performance (Ahsan & Qureshi, 2021; Iqbal et al., 2020).

Nonetheless, the current body of research remains insufficient to definitively ascertain the impact of WCM on firm performance during high EPU. Additionally, it is important to recognise that global economic policy uncertainty (GEPU) can significantly influence a country's economic landscape, subsequently affecting decisions surrounding WCM and, consequently, firm performance. In its measurement of WCM, this study employs the CCC. Accordingly, this study proposes the following hypotheses:

H1 There is a significant relationship between CCC and GEPU
H2 CCC causes a decline in ROA during GEPU

2.3 CTA, WCM, and firm performance

The influence of taxes on financial decision-making in corporate finance dates back to at least Modigliani and Miller (1963) and continues to the current day (Graham, 2014). Tax avoidance is connected to asymmetric cost behaviour due to the fact that tax avoidance decreases a company's tax liability and increases its cash flow. Consequently, cash tax savings may be leveraged as a source of funding to generate more internal finances (Edwards et al., 2016). Graham et al. (2014) find that businesses with limited financial resources are more likely to actively manage their tax liabilities in order to generate cash savings. Concurrently, Law and Mills (2015) note that enterprises with limited resources engage in more aggressive tax planning tactics.

Furthermore, the role of tax avoidance extends as a mechanism to safeguard a company's cash flow during tumultuous periods, especially amid macroeconomic volatility. The hypothesis put forth in this study posits that firms facing financial adversity due to GEPU may resort to corporate tax avoidance as a hedging technique against volatile cash flows. The rationale

is rooted in the direct and indirect influence of tax avoidance on both current and future cash flows, given its potential to enhance cash inflows through tax obligation reduction (Khuong et al., 2020; Machdar, 2022). Minh Ha et al. (2021) substantiate this trend by noting the growing interest among firm managers in utilising tax avoidance as a financing avenue, recognising taxes' pivotal role in an array of corporate financial decisions encompassing risk management and organisational structure.

Temporary tax avoidance, as highlighted by these researchers, is one of the most significant sources of financing for corporate operations. From these considerations, it is evident that tax avoidance offers advantages from a variety of perspectives, such as shareholders increasing their assets in the form of dividends and companies having more funds to service debt and expand working capital. Hence, the efficient use of WCM helps firms to perform better. Businesses need to have effective WCM in place to guarantee their survival and growth over the long term and increase their performance and shareholders' value (Lyngstadaas, 2020).

Past studies demonstrate that CTA is pervasive and can have a positive impact on corporate value (Zhang et al., 2016), financing costs (Graham & Tucker, 2006), and capital structure (Lee et al., 2023). A considerable body of existing literature demonstrates the positive impact of CTA. According to Blouin (2014), tax avoidance may increase cash flows and net profit after tax, which is advantageous for shareholders. Graham et al. (2014) note that a larger percentage of CEOs of publicly-traded businesses feel that tax planning tactics aid in boosting earnings per share (EPS). By analysing large panel data from US firms, Blaylock (2016) demonstrates that tax avoidance remains significantly positively linked to future operating performance even in firms with comparatively poor governance. Additionally, there is no consistent evidence that tax avoidance implementation correlates with excessive or suboptimal investment decisions. Further, Houlder (2010) show that tax reduction may help a company retain more of its earnings.

Moreover, the practical effect of CTA is to increase shareholder value, making it an important business strategy, particularly for large corporations (Armstrong et al., 2015). Ling and Wahab (2019) demonstrate that because taxes account for a significant amount of the cash flow of the focal company, the transfer of funds from the state to shareholders should improve the wealth of shareholders. The findings of Goh et al. (2016) and Guenther et al. (2017) indicate that shareholders see tax avoidance positively, which may

be attributable to the fact that it results in tax savings. Concurrently, Drake et al. (2019) assert that investors place a positive value on tax avoidance strategies.

However, prior studies have mainly delved into the influence of taxes on a spectrum of corporate decisions, including internal capital allocation (Desai et al., 2004), maintenance of cash reserves (Foley et al., 2007), implementation of hedging strategies (Graham & Rogers, 2002), and integration of risk (Ljungqvist et al., 2017). While some studies have explored the impact of CTA on firm value, there remains a dearth of research examining the relationship between CTA and CCC in relation to its impact on ROA. This study aims to bridge this gap through the formulation of the following hypothesis:

H3 The interaction between CCC and CTA significantly impacts ROA

3. Methodology

3.1 Sampling and data collection

The study's sample includes a comprehensive analysis of 7,645 firms from the US, 1,107 firms from the UK, 681 firms from Germany, and 4,403 firms from China. The selection was based on the country of headquarters and exchange, spanning the period from 2006 to 2020. To initiate the study, data on the global economic policy uncertainty index was gathered from the Economic Policy Uncertainty Index website, which provides access to Baker et al.'s (2016) news-based GEPU index, which has been widely utilised by esteemed researchers in recent years (Ashraf & Shen, 2019; Dbouk et al., 2020; Reyad et al., 2022). Additionally, all financial data for the study was sourced from DataStream (Thomson Reuters Refinitiv Eikon).

3.2 Measurements of the variables

3.2.1 Working capital management

This study measures WCM using the CCC and its components. The CCC is a frequently used indicator of WCM because it measures the number of days

it takes a company to convert its inventory and accounts receivable into cash, less the number of days it takes to pay its suppliers (Boisjoly et al., 2020; Hossain & Zariyawati, 2022).

$$CCC = DSO + DIO - DPO \tag{1}$$

$$CCC = \left(\frac{Account\ Receivables}{Sales} \times 365\right) + \left(\frac{Inventory}{COGS} \times 365\right) - \left(\frac{Account\ Payables}{COGS} \times 365\right) \tag{2}$$

3.2.2 Global economic policy uncertainty

This study measures GEPU using Baker et al.'s (2016) global EPU index. The computation of GEPU follows the methodology established by Attig et al. (2021) and Gulen and Ion (2016), wherein it is derived as the natural logarithm of the 12-month arithmetic mean of the EPU index.

3.2.3 Corporate tax avoidance

Tax avoidance is measured by the effective tax rate (ETR). ETR is an appropriate measure to assess firms' tax avoidance behavior because it captures both permanent and temporary tax avoidance strategies (Aronmwan & Okaiwele, 2020).

$$ETR = \frac{(Total\ Tax\ Expense - Defferred\ Tax\ Expense)}{Pretax\ Income} \tag{3}$$

3.2.4 Firm performance

Profitability is a commonly used metric for evaluating a firm performance that essentially determines a firm's success or failure. The study uses ROA to measure the firm's profitability. ROA is calculated by dividing net income by total assets (Hu & Zhang, 2021).

3.2.5 Control variables

Sales growth (SG) is the percentage increase or decrease in sales that occurs over a certain time period (Reyad et al., 2022). Leverage (LEV) accounts for the influence of debt financing on working capital by calculating the cost

of debt relative to equity. Leverage is the ratio of total debt over total assets (Dbouk et al., 2020). The firm size (SIZE) is equal to the natural logarithm of the total assets of a firm (Attig et al., 2021).

3.4 Estimation technique and models

The study employs a quantitative data analysis approach using panel data methodology in STATA 15. The panel data methodology provides a variety of methods for investigating relationship among variables, including ordinary least squares (OLS), fixed-effects models (FE), random-effect models (RE), and generalised method of moments (GMM). The data analysis in this research begins with the utilisation of the following OLS model as the baseline regression model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mathcal{E}_{i,t} \quad (4)$$

Where Y indicates the dependent variable; β represents the estimated coefficient; X represents all the independent variables; and $\mathcal{E}_{i,t}$ indicates error term.

OLS regression, the most common form of linear regression, estimates correlation between variables under specific assumptions, requiring linearity, independence of observations, and continuous dependent variables. Yet, endogeneity can lead to biased and inconsistent parameter estimates. However, recognising the potential endogeneity issues associated with OLS regression, this research aims to address this concern by employing the Durbin–Wu–Hausman test. The Durbin–Wu–Hausman test is a widely recognised diagnostic tool used to assess the endogeneity of individual regressors (Janot et al., 2016). If the results of the Durbin–Wu–Hausman test indicate the presence of endogeneity in the OLS model, this study is prepared to adopt an alternative estimation methodology that can provide more robust and consistent estimates compared to OLS.

Therefore, to address these concerns, the current study utilises a two-step system GMM estimation approach, with dynamic panel models offering superior performance in cases of endogeneity, induced by reverse causality or omitted variables, compared to OLS, FE, and RE models (Leszczensky & Wolbring, 2022). The rationale behind this approach is that the two-step GMM estimator eliminates unobservable individual effects through first-

order differencing. Additionally, it incorporates lagged instrumental variables to account for the correlation between the difference in the dependent variable and the error term (Blundell & Bond, 1998).

According to Blundell and Bond (1998), the first-differenced GMM estimator proposed by Arellano and Bover (1995) may suffer from bias and imprecision when the series exhibit high persistence or when the variance of the individual-specific impact is substantial compared to the error variance. Hence, this study adopts Blundell and Bond's (1998) two-step GMM estimation approach, which has been demonstrated to be more efficient and robust. The dynamic panel model is presented below.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_{i,t} \quad (5)$$

Where $Y_{i,t}$ indicates the dependent variable for firm i at the time t; $Y_{i,-1}$ indicates the lag term of the dependent variable; β represents the estimated coefficient; X, represents all the independent variables for firm i at the time t; α_i represents time-invariant unobserved heterogeneity; and $\varepsilon_{i,t}$ represents idiosyncratic error.

3.4.1 Empirical models

The research models are meticulously structured in accordance with the study's objectives and hypotheses. The current study begins with below OLS models as the baseline regression models.

$$CCC = \beta_0 + \beta_1 GEPU + \beta_2 SG + \beta_3 LEV + \beta_4 SIZE + \varepsilon_{i,t} \quad (6)$$

$$ROA = \beta_0 + \beta_1 CCC*GEPU + \beta_2 SG + \beta_3 LEV + \beta_4 SIZE + \varepsilon_{i,t} \quad (7)$$

$$ROA = \beta_0 + \beta_1 CCC + \beta_2 CTA + \beta_3 CCC*CTA + \beta_4 SG + \beta_5 LEV + \beta_6 SIZE + \varepsilon_{i,t} \quad (8)$$

Here, equations 6 to 8 chronologically represent the three hypotheses of the study. However, the current study postulates that the OLS models will be subject to endogeneity issues. Hence, this study will employ an endogeneity test. If the OLS model contains endogeneity issues, this study will develop the following models using Blundell and Bond's (1998) two-step system GMM estimation.

$$CCC_{i,t} = \beta_0 + \beta_1 CCC_{i,t-1} + \beta_2 GEPU + \beta_3 SG + \beta_4 LEV + \beta_5 SIZE + \alpha_i + \varepsilon_{i,t} \quad (9)$$

Equation 9 aims to examine the impact of GEPU on CCC. Here, $CCC_{i,t}$ is the dependent variable; $CCC_{i,t-1}$ is the lagged dependent variable; *GEPU* indicates independent variable; and β_4, β_5, β_6 indicate the estimated coefficient of control variables (sales growth, leverage, and firm size).

$$ROA_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 CCC*GEPU + \beta_3 SG + \beta_4 LEV + \beta_5 SIZE + \alpha_i + \varepsilon_{i,t} \quad (10)$$

The GMM model in equation 10 will examine the effect of the CCC on ROA during GEPU using the interaction between CCC and GEPU. In this model, $ROA_{i,t}$ is the dependent variable; $ROA_{i,t-1}$ is the lagged dependent variable; and *CCC*GEPU* is the interaction variable.

$$ROA_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 CCC + \beta_3 CTA + \beta_4 CCC*CTA + \beta_5 SG + \beta_6 LEV + \beta_7 SIZE + \alpha_i + \varepsilon_{i,t} \quad (11)$$

In equation 11, the above model adds the interaction variable *CCC*CTA* to examine their effect on *ROA*. Here, *CTA* as a hedging technique used to examine how its association with *CCC* influence *ROA*.

4. Results and Discussions

4.1 Descriptive statistics

Table 1 displays the descriptive statistics for all variables encompassed in the research. As evident from the table, variations in the observations of each variable arise due to instances of missing data in specific years. Notably, the majority of variables exhibit standard deviation (SD) values that are lower than their respective mean values, indicative of data clustering around the mean. In contrast, the variable CTA stands out with a higher SD compared to its mean, pointing to data dispersion extending beyond the mean.

Table 1: Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Minimum	Maximum
ROA	66,512	3.690	0.588	-2.158	4.636
CCC	67,620	4.362	1.033	-0.699	6.191
GEPU	67,660	4.929	0.364	4.394	5.520
CTA	66,509	6.623	6.734	-2.463	22.541
SG	66,062	3.747	0.613	-1.109	5.095
LEV	66,479	3.427	0.766	0.000	5.111
SIZE	66,525	18.661	2.157	11.728	26.653

Note: Variables used in this table are return on assets (ROA), cash conversion cycle (CCC), global economic policy uncertainty (GEPU), corporate tax avoidance (CTA), sales growth (SG), leverage (LEV), and firm size (SIZE).

4.2 Correlation matrix

Preceding the empirical estimation, the study undertakes a correlation analysis to scrutinise the structure and extent of interrelationships among the variables. Presented in Table 2, the correlation coefficients reveal relatively modest values for certain explanatory variables, indicating a limited degree of association between them. Notably, when independent variables exhibit lower correlation, the potential for encountering multicollinearity issues diminishes. Nevertheless, it is noteworthy that this study identifies a strong correlation between CCC and ROA. It is important to underscore that relying solely on correlation analysis is insufficient to establish a causal relationship. Consequently, to delineate a causal connection between independent and dependent variables, more advanced econometric techniques are requisite.

Table 2: Correlation Matrix

	ROA	CCC	GEPU	CTA	SG	LEV	SIZE
ROA	1.000						
CCC	0.125	1.000					
GEPU	-0.093	-0.083	1.000				
CTA	-0.023	-0.019	-0.019	1.000			
SG	0.140	0.255	-0.154	0.007	1.000		
LEV	0.003	0.046	-0.069	0.063	0.109	1.000	
SIZE	0.088	0.146	0.014	-0.072	0.127	0.023	1.000

Note: Variables used in this table are return on assets (ROA), cash conversion cycle (CCC), global economic policy uncertainty (GEPU), corporate tax avoidance (CTA), sales growth (SG), leverage (LEV), and firm size (SIZE).

4.3 Regression analysis

4.3.1 Baseline regression analysis

This study begins its empirical analysis with an OLS baseline regression analysis (Table 3) to determine whether the OLS models' findings are susceptible to endogeneity problems. However, the first model, as illustrated in Table 3, reports a significantly negative relationship between GEPU and the CCC, indicating a preference among firms to shorten their CCC periods during heightened GEPU. Additionally, the result from Model 2 reveals a positive correlation between the interaction variable CCC*GEPU and ROA, signifying that the CCC exacerbates the negative impact of GEPU on firms' ROA. Furthermore, within this context, the interaction of CCC and CTA exhibits a significantly positive association with ROA (Model 3).

Table 3: OLS Regression Analysis

Variables	Model 1 DV: CCC	Model 2 DV: ROA	Model 3 DV: ROA
GEPU	-0.133*** (0.011)		
CCC			-0.013*** (0.003)
CCC*GEPU		0.007*** (0.001)	
CTA			-0.052*** (0.002)
CCC*CTA			0.012*** (0.007)
SG	0.382*** (0.006)	0.115*** (0.004)	0.105*** (0.004)
LEV	0.021*** (0.005)	-0.010*** (0.003)	-0.009*** (0.003)
SIZE	0.055*** (0.002)	0.017*** (0.001)	0.015*** (0.001)
Constant	2.532*** (0.069)	2.830*** (0.024)	3.110*** (0.026)
Endogeneity test (Durbin-Wu-Hausman) P-value	0.000	0.000	0.000

Notes: Standard errors are in parentheses ***p < 0.01, **p < 0.05, *p < 0.1. Variables used in this table are return on assets (ROA), cash conversion cycle (CCC), global economic policy uncertainty (GEPU), corporate tax avoidance (CTA), sales growth (SG), leverage (LEV), and firm size (SIZE).

However, it is crucial to acknowledge that relying solely on the OLS results is not appropriate due to the identified endogeneity concerns, as confirmed by the Durbin-Wu-Hausman test. A significant result in the Durbin-Wu-Hausman test for an explanatory variable indicates its endogenous nature and its association with the residuals or error term. As shown in Table 3, the null hypothesis of the Durbin-Wu-Hausman test is rejected, providing evidence of the presence of an endogeneity issue within the empirical model. Therefore, alternative estimation techniques are necessary to obtain more reliable and unbiased estimates.

4.3.2 Two-step system GMM analysis

This study adopts a robust approach to address endogeneity concerns by employing dynamic panel data regression analysis with a two-step system GMM estimation. The current study includes first-order AR(1) correlations, second-order AR(2) correlations, and the Hansen test to validate the two-step system GMM estimation method. The Hansen test of overidentifying restrictions measures the validity of instruments and determines whether models have been accurately defined. First- and second-order serial correlations are measured by AR(1) and AR(2), respectively.

Models 1 and 2 correspond to the first and second hypotheses of the study. The results obtained through the GMM estimation consistently support the study's first hypothesis, which suggests a significantly negative relationship between GEPU and CCC (Table 4). This finding indicates that as GEPU levels increase, businesses tend to accelerate the conversion of their WC investments into cash. This strategic response is driven by the fact that firms often face capital constraints during periods characterised by high GEPU (Bloom et al., 2018). Furthermore, a closer examination of Model 2 in Table 4 reveals an interesting insight: the interaction term CCC*GEPU shows a positive correlation with ROA. The positive correlation between the interaction term CCC*GEPU and ROA suggests that the combined effect of CCC and GEPU has a detrimental influence on ROA. When CCC lengthens, it indicates that a company takes more time to convert its WC investments into cash. This implies that the company has higher WC requirements, which can tie up resources and potentially reduce profitability. Additionally, when GEPU is high, it signifies increased uncertainty in global economic policies, which can further impact a company's operations and profitability.

Table 4: GMM Estimates for Models 1 and 2

Variables	Model 1 DV: CCC	Model 2 DV: ROA
L.CCC	0.738*** (0.045)	
L.ROA		1.900*** (0.133)
GEPU	-0.057*** (0.014)	
CCC*GEPU		0.007*** (0.002)
SG	0.164*** (0.011)	0.076*** (0.012)
LEV	-0.016** (0.007)	0.050*** (0.015)
SIZE	0.042*** (0.003)	-0.043*** (0.005)
Constant	0.067 (0.190)	-3.205*** (0.501)
AR(1) P-value	0.000	0.000
AR(2) P-value	0.792	0.736
Hansen Test P-value	0.257	0.668

Notes: Standard errors are in parentheses ***p < 0.01, **p < 0.05, *p < 0. Cash conversion cycle (CCC) is the dependent variable in Model 1; L.CCC is the lagged CCC (lagged dependent variable); return on assets (ROA) is the dependent variable in Model 2; L.ROA is the lagged ROA (lagged dependent variable); CCC*GEPU is the interaction variable between cash conversion cycle (CCC) and global economic policy uncertainty (GEPU); sales growth (SG), leverage (LEV), and firm size (SIZE) are control variables. First- and second-order serial correlations are measured by AR(1) and AR(2), respectively; the Hansen test of overidentifying restrictions measures the validity of instruments and determines whether models have been accurately defined.

Therefore, when CCC interacts with GEPU, it exacerbates the negative impact on ROA. In other words, as both CCC lengthens and GEPU rises, the negative effect on ROA becomes more pronounced. This highlights the importance of effectively managing WC and adapting to economic uncertainties to maintain a healthy level of profitability.

The study's third hypothesis suggests that the interaction between CCC and CTA significantly affects ROA. Consistently, the current study reveals that CCC*CTA has a significant positive impact on ROA, as evidenced in Table 5. This means that when both CCC and CTA are present, they

contribute to an increase in the ROA. The positive association suggests that the combination of these variables has a beneficial effect on the financial performance of the entity being studied. Accordingly, when the CCC and CTA strategies align effectively, a synergistic effect can emerge. A company that efficiently manages its WC requirements while also implementing intelligent tax avoidance tactics can reap dual benefits. The cash saved through tax reduction strategies can be utilised to optimise WC, thereby further improving the cash conversion cycle.

Table 5: GMM Estimates for Model 3

Variables	**Model 3** **DV: ROA**
L.ROA	0.278 (0.188)
CCC	-2.521*** (0.913)
CTA	-2.014*** (0.717)
CCC*CTA	0.445*** (0.159)
SG	0.078*** (0.025)
LEV	0.082** (0.036)
SIZE	-0.031** (0.015)
Constant	14.183*** (4.895)
AR(1) P-value	0.000
AR(2) P-value	0.128
Hansen Test P-value	0.441

Notes: Standard errors are in parentheses ***p < 0.01, **p < 0.05, *p < 0.1. Return on assets (ROA) is the dependent variable in Model 3; L.ROA is the lagged ROA (lagged dependent variable); CCC*CTA is the interaction variable between cash conversion cycle (CCC) and corporate tax avoidance (CTA); sales growth (SG), leverage (LEV), and firm size (SIZE) are control variables. First- and second-order serial correlations are measured by AR(1) and AR(2), respectively; The Hansen test of overidentifying restrictions measures the validity of instruments and determines whether models have been accurately defined.

In simpler terms, by effectively managing taxes, a company can increase its cash flows, which, in turn, positively impacts its ability to finance WC needs and other operational requirements. This enhanced cash flow can contribute to an improved ROA. This finding highlights the importance of integrating WCM and tax strategies to enhance a company's financial performance. By aligning these two aspects, firms can unlock potential synergies that lead to improved profitability and overall financial health. This relationship is underpinned by the concept that strategic tax management can effectively curtail tax payments as a fraction of pre-tax revenue, fostering augmented cash inflows and, subsequently, fortifying overall profitability (Blouin, 2014; Goh et al., 2016).

The existing body of research accentuates these notions further, demonstrating the pervasiveness of CTA and its multi-dimensional impact. Previous studies reported its positive influence on corporate value (Kim et al., 2011), financing costs (Graham & Tucker, 2006), and capital structure (Lee et al., 2023). As highlighted by Blouin (2014), tax avoidance strategies possess the potential to amplify cash flows and net post-tax profits, thereby positively impacting firm value. Graham et al. (2014) suggest that a notable proportion of CEOs within publicly traded enterprises perceive tax planning manoeuvres as instrumental in augmenting earnings per share (EPS). An exhaustive analysis of extensive panel data from US firms by Blaylock (2016) substantiates that the positive association between tax avoidance and future operational performance persists, even within firms characterised by comparatively weaker governance structures.

These findings encapsulate the notion that tax avoidance bolsters corporate performance through amplified cash flows that, in turn, facilitate the financing of working capital needs. Consequently, firms can adeptly strike equilibrium between liquidity and profitability by adroitly employing tax avoidance strategies. This concurs with the trade-off theory, which advocates that superior firm performance necessitates a trade-off between liquidity and profitability (Dakua, 2019; Myers & Majluf, 1984).

However, the findings presented in Table 5, which cover the entire study sample, do not offer a conclusive outcome. In order to obtain a more comprehensive understanding, it is essential to analyse the results on a country-by-country basis. Therefore, to explore the specific dynamics within individual countries, Table 6 has been included.

Table 6: Country-Specific Results

Model 3	DV: Return on assets (ROA)			
	US	**UK**	**Germany**	**China**
L.ROA	0.755*** (0.044)	0.537*** (0.104)	-0.054 (0.093)	0.190 (0.177)
CCC	1.297** (0.691)	-0.004** (0.002)	-1.783*** (0.622)	-0.078** (0.033)
CTA	0.604** (0.262)	-0.120*** (0.042)	-1.236*** (0.002)	-3.137** (1.458)
CCC*CTA	-0.134** (0.058)	0.001** (0.001)	0.510*** (0.180)	0.023** (0.010)
SG	0.065*** (0.015)	0.209*** (0.044)	-0.192 (0.158)	0.106*** (0.025)
LEV	0.141*** (0.024)	-0.063*** (0.024)	0.529** (0.222)	-0.117*** (0.037)
SIZE	-0.033** (0.015)	0.084*** (0.018)	-0.089 (0.055)	-0.058*** (0.020)
Constant	-5.102** (2.245)	0.163 (0.311)	5.077*** (0.949)	14.832*** (5.634)
AR(1) P-value	0.007	0.009	0.009	0.024
AR(2) P-value	0.292	0.264	0.202	0.181
Hansen test P-value	0.546	0.690	0.146	0.514

Notes: Standard errors are in parentheses ***p < 0.01, **p < 0.05, *p < 0.1. Return on assets (ROA) is the dependent variable in Model 3; L.ROA is the lagged ROA (lagged dependent variable); CCC*CTA is the interaction variable between cash conversion cycle (CCC) and corporate tax avoidance (CTA); sales growth (SG), leverage (LEV), and firm size (SIZE) are control variables. First- and second-order serial correlations are measured by AR(1) and AR(2), respectively; The Hansen test of overidentifying restrictions measures the validity of instruments and determines whether models have been accurately defined.

In the context of US-based firms, when CCC and CTA interact with each other, it leads to a negative effect on ROA (Table 6). According to the result, when US-based firms simultaneously engage in CTA and have a longer CCC, it results in a decrease in their ROA. This result indicates that the combination of these two factors has a detrimental impact on the financial performance of US-based firms. It emphasises the significance of considering both the efficiency of cash conversion and the extent of CTA when evaluating the overall profitability of these firms.

This deviation from the general outcome in Table 5 can be attributed to several factors. US-based entities that engage in tax avoidance may encounter elevated equity costs (Goh et al., 2016) and increased expenses associated with debt (Dhawan et al., 2020). Tax-avoidant firms might face higher costs of equity capital due to investors perceiving them as riskier, and they may also experience higher borrowing costs as lenders view them as more risky borrowers. These heightened financial costs can undermine the benefits derived from tax savings, ultimately resulting in US firms' reduced profitability.

Contrary to US firms, firms in the UK, Germany, and China show a positive correlation between CCC*CTA and ROA (Table 6). The divergent outcomes can be attributed to various factors. In the UK, the legality of tax avoidance and the availability of tax evasion schemes for corporate entities may explain the differences (Sikka, 2015). In China, the government's proactive implementation of 'tax and fee reduction' initiatives has reduced the tax burden on domestic firms, promoting economic well-being and market confidence (Han et al., 2021). Germany's high uncertainty avoidance score, indicating a strong inclination to mitigate uncertainty, is noteworthy. In the context of EPU, German firms may face decision-making difficulties and postpone investments. Adopting CTA as a hedging strategy becomes a pragmatic approach to manage associated risks.

Therefore, it is crucial to consider these country-specific factors when analysing the relationship between CCC*CTA and ROA. This is because there is a growing interest among firm managers in utilising tax avoidance as a means of funding essential business operations (Minh Ha et al., 2021). The heightened attention towards tax avoidance is driven by the recognition that taxes have a significant impact on corporate financial decisions, including risk management and organisational structure (Zhang et al., 2018). As a result, modern firm managers acknowledge the potential benefits of using tax avoidance as a source of financing for their operations. Taxes play a pivotal role in various financial decisions, and by directing tax savings into investments, firms can strengthen their value and ultimately achieve improved performance.

5. Conclusion

Managing working capital effectively and its subsequent impact on firm performance become crucial considerations amid global economic policy

uncertainty. This study seeks to investigate how GEPU affects WCM practices and firm performance.

The study reveals a significant and negative correlation between GEPU and the CCC. As GEPU levels increase, businesses tend to expedite the conversion of working capital investments into cash as a strategic response to the uncertain economic environment. Additionally, the interaction term CCC*GEPU shows a positive correlation with ROA, indicating that the interaction between CCC and GEPU has a detrimental effect on ROA, highlighting the complexities of managing WC under heightened economic uncertainty.

Furthermore, the research explores the impact of the interaction between CTA and WCM on firm performance. The study consistently demonstrates that the interaction term CCC*CTA has a significant and positive impact on ROA. When the CCC aligns with effective tax avoidance strategies, a synergistic effect emerges. Firms that effectively manage working capital while employing prudent tax avoidance tactics can benefit from both reduced taxes and optimized WC, leading to improved efficiency in the CCC and overall ROA.

However, it is crucial to note that these findings pertain to the entire sample encompassing the USA, the UK, Germany, and China. When scrutinising the influence of the CCC*CTA interaction on ROA at the country level, a nuanced scenario unfolds. The research reveals a negative impact of this interaction on ROA for US firms, whereas there is a positive impact for firms in the UK, Germany, and China.

In conclusion, the interaction between the CCC and CTA significantly influences a firm's ROA, with strategic management enhancing liquidity, cash flows, and profitability. However, achieving this balance requires a cautious approach that considers both short-term gains and long-term sustainability, particularly amid economic uncertainty. Consequently, during market volatility, businesses may resort to tax avoidance strategies to bolster working capital and enhance firm performance, highlighting the significance of supportive tax policies during periods of global economic policy uncertainty. Thus, this study contributes to the literature on operational hedging through corporate tax avoidance.

References

Ahsan, T., & Qureshi, M. A. (2021). The nexus between policy uncertainty, sustainability disclosure and firm performance. *Applied Economics*, *53*(4), 441–453. https://doi.org/10.1080/00036846.2020.1808178

Alm, J., Liu, Y., & Zhang, K. (2019). Financial constraints and firm tax evasion. *International Tax and Public Finance*, *26*, 71–102. https://doi.org/10.1007/s10797-018-9502-7

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Armstrong, C. S., Blouin, J. L., Jagolinzer, A. D., & Larcker, D. F. (2015). Corporate governance, incentives, and tax avoidance. *Journal of Accounting and Economic*s, *60*(1), 1–17. https://doi.org/10.1016/j.jacceco.2015.02.003

Aronmwan, E. J., & Okaiwele, I. M. (2020). Measuring tax avoidance using effective tax rate: Concepts and implications. *Journal of Accounting and Management*, *10*(1), 27–38. https://dj.univ-danubius.ro/index.php/JAM/article/view/199

Ashraf, B. N., & Shen, Y. (2019). Economic policy uncertainty and banks' loan pricing. *Journal of Financial Stability*, *44*, 100695. https://doi.org/10.1016/j.jfs.2019.100695

Attig, N., El Ghoul, S., Guedhami, O., & Zheng, X. (2021). Dividends and economic policy uncertainty: International evidence. *Journal of Corporate Finance*, *66*, 101785. https://doi.org/10.1016/j.jcorpfin.2020.101785

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *Quarterly Journal of Economics*, *131*(4), 1593–1636. https://doi.org/10.1093/qje/qjw024

Bernanke, B. S., Gertler, M., & Gilchrist, S. (1996). The financial accelerator and the flight to quality. *Review of Economics and Statistics*, *78*, 1–15. https://doi.org/10.2307/2109844

Bhatia, P., & Chakrabarti, P. (2022). Does group affiliation impact financial constraints? Evidence from India. *Managerial Finance*, *48*(6), 917–938. https://doi.org/10.1108/MF-08-2021-0392

Blaylock, B. S. (2016). Is tax avoidance associated with economically significant rent extraction among US firms? *Contemporary Accounting*

Research, *33*(3), 1013–1043. https://doi.org/10.1111/1911-3846.12174

Blouin, J. (2014). Defining and measuring tax planning aggressiveness. *National Tax Journal*, *67*(4), 875–899. https://doi.org/10.17310/ntj.2014.4.06

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Boisjoly, R. P., Conine Jr, T. E., & McDonald IV, M. B. (2020). Working capital management: Financial and valuation impacts. *Journal of Business Research*, *108*, 1–8. https://doi.org/10.1016/j.jbusres.2019.09.025

Braimah, A., Mu, Y., Quaye, I., & Ibrahim, A. A. (2021). Working capital management and SMEs profitability in emerging economies: The Ghanaian case. *SAGE Open*, *11*(1), 2158244021989317. https://doi.org/10.1177/21582440219893

Cheng, X. (2019). The impact of economic policy uncertainty on the efficiency of corporate working capital management—The evidence from China. *Modern Economy*, *10*(3), 811–827. https://doi.org/10.4236/me.2019.103054

Dakua, S. (2019). Effect of determinants on financial leverage in Indian steel industry: A study on capital structure. *International Journal of Finance and Economics*, *24*(1), 427–436. https://doi.org/10.1002/ijfe.1671

Danisman, G. O., Demir, E., & Ozili, P. (2021). Loan loss provisioning of US banks: Economic policy uncertainty and discretionary behavior. *International Review of Economics and Finance*, *71*, 923–935. https://doi.org/10.1016/j.iref.2020.10.016

Dbouk, W., Moussawi-Haidar, L., & Jaber, M. Y. (2020). The effect of economic uncertainty on inventory and working capital for manufacturing firms. *International Journal of Production Economics*, *230*, 107888. https://doi.org/10.1016/j.ijpe.2020.107888

Desai, M. A., Foley, C. F., & Hines Jr, J. R. (2004). A multinational perspective on capital structure choice and internal capital markets. *Journal of Finance*, *59*(6), 2451–2487. https://doi.org/10.1111/j.1540-6261.2004.00706.x

Dhole, S., Liu, L., Lobo, G. J., & Mishra, S. (2021). Economic policy uncertainty and financial statement comparability. *Journal of Accounting and Public Policy*, *40*(1), 106800. https://doi.org/10.1016/j.jaccpubpol.2020.106800

Drake, K. D., Lusch, S. J., & Stekelberg, J. (2019). Does tax risk affect investor valuation of tax avoidance? *Journal of Accounting, Auditing and Finance*, *34*(1), 151–176. https://doi.org/10.1177/0148558X17692674

Edwards, A., Schwab, C., & Shevlin, T. (2016). Financial constraints and cash tax savings. *Accounting Review*, *91*(3), 859–881. https://doi.org/10.2308/accr-51282

Fernández-López, S., Rodeiro-Pazos, D., & Rey-Ares, L. (2020). Effects of working capital management on firms' profitability: Evidence from cheese-producing companies. *Agribusiness*, *36*(4), 770–791. https://doi.org/10.1002/agr.21666

Foley, C. F., Hartzell, J. C., Titman, S., & Twite, G. (2007). Why do firms hold so much cash? A tax-based explanation. *Journal of Financial Economics*, *86*(3), 579–607. https://doi.org/10.1016/j.jfineco.2006.11.006

Goh, B. W., Lee, J., Lim, C. Y., & Shevlin, T. (2016). The effect of corporate tax avoidance on the cost of equity. *Accounting Review*, *91*(6), 1647–1670. https://doi.org/10.2308/accr-51432

Graham, J. R., & Rogers, D. A. (2002). Do firms hedge in response to tax incentives? *Journal of Finance*, *57*(2), 815–839. https://doi.org/10.1111/1540-6261.00443

Graham, J. R., & Tucker, A. L. (2006). Tax shelters and corporate debt policy. *Journal of Financial Economics*, *81*(3), 563–594. https://doi.org/10.1016/j.jfineco.2005.09.002

Graham, J. R., Hanlon, M., Shevlin, T., & Shroff, N. (2014). Incentives for tax planning and avoidance: Evidence from the field. *Accounting Review*, *89*(3), 991–1023. https://doi.org/10.2308/accr-50678

Guenther, D. A., Wilson, R. J., & Wu, K. (2019). Tax uncertainty and incremental tax avoidance. *Accounting Review*, *94*(2), 229–247. https://doi.org/10.2308/accr-52194

Han, X., Wang, J., & Cheng, H. (2021). The effect of corporate tax avoidance on salary distribution—Empirical evidence from publicly listed companies in China. *International Review of Financial Analysis*, *78*, 101917. https://doi.org/10.1016/j.irfa.2021.101917

Hoberg, G., & Moon, S. K. (2017). Offshore activities and financial vs operational hedging. *Journal of Financial Economics*, *125*(2), 217–244. https://doi.org/10.1016/j.jfineco.2017.05.003

Hossain, M. R., & Zariyawati, M. (2022). Uncertainty in working capital management and firm performance: A Covid-19 perspective.

International Journal of Economics and Management, *16*, 117–130. http://doi.org/10.47836/ijeam.16.S1.008

Houlder, V. (2010, August 20). Tax officials to soften stance on avoidance. *Financial Times*. https://www.ft.com/content/cd1f1618-abcb-11df-9f02-00144feabdc0

Hu, S., & Zhang, Y. (2021). Covid-19 pandemic and firm performance: Cross-country evidence. *International review of Economics and Finance*, *74*, 365–372. https://doi.org/10.1016/j.iref.2021.03.016

Iqbal, U., Gan, C., & Nadeem, M. (2020). Economic policy uncertainty and firm performance. *Applied Economics Letters*, *27*(10), 765–770. https://doi.org/10.1080/13504851.2019.1645272

Janot, A., Vandanjon, P. O., & Gautier, M. (2016). A revised Durbin-Wu-Hausman test for industrial robot identification. *Control Engineering Practice*, *48*, 52–62. https://doi.org/10.1016/j.conengprac.2015.12.017

Khuong, N. V., Liem, N. T., Thu, P. A., & Khanh, T. H. T. (2020). Does corporate tax avoidance explain firm performance? Evidence from an emerging economy. *Cogent Business and Management*, *7*(1), 1780101. https://doi.org/10.1080/23311975.2020.1780101

Law, K. K., & Mills, L. F. (2015). Taxes and financial constraints: Evidence from linguistic cues. *Journal of Accounting Research*, *53*(4), 777–819. https://doi.org/10.1111/1475-679X.12081

Lee, Y., Shevlin, T., & Venkat, A. (2023). The effect of tax avoidance on capital structure choices. *Journal of the American Taxation Association*, *45*(1), 91–115. https://doi.org/10.2308/JATA-19-049

Leszczensky, L., & Wolbring, T. (2022). How to deal with reverse causality using panel data? Recommendations for researchers based on a simulation study. *Sociological Methods and Research*, *51*(2), 837–865. https://doi.org/10.1177/0049124119882473

Ling, T. W., & Abdul Wahab, N. S. (2019). Components of book tax differences, corporate social responsibility and equity value. *Cogent Business and Management*, *6*(1), 1617024. https://doi.org/10.1080/23311975.2019.1617024

Ljungqvist, A., Zhang, L., & Zuo, L. (2017). Sharing risk with the government: How taxes affect corporate risk taking. *Journal of Accounting Research*, *55*(3), 669–707. https://doi.org/10.1111/1475-679X.12157

Lyngstadaas, H. (2020). Packages or systems? Working capital management and financial performance among listed US manufacturing firms. *Journal*

of Management Control, *31*(4), 403–450. https://doi.org/10.1007/s00187-020-00306-z

Machdar, N. M. (2022). Does tax avoidance, deferred tax expenses and deferred tax liabilities affect real earnings management? Evidence from Indonesia. *Institutions and Economies*, *14*(2), 117–148. https://doi.org/10.22452/IJIE.vol14no2.5

Mayberry, M. (2012). *Tax avoidance and investment: Distinguishing the effects of capital rationing and overinvestment* [Doctoral dissertation]. Texas A&M University, United States. https://core.ac.uk/reader/13642810

Minh Ha, N., Tuan Anh, P., Yue, X. G., & Hoang Phi Nam, N. (2021). The impact of tax avoidance on the value of listed firms in Vietnam. *Cogent Business and Management*, *8*(1), 1930870. https://doi.org/10.1080/23311975.2021.1930870

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review*, *48*(3), 261–297. https://www.jstor.org/stable/1809766

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *American Economic Review*, 433–443. https://www.jstor.org/stable/1809167

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Ozdemir, O., Erkmen, E., & Han, W. (2023). EPU and financial performance in the hospitality and tourism industry: Moderating effect of CSR, institutional ownership and cash holding. *Tourism Management*, *98*, 104769. https://doi.org/10.1016/j.tourman.2023.104769

Rehman, M. U., Sensoy, A., Eraslan, V., Shahzad, S. J. H., & Vo, X. V. (2021). Sensitivity of US equity returns to economic policy uncertainty and investor sentiments. *North American Journal of Economics and Finance*, *57*, 101392. https://doi.org/10.1016/j.najef.2021.101392

Reyad, H. M., Zariyawati, M. A., Ong, T. S., & Muhamad, H. (2022). The impact of macroeconomic risk factors, the adoption of financial derivatives on working capital management, and firm performance. *Sustainability*, *14*(21), 14447. https://doi.org/10.3390/su142114447

Sawarni, K. S., Narayanasamy, S., & Ayyalusamy, K. (2020). Working

capital management, firm performance and nature of business: An empirical evidence from India. *International Journal of Productivity and Performance Management*, *70*(1), 179–200. https://doi.org/10.1108/IJPPM-10-2019-0468

Sikka, P. (2015). No accounting for tax avoidance. *Political Quarterly*, *86*(3), 427–433. https://doi.org/10.1111/1467-923X.12175

Zariyawati, M. A., & Reyad, H. M. (2022). Changes of working capital management and firm value in Thailand and Singapore. *Global Business and Economics Review*, *27*(2), 149–166. https://doi.org/10.1504/GBER.2022.125045

Zhang, C., Cheong, K. C., & Rasiah, R. (2016). Corporate tax avoidance and performance: Evidence from China's listed companies. I*nstitutions and Economies*, 61–83. https://ijie.um.edu.my/index.php/ijie/article/view/5043

Zhang, C., Cheong, K. C., & Rasiah, R. (2018). The extreme outcomes of corporate tax management: *Evidence from Chinese listed enterprises. Institutions and Economies*, 19–52. https://ejournal.um.edu.my/index.php/ijie/article/view/9552

Institutions and Economies
Vol. 17, No. 4, October 2025, pp. 81-106 https://doi.org/10.22452/IJIE.vol17no4.4

Effects of Foreign Direct Investment Inflows on Economic Growth and Human Capital in VISTA Countries

Leward Jeke,[a] Sandisiwe Matitiba,[b] and Richard Apau[c]

Abstract: *This study examines the effect of foreign direct investment (FDI) on the economic growth and human capital of VISTA (Vietnam, Indonesia, South Africa, Turkey, and Argentina) countries. Using time series data spanning from 1990 to 2017, the study employs the autoregressive distributed lag (ARDL) technique to analyse the short and long-run relationships between the interacting variables. The analysis finds a long-run relationship between economic growth, FDI, trade openness, capital formation, primary school enrolment, and inflation over the sampled period. Specifically, FDI drives the direction of growth of VISTA countries' economies, where it is positive for Indonesia but negative for the rest of the countries in the sample. This implies that optimisation of the benefits of FDI flows is dependent on country-specific and systemic characteristics, where economies with sophisticated financial structures benefit positively compared to less sophisticated economies. In addition, the results indicate that FDI has a long-run positive impact on human capital in most VISTA countries, except for South Africa and Turkey, while it has shown a short-run negative effect on human capital in Vietnam. Policy initiatives should be focused on addressing systemic inefficiencies to optimise the benefits of FDI inflows on economic growth and human capital development.*

Keywords: Economic growth; Human capital; FDI; VISTA countries; ARDL model
JEL Classification: E00, E22, E24

[a] Department of Economics, Nelson Mandela University, Port Elizabeth, South Africa. *Email: leward.jeke@mandela.ac.za*. ORCID ID: 0000-0002-8145-4324
[b] Department of Economics, Nelson Mandela University, Port Elizabeth, South Africa. *Email: s215150988@mandela.ac.za.*
[c] Corresponding author. Department of Economics, Nelson Mandela University, Port Elizabeth, South Africa. *Email: owura.apau@yahoo.com.* ORCID ID: 0000-0003-2712-3169

1. Introduction

The flow of foreign direct investment into emerging economies continues to assume ascending trajectories, following the implementation of trade liberalisation policies around the world (Bose & Kohli, 2018). This has resulted in the elimination of restrictive investment regulations, which allows for fluidity of liquidity across international borders. In the span of five years, between 2015 and 2019, the volume of capital flows into emerging economies increased from USD671.47 million to USD680.23 million (UNCTAD, 2021). In 2015, the influx of FDI to emerging markets stood at USD671.47 million but declined by 2.23% at the end of 2016 to USD656.47 million. The volume of investor capital in emerging markets recovered from the previous year's decline and rose by 3.97% to USD682.53 million in 2017. This declined by 0.65% to USD678.08 million the following year, after which it rose again by 0.32% to USD680.23 million in 2019 (UNCTAD, 2021).

FDI is generally expected to exert a significant positive impact on the economic and human development of emerging markets, particularly for the VISTA countries—namely Vietnam, Indonesia, South Africa, Turkey, and Argentina. This is because these emerging economies have been major beneficiaries of FDI flows over the specified period. However, the macroeconomic and human development outlooks of VISTA countries continue to be on a declining trajectory. These emerging markets exhibit identical traits in terms of labour skill level, unemployment, wealth and income distribution levels, and general standard of living. These dynamics imply that the effect of FDI flows on economic growth and human capital is largely dependent on country-specific characteristics, in terms of financial system robustness and trends in socio-economic indicators, such as unemployment and access to basic social amenities.

The unemployment rate in South Africa continues to be on the rise, standing at 33.9% at the end of Q2 2022, while the gross domestic product rate declined within the same period by 0.7% (Statssa, 2022). These statistics reflect the growing levels of social inequality among various segments of the population, relative to basic social amenities, like a regular supply of water, electricity, and food. Turkey's unemployment rate was 9.60% as of the end of August 2022, dropping from 10% the month prior, and its GDP contracted because of minimal FDI inflow because of the uncertainties surrounding a

structural adjustment framework in the financial sector (CEIC Data, 2022; OECD, 2018). Argentina, on the other hand, is ranked the fourth-highest inward FDI stock in the region but has been experiencing high levels of corruption (Guiterrez, 2015). Poverty is still a major challenge in the country, affecting one-third of the population, coupled with insufficient skills, low labour income, poor access to quality public services, and informal employment (OECD, 2017). This evidence shows the prevalence of similar developmental challenges across the various VISTA economies which requires strategic policy interventions.

Managers of these economies have implemented significant deregulation policies as a means of attracting major foreign investors to boost economic growth. VISTA countries share similar characteristics, such as a diverse and dynamic economy and a young growing labour force (Uyar & Gokce, 2017). The combined economies of the countries are considered an important market structure for a paradigm shift in the global context relative to wealth distribution across advanced and developing nations because of their potential for rapid growth (Uyar & Gokce, 2017). Prior studies of the effects of FDI on macroeconomic dynamics are generally focused on the economies of developing countries. Also, the analyses of FDI effects on emerging markets do not consider the unique characteristics of the countries involved. However, VISTA countries exhibit distinct characteristics that may influence the direction of FDI impact; and given that the literature is limited in terms of the dynamics between FDI and economic growth, further investigation is warranted.

Moreover, the existing literature on the influence of FDI on the macroeconomic dynamics of VISTA countries does not capture its impact on human capital, although investors' trading decisions may determine the level of human resource development, especially in emerging economies (Ali & Mingque, 2018; Nguyen et al., 2018). As such, this study analyses the effects of FDI on the economic growth of VISTA countries while accounting for its effect on human capital. The findings of the study will serve as important reference to drive policy regarding financial market regulations and trade liberalisation, thus making a significant contribution to the literature on FDI growth dynamics.

The remainder of the paper is organised as follows. Section 2 presents the literature, Section 3 details the data sources and methodology, Section 4 discusses the results, and Section 5 concludes with policy recommendations.

2. Literature review

2.1 Theoretical framework

FDI continues to remain an important source of foreign capital for emerging market economies, including VISTA countries, where its effect is visible through the direction of macroeconomic dynamics and human development metrics. Emerging economies are thus expected to reflect the benefits of sustained FDI inflow in terms of improved standards in education, technology, infrastructure, and health (OECD, 2002). This anticipation of FDI flow has culminated in the emergence of different theories to explain the dynamic relationship between FDI, macroeconomic trends, and social development across various countries in different regions of the world. Based on the literature, the Harrod-Domar model and endogenous growth theories are suited for explaining the effect of FDI on economic growth and human capital.

Explanations posited under the Harrod-Domar theory (Tarasov & Tarasova, 2019) suggest that increasing investment not only promotes total demand, which leads to increased national income, but includes total supply, which leads to increased productivity. In this way, this theory is applicable in holistic development planning about the determination of the requisite resources for the achievement of high growth and is useful in establishing frameworks for the inclusion of technology in national development strategy (Chetty & Pradhan, 2020). Furthermore, this theory demonstrates that financial markets are characterised by unstable equilibrium growth, thus requiring strategic policy interventions to engender sustained growth momentum (Hotamisli, 2009). Capital flows to emerging economies are expected to stimulate growth through increased savings and high productivity. However, most emerging economies are unable to accumulate savings because they largely depend on external funding to finance domestic development projects (Thong & Hao, 2019). As such, the inclusion of technological innovation in critical sectors of the economy is essential to ensure efficiency and rapidity in production and service delivery while enabling human capital development.

Based on the preceding discussion, the endogenous growth theory is likewise relevant in explaining the dynamics between FDI, economic growth, and human capital development. According to Jones (2019), the

theory implies that technological change is the result of researchers and entrepreneurs who respond to economic incentives. Knowledge is derived from human capital, while knowledge drives technical renovation and improves quality of life. As a result, investment in knowledge exerts a long-run positive impact on economic growth as the flow of new technology from advanced economies to their developing and emerging counterparts support employment creation and labour skill enhancement. Essentially, the theory asserts the importance of improving productivity to obtain faster innovation and more investment in human capital. In this context, the study analyses the dynamics of FDI within the framework of endogenous growth theory to provide explanations for its effect on the economies and human capital of VISTA countries.

2.2 Review of empirical studies

Kaulihowa and Adjasi's (2019) nonlinear analysis of the interaction between FDI and human capital using a generalised method of moments (GMM) model show that FDI inflows constitute a major financing source for the sustenance of human resource development and skill training programmes of host countries, through increased primary and tertiary education enrolment and learning facility provision. This implies that an increase in the inflow of FDI promotes the transfer and development of critical knowledge and technical skills necessary for human capital improvement and economic growth. Similarly, findings from Elboiashi (2015) on the effect of FDI on economic growth vis-à-vis host country characteristics suggest that FDI inflows in general exert a positive impact on economic growth and sustainable development. The analysis shows that specific macroeconomic dynamics, including human capital, infrastructure development, trade openness, and institutional quality drive positive influence in the interaction between FDI and economic growth and thus, represent important determinants of macroeconomic stability.

However, evidence from Awolusi and Adeyeye (2016) does not support the results of Elboishi (2015), which posit a significant effect of increased flow of FDI on host economies. Through ordinary least squares (OLS) and GMM models, Awulusi and Adeyeye (2016) find that the influence of FDI on the direction of growth of African countries is generally insignificant. Nonetheless, the impact of FDI is significant and positive only on the

economy of South Africa, which implies that emerging and advanced countries exhibit significant degrees of responsiveness to the impact of FDI than developing countries. South Africa is recognised as an emerging economy and has relatively more advanced infrastructural systems compared to its African counterparts.

In a related study of the relationship between FDI inflow and GDP growth of Turkey, Temiz and Gökmen (2013) apply the Johnsen cointegration test and Granger causality analysis. Their study documents evidence like the results of Awulusi and Adeyeye (2016), which imply that there is no significant relationship between FDI and GDP (a proxy for economic growth). Temiz and Gökmen's (2013) results thus run contrary to the FDI implications for South Africa, which, like Turkey, is also considered an emerging economy. The researchers find that the insignificant impact of FDI on economic growth can be explained by its mode of entry into host economies, which is mainly through mergers and acquisitions. For the most part, international business takeovers through mergers and acquisitions do not demonstrate commitment towards the improvement of offshore acquired firms' existing facilities and technology. In this way, the ultimate objective of foreign investors to expand business operations on the wheels of enhanced technology is hampered, as outmoded technology and managerial strategies cannot engender the achievement of global competitiveness.

In analysing the relationship between FDI, energy consumption, and economic growth in Argentina, Mavikela et al. (2018) employ the vector error correction model (VECM) and autoregressive distributed lag (ARDL) bounds technique. The results suggest the existence of unidirectional causality in the relationship between FDI flow and energy consumption, while an interactive relationship exists between energy consumption and economic growth. This evidence indicates that the predictive influence of FDI on economic growth is limited if other macroeconomic variables are not accounted for. This is confirmed by Thanh et al. (2019), who investigate the role of economic institutions and economic openness in Vietnam using a system GMM model and find that the impact of FDI on economic growth is more significant when it is driven by trade openness, while a positive effect of each of the two variables on economic growth exists when they are analysed separately. Besides, economic institutions have significant influence on the interaction between FDI and economic growth while accounting for trade openness. In the above context, there exist uncertainties surrounding

the direction of impact in the relationship between FDI, human capital, and economic growth, which calls for further analysis.

3. Methodology

3.1 Data sources and sampling

This study employs time series data spanning from 1990 to 2017 of VISTA countries' FDI, human capital, and economic growth (proxied by GDP), trade openness, inflation, capital formation, and labour data are sourced from the website of the World Bank, while primary school enrolment (a proxy for human capital) data is obtained from the websites of the United Nations Educational Scientific and Cultural Organisation (UNESCO) and the UNESCO Institute for Statistics (UIS). Table 1 provides the variables and their definitions.

Table 1: Definition of Variables

Variable	Definition
FDI	This variable denotes foreign direct investment (FDI). It is measured as the flow of foreign capital and business into a foreign country
Economic growth	This refers to the expansion or contraction in the national productivity of a country. It is proxied by the value of the gross domestic product (GDP) and the base year of this variable for the analysis is 1990
Trade openness	This is defined as the ratio of a country's exports and imports (combined) over GDP. This ratio shows the country's level of receptiveness to international trade
Inflation	This is a measurement of the consumer price index (CPI) of the economy which shows the rate of increase in the prices of general goods and services in the country
Capital formation	This refers to the mobilisation of funds and tangible assets by individuals or corporate organisations for investment and business startup
Labour	This is defined as the rate of employment of persons of active age and employability segment of the country
Human capital	This is measured by the rate of primary school enrolment in a country. This shows the level of literacy and human resource development of the country's population

3.2 Empirical model

Following Nkoro and Uko (2016), this study conducts a co-integration analysis to test the interactive responses between economic growth FDI and human capital using an ARDL model. The co-integration technique is applied to determine the long-run relationship between series that are non-stationary. From the literature, the application of an ARDL approach to co-integration gives a realistic and efficient estimate and helps in identifying the co-integrating vector(s) (Nkoro & Uko, 2016; Pesaran et al., 2001; Pesaran & Shin, 1999). The ARDL has several advantages, such as its applicability regardless of the stationarity properties. It applies irrespective of whether the regressors are purely I(1), purely I(0), or mutually co-integrated as opposed to the Engle-Granger and Johansen co-integration tests, which require that all the variables be integrated of order 1 (Moyo et al., 2017).

Furthermore, this technique is suitable for small or finite samples, which does not apply to the Johansen procedure (Makhetha & Rantaoleng, 2017). The adopted ARDL for the co-integration analysis of FDI, economic growth, human capital, and control variables is represented below. The first equation is the ARDL formulation of the co-integration relationship between economic growth and FDI, followed by the co-integration equation for the relationship between human capital and FDI:

$$\begin{aligned}\Delta GDP_t = {} & \alpha_1 + \alpha_T T + \alpha_{GDP} GDP_{t-1} + \alpha_{FDI} FDI_{t-1} + \alpha_{TO} LTO_{t-1} + \alpha_K LK_{t-1} \\ & + \alpha_{PSE} LPSE_{t-1} + \alpha_{INFL} INFL_{t-1} + \alpha_{LL} LL_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta GDP_{t-i} \\ & + \sum_{J=0}^{q} \alpha_j \Delta FDI_{t-j} + \sum_{k=0}^{r} \alpha_k \Delta LTO_{t-k} + \sum_{l=O}^{s} \alpha_l \Delta LK_{t-l} \\ & + \sum_{m=0}^{t} \alpha_m LPSE_{t-m} + \sum_{n=0}^{u} \alpha_n INFL_{t-n} + \sum_{o=0}^{v} \alpha_o LL_{t-0} + \varepsilon_{I_t}\end{aligned} \tag{1}$$

$$\begin{aligned}\Delta PSE_t = {} & \alpha_1 + \alpha_T T + \alpha_{PSE} PSE_{t-1} + \alpha_{FDI} FDI_{t-1} + \alpha_{GDP} GDP_{t-1} + \alpha_{TO} LTO_{t-1} \\ & + \alpha_K LK_{t-1} + \alpha_{INFL} INFL_{t-1} + \alpha_{LL} LL_{t-1} + \sum_{i=0}^{p} \alpha_i LPSE_{t-i} \\ & + \sum_{j=0}^{q} \alpha_j \Delta FDI_{t-j} + \sum_{k=1}^{r} \alpha_k \Delta GDP_{t-k} + \sum_{l=0}^{s} \alpha_l \Delta LTO_{t-l} \\ & + \sum_{m=O}^{t} \alpha_m \Delta LK_{t-m} + \sum_{n=0}^{u} \alpha_n INFL_{t-n} + \sum_{o=0}^{v} \alpha_o LL_{t-0} + \varepsilon_{I_t}\end{aligned} \quad (2)$$

Where Δ is defined as the first difference operator; T is the time trend; GDP_t is the GDP per capita; FDI_t is FDI; $LnTO_t$ is the natural logarithm of trade openness; LnK_t is the natural logarithm of capital formation; $LnPSE_t$ is the natural logarithm of primary school enrolment; $INFL_t$ is inflation; and LL_t is the natural logarithm of labour. It is assumed that the residuals are normally distributed and white noise.

This study employs the augmented Dicky-Fuller (ADF), Phillips and Perron (PP), and the Dickey-Fuller generalised least squares (DF-GLS) techniques to test the stationarity of variables employed in the analysis, to avoid spurious regression results (Makhethe & Rantaoleng, 2017). Table 2 presents the unit root results of all variables for all sampled countries. As can be observed from the tables, some of the series are stationary at levels (I(0)) while others are stationary at first difference I(1), implying the non-existence of unit root issues in the variables used for the analysis.

Table 2: Unit Root Test Results

	ADF		**PP**		**DF-GLS**	
	I (0)	**I (1)**	**I (0)**	**I (1)**	**I (0)**	**I (1)**
			Vietnam			
GDP	-2.46	-4.46***	-2.59	-4.43***	-2.18**	-4.27***
FDI	-2.62	-4.75***	-2.57	-4.75***	-2.27**	-4.72***
TO	-0.85	-4.30***	0.22	-11.34***	-0.56	-0.26
K	-4.66*	-3.30**	-4.20***	-3.19**	-1.63*	-2.81***
PSE	-0.25	-2.50	-0.51	-3.62**	-0.50	-2.73***
INF	-4.44***	-0.65	-4.20***	-1.80	-1.40	-0.00
L	-3.48**	-2.08	-2.89*	-2.07	-0.84	-2.08**

	ADF		PP		DF-GLS	
	I (0)	**I (1)**	**I (0)**	**I (1)**	**I (0)**	**I (1)**
			Indonesia			
GDP	-2.30	-5.75***	-2.25	-5.92***	-2.34**	-4.97***
FDI	-3.71**	-6.37***	-3.68**	-11.65***	-3.67***	-6.50***
TO	-2.07	-7.32***	-2.07	-8.44***	-2.14**	-7.31***
K	-1.18	-4.35***	-1.38	-4.34***	-1.15	-4.38***
PSE	-2.31	-6.38***	-2.31	-7.19***	-1.24	-5.83***
INF	-4.45***	-8.61***	-4.45***	-15.20***	-4.49***	-8.79***
L	-2.56	-3.30**	-2.29	-3.18**	0.58	-2.82***
			South Africa			
GDP	-2.79*	-5.53***	-2.60	-6.23***	-2.47**	-5.59***
FDI	-4.55***	-6.16***	-4.54***	-16.71***	-4.18***	-6.29***
TO	-1.51	-5.55***	-1.45	-5.87***	-1.22	-4.77***
K	-1.84	-4.30***	-1.84	-4.23***	-1.85*	-4.33***
PSE	-1.40	-3.66***	-1.51	-3.58**	-2.06**	-3.53***
INF	-2.56	-7.87***	-2.52	-7.79***	-1.29	-8.03***
L	-0.83	-2.72*	-1.51	-2.75*	0.38	-2.63**
			Turkey			
GDP	-5.45*	-8.87***	-5.45***	-19.00***	-4.95***	-7.57***
FDI	-2.02	-4.58***	-2.02	-4.57***	-1.94*	-4.68***
TO	-2.33	-3.96**	-2.38	-4.89***	-1.51	-3.28***
K	-2.29	-7.86***	-2.10	-7.95***	-2.36**	-7.69***
PSE	-1.16	-3.33**	-1.34	-3.64**	-1.64*	-3.82***
INF	-1.60	-7.10***	-1.37	-7.64***	-1.60	-7.22***
L	1.94	-2.15	2.49	-4.92***	-1.38	-2.35**
			Argentina			
GDP	-4.17***	-7.10***	-4.17***	-15.97***	-3.93***	-0.09
FDI	-4.06***	-7.43***	-4.06***	-12.65***	-3.97***	-7.55***
TO	-1.74	-5.39***	-1.73	-5.39***	-1.28	-5.19***
K	-2.84*	-4.59***	-2.94*	-4.73***	-2.43**	-4.61***
PSE	-1.71	-0.44	-1.80	-4.21***	-1.46	-1.45
INF	-2.30	-157.99***	-90.27***	-269.50***	-0.33	-0.05
L	-2.38	-4.63***	-2.68*	-4.63***	0.89	-4.42***

Note: ***, **, and * denote significance levels of 1%, 5% and 10% respectively.

4. Empirical results and discussion

4.1 Descriptive analysis

Table 3 presents the descriptive statistics of variables employed in the analysis. From the table, Vietnam reports the highest average economic growth (6.77%) among VISTA countries, followed by Indonesia at 4.93%, Turkey at 4.79%, Argentina at 3.02%, and South Africa at 2.35%. Vietnam reports the highest average FDI inflows as a percentage of GDP at 5.94% followed by Argentina at 2.22%, South Africa at 1.22%, Turkey at 1.19%, and Indonesia at 1.18%. The Jarque-Bera test is used to determine whether the series is normally distributed or not. The null hypothesis of the normal distribution for FDI is rejected at 5% and 1% levels of significance for all countries except for Vietnam.

Table 3: Descriptive Statistics

		GDP	FDI	TO	K	PE	INFL	L
Vietnam	Mean	6.77	5.94	2.08	1.45	2.02	13.51	7.65
	Std. Dev.	1.29	2.28	0.14	0.01	0.02	15.03	0.08
	Skewness	0.60	0.82	-0.32	-1.52	-0.08	2.50	-0.20
	Jarque-Bera	1.95	3.14	1.86	17.04	0.11	83.75	1..92
	Probability	0.38	0.21	0.39	0.00	0.95	0.00	0.39
	Observations	28	28	28	28	28	28	28
Indonesia	Mean	4.93	1.18	1.73	1.46	2.03	12.18	8.00
	Std. Dev.	3.82	1.43	0.08	0.07	0.01	13.29	0.07
	Skewness	-3.95	-1.15	0.70	-0.52	-0.07	3.98	-0.28
	Jarque-Bera	381.51	6.88	5.95	2.56	0.03	393.52	1.36
	Probability	0.00	0.03	0.05	0.28	0.98	0.00	0.51
	Observations	28	28	28	28	28	28	28
South Africa	Mean	2.35	1.22	1.72	1.27	2.02	8.38	7.24
	Std. Dev.	2.02	1.32	0.08	0.04	0.01	3.11	0.07
	Skewness	-0.49	1.99	-0.35	-0.13	0.13	1.18	-0.29
	Jarque-Bera	1.22	36.35	1.40	0.35	0.52	6.56	1.33
	Probability	0.54	0.00	0.50	0.84	0.77	0.04	0.51
	Observations	28	28	28	28	25	28	28

		GDP	FDI	TO	K	PE	INFL	L
Turkey	Mean	4.79	1.19	1.65	1.41	2.01	38.48	7.37
	Std. Dev.	4.66	0.92	0.07	0.06	0.01	37.09	0.06
	Skewness	-1.07	1.11	-1.13	-0.47	-1.07	1.02	0.86
	Jarque-Bera	5.41	6.08	6.02	1.17	9.03	5.00	3.61
	Probability	0.07	0.05	0.05	0.56	0.01	0.08	0.16
	Observations	28	28	28	28	26	28	28
Argentina	Mean	3.02	2.22	1.42	1.24	2.05	92.68	7.23
	Std. Dev.	5.69	1.43	0.15	0.06	0.01	390.08	0.05
	Skewness	-0.58	3.01	-0.22	-1.42	-0.37	4.97	-0.33
	Jarque-Bera	2.07	187.31	1.62	17.30	1.60	721.04	1.70
	Probability	0.35	0.00	0.45	0.00	0.45	0.00	0.43
	Observations	28	28	28	28	25	28	28

4.2 Correlation analysis

Table 4 presents the correlation matrix of variables employed in the analysis for all sampled countries. The results in Table 3 show that among the countries sampled, Argentina is the only country that reports a negative relationship between economic growth (GDP) and FDI, with a value of at value of -0.03. This confirms the theoretical expectations that FDI supports economic growth. This evidence is consistent with Sunde (2017), who argues that the effect of FDI on economic growth varies from country to country as different countries exhibit different characteristics in terms of market regulations and trade policies.

Table 4: Correlation Matrix

		GDP	FDI	TO	K	PE	INFL	L
Vietnam	GDP	1.00	0.45	-0.44	0.03	0.42	-0.01	-0.41
	FDI	0.45	1.00	0.10	0.21	0.28	-0.14	-0.06
	TO	-0.44	-0.10	1.00	0.54	-0.73	-0.56	0.98
	K	0.03	0.21	0.54	1.00	-0.21	-0.70	0.57
	PE	0.42	0.28	-0.73	-0.21	1.00	0.07	-0.70
	INFL	-0.01	-0.14	-0.56	-0.70	0.07	1.00	-0.58
	L	-0.41	-0.06	0.98	0.57	-0.70	-0.58	1.00

		GDP	FDI	TO	K	PE	INFL	L
Indonesia	GDP	1.00	0.38	-0.61	0.23	-0.05	-0.87	-0.06
	FDI	0.38	1.00	-0.52	0.70	-0.27	-0.31	0.21
	TO	-0.61	-0.52	1.00	-0.67	0.44	0.74	-0.43
	K	0.23	0.70	-0.67	1.00	-0.19	-0.25	0.23
	PE	-0.05	-0.27	0.44	-0.19	1.00	0.22	-0.85
	INFL	-0.87	-0.31	0.74	-0.25	0.22	1.00	-0.20
	L	-0.06	0.21	-0.43	0.23	-0.85	-0.20	1.00
South Africa	GDP	1.00	0.13	0.29	-0.14	0.13	-0.32	0.15
	FDI	0.13	1.00	0.36	-0.03	-0.10	-0.16	0.17
	TO	0.29	0.36	1.00	0.49	-0.40	-0.58	0.88
	K	-0.14	-0.03	0.49	1.00	0.14	-0.14	0.41
	PE	0.13	-0.10	-0.40	0.14	1.00	0.23	-0.46
	INFL	-0.32	-0.16	-0.58	-0.14	0.23	1.00	-0.78
	L	0.15	0.17	0.88	0.41	-0.46	-0.78	1.00
Turkey	GDP	1.00	0.05	0.13	0.62	-0.03	-0.26	0.13
	FDI	0.05	1.00	0.48	0.55	-0.07	-0.65	0.38
	TO	0.13	0.48	1.00	0.40	-0.38	-0.53	0.64
	K	0.62	0.55	0.40	1.00	-0.34	-0.60	0.61
	PE	-0.03	-0.07	-0.38	-0.34	1.00	0.04	-0.35
	INFL	-0.26	-0.65	-0.53	-0.60	0.04	1.00	-0.69
	L	0.13	0.38	0.64	0.61	-0.35	-0.69	1.00
Argentina	GDP	1.00	-0.03	0.14	0.55	-0.05	-0.19	-0.06
	FDI	-0.03	1.00	-0.01	0.23	0.17	-0.16	-0.12
	TO	0.14	-0.01	1.00	0.00	0.75	-0.41	0.61
	K	0.55	0.23	0.00	1.00	-0.06	-0.32	0.15
	PE	-0.05	0.17	0.75	-0.06	1.00	-0.42	0.37
	INFL	-0.19	-0.16	-0.41	-0.32	-0.42	1.00	-0.47
	L	-0.06	-0.12	0.61	0.15	0.37	-0.47	1.00

From the table, trade openness (OT) reports a negative correlation with economic growth for Vietnam and Indonesia. Capital formation in South Africa is negatively correlated with economic growth. Primary school enrolment is negatively correlated to economic growth in Indonesia, Turkey, and Argentina. However, in South Africa and Vietnam, primary school enrolment is positively correlated with economic growth. This result is expected, and it is consistent with Kaulihowa and Adjasi (2019), which document a positive relationship between human capital and economic

growth. Inflation reports a negative correlation with growth across all sampled countries. For inflation, all countries are negatively correlated to economic growth. This implies that an increase in inflation deteriorates macroeconomic stability as explained by Vo et al. (2019). Lastly, labour is negatively correlated to economic growth for Vietnam, Indonesia, and Argentina, while it reports positive correlations for South Africa and Turkey.

4.3 Co-integration test results

Table 5 reports the results of the ARDL bound test for VISTA countries. The analysis involves the testing of the null hypothesis of the existence of no co-integration between the two variables. As can be observed from the table, the F-statistic for VISTA countries are greater than the upper and lower critical bounds. As such, the null hypothesis is rejected, implying that there is co-integration for VISTA countries. These results are consistent with Su and Liu (2016), which find a positive relationship between GDP and FDI rate in China, and Choi and Baek (2017), who note that there exists a long-run relationship between FDI and economic growth. The results show that there is evidence that there is a long-run relationship between human capital and FDI in Vietnam, Indonesia, and Argentina. The ARDL test indicates no long-run relationship between human capital and FDI in South Africa and Turkey because the F-statistics is less than the lower bound critical value for both countries.

Table 5: ARDL Bounds Test Results

Country	F-statistic	Conclusion
Vietnam		
F_{GDP} (GPD/FDI, TO, K, PSE, INFL, L)	5.39	Co-integration
F_{FDI} (FDI/GDP, TO, K, PSE, INFL, L)	4.72	Co-integration
F_{TO} (TO/GDP, FDI, K, PSE, INFL, L)	15.71	Co-integration
F_{K} (K/GDP, FDI, TO, PSE, INFL, L)	5.49	Co-integration
F_{PSE} (PSE/GDP, FDI, TO, K, INFL, L)	8.78	Co-integration
F_{INFL} (INFL/GDP, FDI, TO, K, PSE, L)	7.73	Co-integration
F_{L} (L/GDP, FDI, TO, K, PSE, INFL)	121.88	Co-integration

Country				F-statistic	Conclusion
Indonesia					
F_{GDP} (GPD/FDI, TO, K, PSE, INFL, L)				22.30	Co-integration
F_{FDI} (FDI/GDP, TO, K, PSE, INFL, L)				5.05	Co-integration
F_{TO} (TO/GDP, FDI, K, PSE, INFL, L)				5.44	Co-integration
F_{K} (K/GDP, FDI, TO, PSE, INFL, L)				9.75	Co-integration
F_{PSE} (PSE/GDP, FDI, TO, K, INFL, L)				4.99	Co-integration
F_{INFL} (INFL/GDP, FDI, TO, K, PSE, L)				41.68	Co-integration
F_{L} (L/GDP, FDI, TO, K, PSE, INFL)				6.45	Co-integration
South Africa					
F_{GDP} (GPD/FDI, TO, K, PSE, INFL, L)				10.57	Co-integration
F_{FDI} (FDI/GDP, TO, K, PSE, INFL, L)				5.20	Co-integration
F_{TO} (TO/GDP, FDI, K, PSE, INFL, L)				3.36	Co-integration **
F_{K} (K/GDP, FDI, TO, PSE, INFL, L)				6.05	Co-integration
F_{PSE} (PSE/GDP, FDI, TO, K, INFL, L)				2.38	Co-integration *
F_{INFL} (INFL/GDP, FDI, TO, K, PSE, L)				4.20	Co-integration
F_{L} (L/GDP, FDI, TO, K, PSE, INFL)				3.83	Co-integration **
Turkey					
F_{GDP} (GPD/FDI, TO, K, PSE, INFL, L)				33.43	Co-integration
F_{FDI} (FDI/GDP, TO, K, PSE, INFL, L)				3.49	Co-integration **
F_{TO} (TO/GDP, FDI, K, PSE, INFL, L)				3.06	Co-integration *
F_{K} (K/GDP, FDI, TO, PSE, INFL, L)				24.66	Co-integration
F_{PSE} (PSE/GDP, FDI, TO, K, INFL, L)				3.75	Co-integration **
F_{INFL} (INFL/GDP, FDI, TO, K, PSE, L)				4.65	Co-integration
F_{L} (L/GDP, FDI, TO, K, PSE, INFL)				3.17	Co-integration *
Argentina					
F_{GDP} (GPD/FDI, TO, K, PSE, INFL, L)				13.82	Co-integration
F_{FDI} (FDI/GDP, TO, K, PSE, INFL, L)				4.36	Co-integration
F_{TO} (TO/GDP, FDI, K, PSE, INFL, L)				5.36	Co-integration
F_{K} (K/GDP, FDI, TO, PSE, INFL, L)				9.62	Co-integration
F_{PSE} (PSE/GDP, FDI, TO, K, INFL, L)				5.48	Co-integration
F_{INFL} (INFL/GDP, FDI, TO, K, PSE, L)				4.17	Co-integration
F_{L} (L/GDP, FDI, TO, K, PSE, INFL)				4.02	Co-integration
K				6	
Critical values					
10%		**5%**		**1%**	
I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
1.99	2.94	2.27	3.28	2.88	3.99

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels of significance respectively.

4.4 The relationship between economic growth and FDI

Table 6 presents the short-run and long-run estimation results of the interaction between economic growth and FDI. As can be observed from the table, the error correction term is negative and significant at 1% for all VISTA countries. This supports the existence of long-term relationships among the variables, which implies a slow-paced adjustment to equilibrium for all sampled countries. The short-term deviations from the long-term equilibrium in Vietnam, Indonesia, South Africa, Turkey, and Argentina are corrected by -0.98%, -0.82%, -0.65%, -1.81%, and -1.12% respectively towards the long-term equilibrium. The short-run estimates show that FDI has a negative impact on economic growth in Vietnam, Turkey, and Argentina, while it reports a positive impact on economic growth in Indonesia. In South Africa, the effect of FDI on economic growth is significantly negative, which indicates that increases in FDI exert deteriorating impacts on economic growth. Similar evidence is documented by Sunde (2017).

Table 6: Results of Long- and Short-Run Relationships between GDP and FDI

Variables	Vietnam (1, 0, 2, 0, 2, 2, 2)	Indonesia (1, 0, 0, 0, 0, 0, 0, 0)	South Africa (1, 0, 1, 0, 1, 1, 1, 1)	Turkey (3, 0, 0, 0, 0, 0, 0, 0)	Argentina (1, 1, 1, 1, 0, 1, 1, 1)
Dependent variable: GDP					
Long run					
FDI	-0.09 (-1.00)	0.47 (1.14)	-1.98 (-2.00) *	-1.02 (-1.38)	-0.59 (-1.26)
TO	-32.74 (-2.81) **	-5.07 (-0.39)	22.58 (0.86)	5.88 (0.51)	16.27 (2.37) **
K	7.01 (1.80)	-12.12 (-0.93)	-31.73 (-1.87) *	55.18 (5.18) ***	42.48 (3.68) ***
PSE	-41.02 (-1.66)	-13.30 (-0.13)	-9.60 (-0.13)	58.61 (2.02) *	15.23 (0.24)
INF	0.01 (0.11)	-0.29 (-4.42) ***	-0.19 (-0.74)	-0.01 (-0.52)	-0.04 (-0.59)
L	26.48 (1.13)	-16.39 (-1.51)	-10.73 (-0.42)	-18.23 (-1.57)	-22.10 (-1.07)
Constant	-49.99 (-0.26)	192.71 (0.70)	108.05 (0.45)	-64.73 (-0.65)	56.73 (0.33)

Variables	Vietnam (1, 0, 2, 0, 2, 2, 2)	Indonesia (1, 0, 0, 0, 0, 0, 0, 0)	South Africa (1, 0, 1, 0, 1, 1, 1)	Turkey (3, 0, 0, 0, 0, 0, 0)	Argentina (1, 1, 1, 1, 0, 1, 1)
Dependent variable: GDP					
Short run					
Δ (GDP (-1))	-0.99 (-5.33) ***	-0.82 (-7.18) ***	-0.65 (-2.90) **	0.55 (2.13) **	-1.12 (-8.16) ***
Δ (FDI)	-0.09 (-1.05)	0.39 (1.10)	-0.64 (-2.34) **	-1.85 (-1.66)	-0.01 (-0.03)
Δ (TO)	21.77 (3.23) *	-4.14 (-0.40)	47.04 (3.38) **	10.66 (0.54)	18.15 (2.19) **
Δ (K)	6.93 (1.75)	-9.89 (-0.97)	-20.49 (-1.88) *	100.07 (6.84) ***	47.39 (2.77) **
Δ (PSE)	6.57 (0.41)	-10.85 (-0.13)	88.41 (1.90) *	106.29 (1.95) *	16.99 (0.24)
Δ(INF)	0.03 (1.42)	-0.24 (-5.29) ***	-0.12 (-0.72)	-0.02 (-0.54)	-0.05 (-0.60)
Δ(L)	-292.51 (-2.55) **	-13.38 (-1.42)	-205.49 (-2.68) **	-33.05 (-1.85) *	-24.66 (-1.05)
ECM (-1)	-0.98 (-8.56) ***	-0.82 (-15.62) ***	-0.65 (-7.60) ***	-1.81 (-11.41) ***	-1.12 (-13.04) ***
R-squared	0.91	0.86	0.83	0.82	0.92
DW-test	2.45	1.59	2.29	1.42	2.21

Short-run diagnostic test

Country	Normality	Serial correlation	Heteroscedasticity
Vietnam	1.49 [0.47]	2.35 [0.16]	0.60 [0.82]
Indonesia	2.47 [0.29]	0.64 [0.54]	0.91 [0.52]
South Africa	1.44 [0.49]	1.38 [0.30]	0.62 [0.77]
Turkey	1.73 [0.42]	1.18 [0.34]	0.77 [0.64]
Argentina	1.11 [0.58]	1.41 [0.28]	0.58 [0.81]

Notes: ***, **, and * indicate significance at 1%, 5%, and 10% levels of significance respectively. T-statistics values are in square brackets [ ], while p-values are in parentheses, ( ).

From the table, trade openness shows a significant positive impact on the economic growth of Vietnam, South Africa, and Argentina. This evidence suggests that increased trade liberalisation and market connectivity by these countries promote macroeconomic stability and enhanced productivity. This finding is consistent with Raghutla (2020), who documents a positive predictive influence of market openness on the economic growth of developing and emerging economies. Beyond trade openness, capital formation also exerts a predictive influence on economic growth. As seen in Table 6, capital formation exerts a significant negative impact on the economic growth of South Africa, whereas its effect on the macroeconomic trajectory of Turkey and Argentina is positive. Guru and Yadav (2019) explain that increases in individual and corporate savings activity promote investment activities that support job creation, enhanced productivity, and economic growth.

The table also shows that human capital has a significant positive effect on the economic growth of South Africa and Turkey. This result is consistent with Cooray (2009), who finds a significant positive relationship between economic growth and primary school enrolment in lowand middle-income countries. It can also be seen above that inflation has a significant negative impact on economic growth in Indonesia, while it is insignificant for the other VISTA countries. This is corroborated by Aydin and Esen (2016), who indicate that increased inflation-driven macroeconomic uncertainties hamper economic growth. Lastly, labour reports a significant negative impact on economic growth in Vietnam, South Africa and Turkey. From the literature, increases in employment opportunities reflect increased productivity and consequently positive trends in economic growth (Doran et al., 2018). Based on the results, it can be explained that a conducive socio-economic environment and institutional robustness of a country have positive implications for sustained FDI inflows and enhance national productivity.

4.5 The relationship between human capital and FDI

Table 7 presents the results of the long-run and short-run estimates for the relationship between human capital and FDI. In the long run, the impact of FDI on human capital is significantly positive for Argentina, while it is insignificant for the rest of the sampled countries. This result is in line with Gittens and Pilgrim (2013), who suggest a positive influence of

FDI on human capital in developing countries. From the table, economic growth exerts a significant negative effect on human capital in Vietnam and Argentina. This is inconsistent with Altiner and Toktas (2017), whose results indicate that expansionary trends in macroeconomic dynamics impact positively on human development in developing and emerging countries through the availability of employment opportunities, skill acquisition, and the provision of quality health infrastructure.

Table 7: Results of Relationship between Human Capital and FDI

Variables	Vietnam (1, 0, 2, 0, 2, 2, 2)	Indonesia (1, 0, 0, 0, 0, 0, 0)	South Africa (1, 0, 1, 0, 1, 1, 1)	Turkey (3, 0, 0, 0, 0, 0, 0)	Argentina (1, 1, 1, 1, 0, 1, 1)
Dependent variable: PSE					
Long run					
FDI	-0.00 (-1.66)	-0.00 (-1.37)	0.00 (0.49)	0.02 (1.08)	0.01 (4.48) *
GDP	-0.00 (-1.96) **	8.14 (0.06)	0.00 (1.42)	0.03 (1.44)	-0.00 (-3.55) *
TO	0.09 (1.91) *	-0.04 (-0.56)	-0.21 (-2.62) **	-0.08 (-0.30)	0.12 (14.33) ***
K	-0.02 (-1.44)	-0.01 (-0.13)	0.25 (4.61) ***	-0.14 (-0.59)	0.03 (1.60)
INF	-0.00 (6.06) ***	0.00 (1.00)	0.00 (1.62)	0.00 (0.65)	0.00 (2.95) *
L	-0.44 (-4.23) *	-0.04 (1.12)	0.00 (0.03)	-0.53 (1.11)	-0.11 (-1.49)
Constant	5.23 (7.35) ***	2.46 (7.84) ***	2.02 (3.78) **	6.08 (1.84)	2.64 (5.08) **
Short run					
Δ (PSE (-1))	1.52 (3.80) *	-0.47 (-2.18) **	-1.32 (-3.67) **	-0.43 (-1.52)	-4.15 (-5.24) **
Δ (FDI)	-0.00 (-1.84) ***	0.00 (1.45)	0.00 (0.51)	0.01 (1.23)	0.00 (2.55)
Δ(GDP)	-0.00 (-1.47)	3.80 (0.06)	0.00 (1.50)	0.01 (4.14) **	0.01 (4.04) ***
Δ (TO)	0.19 (1.45)	-0.02 (-0.70)	-0.28 (-2.17) ***	0.12 (1.03)	0.36 (4.36) **
Δ (K)	-0.05 (-1.23)	0.03 (0.74)	0.33 (2.86) **	-0.63 (-2.97) **	-1.02 (-3.37) ***
Δ(INF)	-0.00 (-3.36) **	0.00 (1.30)	0.00 (1.41)	0.00 (0.67)	-0.00 (-3.56) ***

Variables	Vietnam (1, 0, 2, 0, 2, 2, 2)	Indonesia (1, 0, 0, 0, 0, 0, 0, 0)	South Africa (1, 0, 1, 0, 1, 1, 1)	Turkey (3, 0, 0, 0, 0, 0, 0)	Argentina (1, 1, 1, 1, 0, 1, 1)
Dependent variable: PSE					
Short run					
Δ(L)	10.45 (2.74) **	0.38 (2.38) **	0.00 (0.03)	0.49 (1.09)	-11.94 (3.40) ***
ECM (-1)	-1.99 (-10.93) *	-0.47 (-7.74) *	-1.32 (-6.17) **	-0.43 (-9.08) *	-4.15 (-14.05) *
R-squared	0.97	0.91	0.79	0.92	0.99
DW test	2.18	2.13	2.16	3.35	2.46

Short-run diagnostic test			
Country	**Normality**	**Serial correlation**	**Heteroscedasticity**
Vietnam	1.33 (0.51)	0.41 (0.54)	0.56 (0.84)
Indonesia	1.73 (0.42)	0.79 (0.48)	1.24 (0.35)
South Africa	0.26 (0.88)	1.92 (0.24)	0.63 (0.77)
Turkey	0.81 (0.67)	23.11 (0.15)	1.42 (0.40)
Argentina	0.88 (0.65)	0.37 (0.65)	1.51 (0.47)

Notes: ***, **, and * indicate significance at 1%, 5%, and 10% levels of significance respectively. T-statistics values are in square brackets [ ], while p-values are in parentheses ( ).

It can be seen from the table that trade openness has varied effects on human capital in Vietnam and South Africa. While it exerts a significant positive effect in Vietnam, its impact on human capital is negative in South Africa. According to scholars, the implementation of trade liberalisation policies avails opportunities for economic expansion and job creation to develop the human resources of a country (Maryam & Hassan, 2013). Regarding the effect of capital formation, it has a significant positive effect on human capital in South Africa, while its effect in the other VISTA countries is insignificant. Increases in capital mobilisation through savings and investments engender higher productivity and job creation. These dynamics impact positively on skill and knowledge development (Guru & Yadav, 2019). As can be observed above, inflation exerts a significant negative effect on human capital in Vietnam and a positive effect in Argentina. This suggests that the impact of inflation on human capital is

country-specific, where countries with robust macroeconomic fundamentals can withstand the shocks induced by the high rate of inflation compared to their less robust counterparts. In the long run, labour exhibits a significant negative impact on human capital only in Vietnam, implying that the long-run influence of labour on human capital is limited across VISTA countries.

The short-run estimates in Table 7 indicate that the coefficients of the error correction term are negative and significant at 1% for Vietnam, Indonesia, Turkey, and Argentina. For South Africa, the error correction term is negative and significant at 5%. The short-term deviations from the long-term equilibrium in Vietnam, Indonesia, South Africa, Turkey, and Argentina are corrected by -1.99%, -0.47%, -1.32%, -0.43%, and -4.15% respectively towards the long-term equilibrium. The results suggest that FDI has a negative impact on primary school enrolment and is significant at the 10% level in Vietnam.

The short-run results also show that economic growth has a significant positive impact on human capital in Turkey and Argentina. This implies short-term expansion in macroeconomic dynamics drives improvement in human capital, in line with Sultanuzzaman et al. (2019). In South Africa and Argentina, trade openness shows a significant negative impact on human capital, while it is significantly positive for Turkey. This suggests that generally, short-run market liberalisation impacts positively on human capital development, consistent with Stein and Yannelis (2020). Capital formation has a significant positive effect on human capital in South Africa, while its effect on human capital is limited in other VISTA countries. From the table, inflation reports a negative impact on human capital for Vietnam and Argentina. This suggests that significant increases in the rate of inflation impact adversely education and human development programmes, as explained by Omodero (2019). Lastly, labour reports a short-run positive impact on human capital in Vietnam and Indonesia, while it exerts a significant negative impact on human capital in Argentina. This implies that in the short run, the impact of labour dynamics on human capital is consequent on country-specific characteristics, such as demographic distribution and population size. Overall, it can be concluded that the direction of the impact of FDI flows on human capital is largely dependent on the country-specific institutional quality and macroeconomic robustness, as different markets respond differently to the influx of foreign capital.

5. Conclusion and policy recommendations

This study analysed the effect of FDI on human capital and economic growth of VISTA countries with the application of an ARDL frame on a time series covering 1990 to 2017. It was found that FDI exerts both long-run and short-run predictive influences on the economic growth of VISTA countries, where it is positive in Indonesia but negative in Vietnam, South Africa, Turkey, and Argentina. The negative impact of FDI on the economic growth of the VISTA countries except Indonesia can be linked to low levels of market openness, human capital development, and institutional robustness to ensure the retention of a significant proportion of FDI profits to support economic growth. Generally, this implies that sustained FDI inflows to VISTA countries do not promote economic expansion. This evidence contradicts the theoretical expectation that FDI boosts economic growth through capital accumulation, technology transfer, and enhancement of human capital through skills transfer. As such, this study verifies that factors other than FDI drive the direction of growth of VISTA countries. These factors include trade openness, capital formation, inflation, and labour.

Also, it was found that generally, FDI influences long-run improvement in the human capital of VISTA countries. However, its short-run impact on human resources is statistically marginal, thus implying that the benefits of FDI inflows to emerging economies in terms of human resource development is gradual and requires strategic policy interventions to anchor its impact. These dynamics, relative to the relationship between human capital and FDI, are underpinned by the endogenous growth model, which explains that FDI promotes R&D and human capital development that support macroeconomic stability in the long run.

Based on the findings, policy efforts should be focused on ensuring financial system robustness to respond to changing global market dynamics, as the optimisation of FDI inflow benefits is dependent on country-specific macroeconomic characteristics. Future studies can test the relationship between FDI and economic growth under transitioning macroeconomic conditions, as the interaction between economic factors may change under different market conditions. This study is limited in this regard because of the focus and scope of the current analysis.

References

Ali, N., & Mingque, Y. (2018). Does foreign direct investment lead to economic growth? Evidences from Asian developing countries. *International Journal of Economics and Finance*, *10*(3), 109–119. https://doi.org/10.5539/ijef.v10n3p109

Altiner, A., & Toktas, Y. (2017). Relationship between human capital and economic growth: An application to developing countries. *Eurasian Journal of Economics and Finance*, *5*(3), 87–98. http://doi.org/10.15604/ejef.2017.05.03.007

Aydın, C., Esen, Ö., & Bayrak, M. (2016). Inflation and economic growth: A dynamic panel threshold analysis for Turkish republics in transition process. *Procedia—Social and Behavioral Sciences*, *229*, 196–205. https://doi.org/10.1016/j.sbspro.2016.07.129

Awolusi, O. D., & Adeyeye, O. P. (2016). Impact of foreign direct investment on economic growth in Africa. *Problems and Perspectives in Management*, *14*(2), 289–297. https://doi.org/10.1016/j.rie.2014.04.003

Bose, S., & Kohli, B. (2018). Study of FDI trends and patterns in BRICS economies during the period 1990–2015. *Emerging Economy Studies*, *4*(1), 78–101. https://doi.org/10.1177/2394901518769225

CEIC Data (2022). Turkey unemployment rate. *CEIC Data*. https://www.ceicdata.com/en/indicator/turkey/unemployment-rate

Chetty, V. K. & Basanta, K. K. (2020). Harrod-Domar formula for two sector growth models. *IEG Working Papers*, *413*. https://ideas.repec.org/p/awe/wpaper/413.html

Choi, Y. J., & Baek, J. (2017). Does FDI really matter to economic growth in India? *Economies*, *5*(2), 20. https://doi.org/10.3390/economies5020020

Doran, J., McCarthy, N., & O'Connor, M. (2018). The role of entrepreneurship in stimulating economic growth in developed and developing countries. *Cogent Economics and Finance*, *6*(1), 1442093. https://doi.org/10.1080/23322039.2018.1442093

Elboiashi, H. A. (2011). The effect of FDI and other foreign capital inflows on growth and investment in developing economies. http://theses.gla.ac.uk/3026/1/2011elboiashiphd.pdf

Jones, C. I. (2019). Paul Romer: Ideas, nonrivalry, and endogenous growth. *Scandinavian Journal of Economics*, *121*(3), 859–883. https://doi.org/10.1111/sjoe.12370

Gittens, D., & Pilgrim, S. (2013). Foreign direct investment and human capital: A dynamic paradox for developing countries. *Journal of Finance, Accounting and Management*, *4*(2), 26–49.

Guru, B. K., & Yadav, I. S. (2019). Financial development and economic growth: Panel evidence from BRICS. *Journal of Economics, Finance and Administrative Science*, *24*(47), 113–126. https://doi.org/10.1108/JEFAS-12-2017-0125

Gutierrez, R. A. (2015). Theory and praxis of environmental rights in Argentina. *Temas y Debates*, *30*, 13–36.

Hotamişli, M., İbicioğlu, H., & Karayel, M. (2009, June 9–10). Larry Greiner growth model in the organization life and a case study [Conference presentation]. *International Symposium on Sustainable Development, Sarajevo, Bosnia and Heregovina*.

Kaulihowa, T., & Adjasi, C. (2019). Non-linearity of FDI and human capital development in Africa. *Transnational Corporations Review*, *11*(2), 133–142. https://doi.org/10.1080/19186444.2019.1635734

Makhetha, L., & Rantaoleng, J. (2017). Foreign direct investment, trade openness and growth nexus in Lesotho. *Journal of Economic and Financial Sciences*, *10*(1),145 –159. http://doi.org/10.4102/jef.v10i1.10

Maryam, A., & Hassan, M. S. (2013). Human capital: Is it beneficial for trade openness in Pakistan? *Middle-East Journal of Scientific Research*, *17*(7), 965–975. http://doi.org/10.5829/idosi.mejsr.2013.17.07.1366

Mavikela, N., & Khobai, H. (2018). Investigating the link between foreign direct investment, energy consumption and economic growth in Argentina. *MPRA*. https://mpra.ub.uni-muenchen.de/83960/1/MPRA_paper_83960.pdf

Moyo, C., Kolisi, N., & Khobai, H. (2017). The relationship between trade openness and economic growth: The case of Ghana and Nigeria. *International Journal of Economics and Financial Issues*, *8*(1), 77–82. https://www.econjournals.com/index.php/ijefi/article/view/5557

Nguyen, C. P., Su, T. D., & Nguyen, T. V. H. (2018). Institutional quality and economic growth: The case of emerging economies. *Theoretical Economics Letters*, *8*(11), 1943. http://doi.org/10.4236/tel.2018.811127

Nkoro, E., & Uko, A. K. (2016). Autoregressive distributed lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, *5*(4), 63–91. https://www.scienpress.com/Upload/JSEM/Vol%205_4_3.pdf

Organisation for Economic Co-operation and Development (OECD) (2017). *OECD Economic Surveys: Argentina 2017*. https://www.oecd.org/countries/argentina/Argentina-2017-OECD-economic-survey-overview.pdf

Organisation for Economic Co-operation and Development (OECD) (2018). *OECD Economic Surveys: Turkey 2018*. http://www.oecd.org/eco/surveys/Turkey-2018-OECD-economic-surveyoverview.pdf

Organisation for Economic Co-operation and Development (OECD) (2002). *Foreign Direct Investment for Development: Maximising Benefits, Minimising Costs*. https://www.oecd.org/investment/investmentfordevelopment/1959815.pdf

Omodero, C. O. (2019). Government general spending and human development: A case study of Nigeria. *Academic Journal of Interdisciplinary Studies*, *8*(1), 51–59. http://doi.org/10.2478/ajis-2019-0005

Pesaran, M. H., Shin, Y. & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289–326. https://doi.org/10.1002/jae.616

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, *94*(446), 621–634. http://doi.org/10.2307/2670182

Raghutla, C. (2020). The effect of trade openness on economic growth: Some empirical evidence from emerging market economies. *Journal of Public Affairs*, *20*(3), e2081. https://doi.org/10.1002/pa.2081

Statistic South Africa (Statssa) (2022, September 6). South Africa GDP decline by 0.7%. https://www.sanews.gov.za/south-africa/south-african-gdp-declines-07

Stein, L. C., & Yannelis, C. (2020). Financial inclusion, human capital, and wealth accumulation: Evidence from the Freedman's Savings Bank. *Review of Financial Studies*, *33*(11), 5333–5377. https://doi.org/10.1093/rfs/hhaa013

Sultanuzzaman, M. R., Fan, H., Mohamued, E. A., Hossain, M. I., & Islam, M. A. (2019). Effects of export and technology on economic growth: Selected emerging Asian economies. *Economic Research-Ekonomska Istraživanja*, *32*(1), 2515–2531. https://doi.org/10.1080/1331677X.2019.1650656

Sunde, T. (2017). Foreign direct investment, exports, and economic growth: ADRL and causality analysis for South Africa. *Research in International Business and Finance*, *41*, 434–444. https://doi.org/10.1016/j.ribaf.2017.04.035

Su, D. Thanh, Nguyen, P. Canh, & Christophe, S. (2019). Impact of foreign direct investment, trade openness and economic institutions on growth in emerging countries: The case of Vietnam. *Journal of International Studie*s, *12*(3), 243–264. https://doi.org/10.14254/2071-8330.2019/12-3/20

Su, Y., & Liu, Z. (2016). The impact of foreign direct investment and human capital on economic growth: Evidence from Chinese cities. *China Economic Review*, *37*, 97–109. https://doi.org/10.1016/j.chieco.2015.12.007

Tarasov, V. E., & Tarasova, V. V. (2019). Harrod–Domar growth model with memory and distributed lag. *Axioms,* 8(1), 9. https://doi.org/10.3390/axioms8010009

Temiz, D., & Gökmen, A. (2014). FDI inflow as an international business operation by MNCs and economic growth: An empirical study on Turkey. *International Business Review*, *23*(1), 145–154. https://doi.org/10.1016/j.ibusrev.2013.03.003

Thong, L.N., & Hao, N.T. (2019). The Harrod-Domar growth model and its implications for economic development in Vietnam. *International Journal of Humanities Social Sciences and Education*, *6*(4),11–17. http://doi.org/10.20431/2349-0381.0604003

United Nations Trade and Development (UNCTAD) (2021). **World investment report 2021**. https://unctad.org/webflyer/world-investment-report-2021

Uyar, U., & Gökçe, A. (2017). The relationship between energy consumption and growth in emerging markets by panel quantile regression: Evidence from VISTA countries. *Pamukkale University Journal of Social Sciences Institute*, *27*, 364–373. https://doi.org/10.5505/pausbed.2017.38233

Vo, A. T., Van, L. T. H., Vo, D. H., & McAleer, M. (2019). Financial inclusion and macroeconomic stability in emerging and frontier markets. *Annals of Financial Economics*, *14*(2), 1950008. https://doi.org/10.1142/S2010495219500088

Institutions and Economies
Vol. 17, No. 4, October 2025, pp. 107-127 https://doi.org/10.22452/IJIE.vol17no4.5

Religiosity of the Rich and Poor and Escape Theory: Cross-Country Evidence

Makmor Tumin,[a] Khaled Tafran,[b] Ahmad Farid Osman[c] and Nawi Abdullah[d]

Abstract: *This study attempts to explore the relevance of secularisation theory and its relationship with escape theory, by examining the probable quadratic nature of the relationship between income and religiosity beyond individual data. This research reveals that cross-country data on the measurements of income and religiosity across 105 countries only weakly supports this quadratic relationship. Although an exceptional case can be made for very rich countries, the explanatory power of secularisation theory is not diminished in explaining the relationship between income and religiosity in rich and poor countries, whereby religiosity declines in the presence of increased income. In examining the relationship between income and religiosity at an aggregate level, this study employs three different sets of econometric models, with each set using different dependent variables as a proxy of religiosity. As for independent variables, in addition to income and quadratic terms of income, several other variables were included in regressions as control variables. Results from estimations reveal consistent findings, in which religiosity decreases with decreasing income to a certain point, then begins to increase with increasing income. This finding supports the study hypothesis that escape theory does apply for both the poor and rich.*

Keywords: Atheism; Escape theory; Religiosity; Poor countries; Rich countries
JEL Classification: C51, C52, Z120

[a] Department of Political Science, Public Administration and Development Studies, Faculty of Business and Economics, Universiti Malaya, Kuala Lumpur, Malaysia. Email: makmor@um.edu.my. ORCID ID: 0000-0002-0093-7181

[b] Freelance researcher, Gothenburg, Sweden. *Email: khaledtafran@hotmail.com*

[c] Corresponding author. Department of Decision Science, Faculty of Business and Economics, Universiti Malaya, Kuala Lumpur, Malaysia. *Email: faridosman@um.edu.my*. ORCID ID: 0000-0001-9007-4908

[d] Department of Political Science, Public Administration and Development Studies, Faculty of Business and Economics, Universiti Malaya, Kuala Lumpur, Malaysia. *Email: a.nawi@um.edu.my*

1. Introduction

By defining religion as "beliefs, actions, and institutions" (Bruce, 2011), secularisation can be defined as a process through which a society shifts from a strong association with religious institutions and ideals to nonreligious principles and secular institutions. The secularisation thesis emphasises the view that religious authority declines in all spheres of social life and government as nations evolve, notably via modernity, rationality, and breakthroughs in science and technology.

Secularisation thus constitutes the decline of religious institutions; the displacement of religious principles and regulations in concerns of behaviour; governmental sequestration of religious organisations' assets and facilities; the substitution of an empirical, logical, and instrumental perspective for religious consciousness; the transition of social activities and functions from religion to secular control; and the decrease in the amount of money that people spend on paranormal issues (Bruce, 2011; Wilson, 1982).

Secularisation theory is long-standing, despite having been challenged, and continues to suggest that religiosity declines with increasing income (Inglehart, 2020). Prior to that, however, many of the world's richest people were found to be religiously affiliated (New World Health, as cited in Frank, 2015), suggesting that the relationship between income and religiosity is not necessarily linear. Some theories describe the religiosity of the poor as an escape from the hardship caused by low economic status, completely neglecting the arguments of the authenticity of religion. But could the very rich also possibly have an escape? The study above generally approaches the issue by considering the relationship between certain measures of religiosity and individual income. The authors are aware that attempts to explore the relevance of the secularisation theory and its relationship with the escape theory by examining the probable quadratic nature of the relationship between income and religiosity beyond individual data runs a risk of simplification. Other factors may come into play, and the relationship between the cross-sectional, time series, and even panel evidence could lead to different discoveries.

Secularisation theory predicts that development leads to a lower level of religiosity. As development increases income and eradicates poverty, the demand for religion declines. According to this view, as pioneered since the late 19th century, the need for religion among the poor is an escape from the

deprivation and being of lower-class. It offers an escape from their fear of life's challenges (Freud, 1927). In the words of Karl Marx, religion is "the opium of the people" (Marx, 1970).

Inglehart's secularisation theory claims a negative relationship between existential threats and religiosity. However, this is challenged by the fertility rate, in which only modern and technologically advanced Western countries, like the Nordic countries and the United States, exhibit a replacement level below the normal rate, presenting evidence of religious decline (Inglehart, 2020). On the other hand, in other countries, especially Muslim-majority countries, religion remains stable. The argument that religiosity declines as countries achieve an increased income and a higher level of security against potential life challenges has received empirical support from several prior studies (Barber, 2011; Herzer & Strulik, 2017). For instance, Herzer and Strulik (2017) find a bi-directional and causal relationship between income and religiosity, where increased income causes a decline in religiosity (and vice versa), by country.

In a comprehensive review of the correlation between religion and social status, Ellis et al. (2018) find mixed evidence on the correlation between religiosity and income or wealth. The suggested reason for these mixed findings is that these studies employ different measures of religiosity. However, another possible reason is that the relationship between religiosity and income is not linear. Assuming that it might lead to conflicting outcomes depending on, among others, the income levels used in each study. The above study suggests that the relationship between religiosity and income may not necessarily be linear, where increased income will always result in lower religiosity. Rather, religiosity could be hypothesised to decrease with increased income only to a certain threshold, thereafter, increasing with increasing income. In other words, the relationship between religiosity and income is likely quadratic, taking a U-shape. While individual data might support the non-linearity form of income and religiosity, this is yet to be proven by aggregate data.

The objective of this study therefore is to examine the religiosity-income nexus by employing cross-country data from 105 countries on the measurements of their income and religiosity. We present a discussion on religion for the rich and escape theory, followed by the materials and methods of the study, the results and discussion, limitations, and finally, the conclusion of the study.

The implementation of this study is motivated by the need to understand religious behaviours of people, not only at individual level, but also at an aggregate level. Many countries around the world allocate huge sums of money on religion-related matters or programmes for clear objectives. Religion as a tool to shape moral and ethical values across different societies and cultures provides a framework for understanding right and wrong, and for defining what is considered acceptable behaviour (Collegenp, 2023). From the perspective of a country, developing social integration and cooperation among its residents is imperative. As religious people are found to be more prosocial (Shariff, 2015), having a large portion of the population who are not religious may lead to less integrated communities within the country. Studying the potential relationship between income and religiosity is an approach of looking at how different segments of people within a country characterised by different levels of income are adopting religion-guided rules of life.

2. Religion for the Rich and Escape Theory

The escape theory, which refers to "the tendency for people to engage in behaviours to avoid an unpleasant psychological reaction" (Baumeister et al., 2007), provides a psychological basis for the proponents of the secularisation hypothesis. This could also help explain why the very rich might be more religious than those who are in the middle. In other words, religiosity could be the 'opium for the rich' as well, and not only for the poor. But what might the rich be escaping from? We will discuss some Hobbesian and Rousseauian ideas below to help understand their escape.

Neumayer (2003) studies the relationship between income and suicide rates at the country level and finds that "higher income levels first lower the suicide rate, but at a decreasing rate, and then raise the suicide rate after a certain income level has been reached." When per capita income exceeds USD30,700, Neumayer (2003) concludes that higher income levels are associated with higher suicide rates. In other words, suicide is higher among the poor and the very rich compared to those in the middle. In line with that, Luthar and Latendresse (2005) conclude that children of the affluent are subjected to several psychological risks as a result of excessive pressure to achieve expectations and the physical and emotional isolation from their parents.

For the rich, religion might offer an escape from various types of mental illnesses that lead to a higher risk of committing suicide. Suicide, which "is often an escape from the self" (Baumeister, 1990), is evidently lower at higher levels of religiosity (Clarke et al., 2003). As Pajević et al. (2005) argue:

> *It [religion] corrects tendencies towards psychopathic and paranoid behaviour, reduces converse, depressive and schizoid tendency, and provides successful overcome of emotional conflicts…[it] provide[s] a clear life orientation, solid basis and safe frames for personality development, assuring human to be continually on the way to achieve its own generic essence and reach its own maturity and self-actualisation.*

While evidence at the individual level might hold true, evidence at an aggregate level might tell another story. Hence, this paper attempts to explore such possibility.

Hobbesians believe that in times of extreme and fierce violence, rational beings know of the chances to continue living by consenting to Leviathan (a strong state), thus escaping from the fear of death (Hobbes, 2008). Taking a cue from Hobbes' maxim, when approaching death, rational beings who know that the chance to stay alive is no longer present would consent to religion, escaping from the fear of potential punishment in the afterlife; this applies to both the rich and poor. From Jean-Jacques Rousseau (1985), we learn that refusing to live a simple life and continuously making attempts to achieve self-imposed values would make our lives intensely painful. Therefore, people tend to escape by suicide, and those who do not escape the intense pressure turn to religion. In short, Hobbes' escape theory from the fear of death and Rousseau's theory of people's refusal to live a simple life are the reasons the rich are more likely to stay religious; such is the postulation of religion being "the opium for the rich" as seen from the lens of New Marxists.

3. Materials and Methods

3.1 Measurements of religiosity

This research is based on the indicators of religious commitment from the Pew Research Center (2018), using survey data collected from 105 countries, primarily between 2011 and 2015. The indicators are as follows: importance of religion, or the percentage of people stating that religion is highly important; weekly attendance, or the percentage of people stating that they attend religious services every week; and daily prayer, or the percentage of people stating that they perform daily prayers.

3.2 Control variables

3.2.1 Income inequality

Income inequality concerns how a country's overall income is distributed across different strata of the population. An increase in gross domestic product accompanied by high inequality may lead to the rich getting richer, and the poor poorer. As our dual escape hypotheses predict, this would lead to higher religiosity rates. In countries with more equal income distribution, however, the bulk of the same increase in GDP, perhaps accompanied by higher taxes, would go to help low-income people break out of poverty. Hence, in countries with low levels of income inequality, an increase in income may lead to a decrease in religiosity. Therefore, in testing our hypothesis, it is important to control for income inequality. Agreeing with the dual escape hypothesis, Barber (2011) finds that income inequality, measured by the Gini coefficient, is associated with significantly lower atheism rates in 137 countries. In other words, a more equal distribution of a country's income is associated with lower levels of religiosity.

3.2.2 Education

It is occasionally argued that as people become better educated, they become less religious, based on the assumption that educated people are more scientific and have less tendency to believe in metaphysical explanations of the world (Barro & McCleary, 2003). However, previous findings regarding

the effect of education on religiosity are complex. The pioneering work of Barro and McCleary (2003) reveals that education has both negative and positive effects on religiosity, with the effect depending on the specification of the model. One study provides evidence on the positive relationship between education and religiosity (Rachmatullah et al., 2019). We also can refer to other studies that indicate the presence of a relationship between education and the adoption of religion-related products or services. For instance, Ahmed et al. (2021) finds that those who receive tertiary level education have a better attitude towards Islamic microfinance services compared to those with lower levels of education.

It is worthy to note in our discussion here that when Barro and McCleary (2003) include education in their regression, the income variable (GDP) is insignificant. In a follow up study, Barro and McCleary (2006) do not include education as a determinant of religion. Herzer and Strulik (2017) find that education has a negative effect on religiosity, but their regressions do not control for national income. In contrast, Glaeser and Sacerdote (2008) find that education has a positive effect on religiosity. These contradictory results likely reflect the fact that income captures the bulk of the effect of education on religiosity (Barro & McCleary 2003). In fact, income and education are highly correlated variables; most models that include income likely control the education variable.

3.2.3 Communist governments

Communist countries have significantly lower levels of religiosity compared to their counterparts. Some of these countries have policies to eradicate religions, which is seen to compete with communism (Barro & McCleary, 2003; Barro & McCleary 2006; Barber, 2011). In our analysis, we use a dummy variable to control for the four contemporaries' communist countries in the sample: China, Cuba, Laos, and Vietnam.

3.2.4 Islam

Islam regards apostasy as a capital offense. According to Islamic law, a Muslim who changes his or her religion or becomes an atheist faces capital punishment. Although not in practice in many Muslim countries, this potentially severe punishment influences people's belief and practice of the

religion (Barro & McCleary, 2003; Barro & McCleary, 2006; Barber, 2011; Cottee, 2015). In this study, we controlled for Islam using the percentage of Muslims in each country's overall population.

3.3 Measurement of independent variables

Table 1 presents the independent variables and their measurements and sources. Income data were retrieved from the World Development Indicators database of the World Bank (2019), as were data on income inequality and education. GDP per capita is used as a proxy for income, as it measures per capita income. Education is measured by gross tertiary school enrolment. It is calculated by taking the ratio between total enrolment, regardless of age, and the population of the age group that officially corresponds to the tertiary education level. Thus, it is possible to have a ratio that is greater than 100%. Inequality is measured by the Gini coefficient, which originally ranges from 0 to 1. However, we transformed this coefficient to range from 0 to 100, to illustrate more fine-grained results. Data on the fraction of Muslims in each country are 2010 estimates from the Pew Research Center (2015) dataset. The communist countries of China, Cuba, Laos and Vietnam (CIA, 2020) are assigned a dummy variable.

Table 1: Independent Variables, Measurements, and Sources

Variable	Measurement	Period(s)	Source
Income	Per capita GDP (thousands, constant 2011 USD, PPP)*	2011–2015	World Bank (2019)
Income inequality	Gini coefficient (ranges from 0–100)*	2011–2015	World Bank (2019)
Education	Tertiary school enrolment (% gross)*	2011–2015	World Bank (2019)
Muslims	% of population	2010	Pew Research Center (2015)
Communist country^	Dummy (1: communist, 0: otherwise)	2011–2015	CIA (2020)

3.4 Models and statistical analyses

As previously mentioned, this study relies on cross-sectional data regarding three indicators of religious commitment from the Pew Research Center:

importance of religion, daily prayer, and weekly attendance. For each of these three indicators, multivariate ordinary least squares (OLS) regression was used to examine the study hypothesis. This study intends to prove that the relationship between income and religiosity is non-linear, represented by a U-shaped connection between the two variables.

The non-linearity of the religiosity-income relationship can be examined by adding a quadratic term of income. It replicates a similar model used by Barro (1996) in examining the non-linear relationship between democracy index and growth rate of real per capita GDP. For simplicity, in the following models, we use the term 'religiosity' to refer to all dependent variables presented in Section 3.1.

$$Religiosity = a_0 + a_1 Income + a_2 Income^2 + Controls + error \quad (1)$$

The turning point wherein the relationship between religiosity and income turns from phase I to II can be derived from the first order condition as follows:

$$\frac{d\ Religiosity}{d\ Income} = a_1 + 2a_2 * Income = 0$$

$$Income = \frac{1}{2} * \frac{-a_1}{a_2} \quad , \quad a_2 \neq 0$$

Where the dependent variables measure religious commitment (i.e. the three indicators from the Pew dataset). The study hypothesis is true if both a_1 and a_2 are significant, with $a_1 < 0$ and $a_2 > 0$.

4. Results and Discussion

Table 2 presents descriptive statistics of the study variables. The lowest religious commitment is in China, with only 1% of performing prayers daily or attending religious service on a weekly basis; only 3% consider religion to be a very important aspect of their lives. At the other extreme, Nigeria (89% attend a religious service weekly), Afghanistan (96% pray daily), and Senegal (98% consider religion very important) have the strongest religious commitment across the 105 studied countries.

Table 2: Descriptive Statistics

	N	Mean	Std. Dev.	Min.	Max.
Importance of religion	105	54.048	31.151	3.000 [China]	98.000 [Senegal]
Pray daily	104	48.990	27.313	1.000 [China]	96.000 [Afghanistan]
Attend weekly	101	38.366	27.039	1.000 [China]	89.000 [Nigeria]
Income	105	17.326	14.872	0.745 [Congo, D.R.]	63.098 [Norway]
Communist	105	0.019	0.137	0.000	1.000*
Inequality	94	37.606	8.175	24.680 [Ukraine]	63.000 [South Africa]
Muslim	105	27.225	38.258	0.001 ^	99.900 [Morocco]
Education	95	45.437	29.089	2.241 [Niger]	119.695 [Australia]

Notes: *China, Cuba, Laos, and Vietnam. ^ 23 countries have 0.001% Muslim population.

A correlation matrix of the studied variables is shown in Table 3. The three measures of religious commitment are highly correlated ($r > 0.84$). Except for income and education, correlations across the independent variables range from very weak to moderate ($r < 0.5$). Unsurprisingly, income and education have a considerably strong correlation ($r = 0.774$), but not strong enough to signify a serious multicollinearity issue in the regression model. This is indicated by low variance inflation factor (VIF) values in the models that include both income and education as independent variables.

Table 3: Pearson Correlation Matrix

	Importance of religion	Pray daily	Attend weekly	Income	Communist	Inequality	Muslim
Pray daily	0.931						
	(0.000)						
Attend weekly	0.903	0.842					
	(0.000)	(0.000)					
Income	-0.727	-0.671	-0.654				
	(0.000)	(0.000)	(0.000)				
Communist	-0.196	-0.214	-0.139	-0.083			
	(0.045)	(0.029)	(0.166)	(0.400)			

	Importance of religion	**Pray daily**	**Attend weekly**	**Income**	**Communist**	**Inequality**	**Muslim**
Inequality	0.567	0.534	0.568	-0.391	0.004		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.973)		
Muslim	0.384	0.425	0.287	-0.388	-0.096	-0.204	
	(0.000)	(0.000)	(0.004)	(0.000)	(0.330)	(0.048)	
Education	-0.732	-0.681	-0.761	0.774	-0.076	-0.430	-0.438
	(0.000)	(0.000)	(0.000)	(0.000)	(0.467)	(0.000)	(0.000)

Table 4 presents the results of the multivariate regressions, wherein the dependent variable is the importance of religion. There are nine different specifications of econometrics models used here, with each consisting of a different set of independent variables. With exception to the regression in Column 7, all regressions either include income or income and its quadratic term. The regression in Column 7 excludes income and includes all control variables. Religiosity decreases with decreasing income to a certain turning point, and then begins to increase with increasing income. This is depicted by the obtained negative value of the estimated regression coefficient for the income variable and positive value of the estimated regression coefficient for the income^2 variable. The inclusion of the linear form of the income variable into the regression (Column 8) improves the model's explanatory power (adjusted R^2) from 0.768 to 0.800, while including the quadratic term of income into the regression improves the adjusted R^2 to 0.827 (regression 6).

Noticeably, education becomes insignificant ($p = 0.12$) when including the non-linear term of income in the regression (Column 6). It is significant without the non-linear term of income (Column 8). However, the presence of the education variable in the model provides important explanatory power, improving the adjusted R^2 from 0.813 (regression 5) to 0.827 (regression 6). As mentioned above, the countries' levels of income and education are highly correlated. This implies that a large fraction of the effect of education on religiosity is captured by income in our model. Importantly, income in its quadratic form produces higher explanatory power than education, as can be seen from a comparison between regression 5 (adjusted $R^2 = 0.813$) wherein education is excluded and regression 7 (adjusted $R^2 = 0.768$) wherein income is excluded.

The last row of Table 4 presents the turning points at which the relationship between religiosity and income become positive instead of

negative. The turning point value can only be calculated for regressions that include the quadratic term of income. The calculation was done according to the derived formula given in Section 3.4. Regressions 5 (without education variable) and 6 (with full set of independent variables) indicate that this turning point is around USD41,000. In other words, when a country's income exceeds this threshold, higher income is associated with a higher fraction of the population reporting religion to be very important in their lives (i.e., positive relationship between income and religiosity). Meanwhile, below this level of income, the opposite holds true (negative relationship between income and religiosity).

Table 4: Determinants of Religiosity (Measured by 'Importance of Religion')

	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**
Income	-1.522	-3.110	-3.000	-3.069	-2.685	-2.213	-	-0.587	-1.022
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	-	(0.000)	(0.000)
$Income^2$	-	0.032	0.035	0.035	0.033	0.027	-	-	-
	-	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	-	-	-
Inequality	-	-	1.273	1.234	1.622	1.524	1.514	1.358	1.645
	-	-	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Communist	-	-	-	-56.063	-48.501	-50.044	-47.658	-51.000	-47.409
	-	-	-	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Muslim	-	-	-	-	0.222	0.190	0.218	0.180	0.243
	-	-	-	-	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Education	-	-	-	-	-	-0.161	-0.595	-0.393	-
	-	-	-	-	-	(0.120)	(0.000)	(0.000)	-
Constant	80.417	91.114	39.328	43.095	17.572	24.245	18.909	26.979	4.173
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.024)	(0.118)	(0.020)	(0.705)
R^2	0.528	0.589	0.708	0.775	0.823	0.839	0.779	0.811	0.758
Adjusted R^2	0.523	0.581	0.698	0.765	0.813	0.827	0.768	0.800	0.748
Observations	105	105	94	94	94	87	87	87	94
Turning point	-	47.99	42.98	43.72	41.06	41.29	-	-	-

Notes: GDP = Gross national product. Parentheses denote p values. Multivariate OLS regressions.

Tables 5 and 6 present the results of regressions using weekly attendance and daily prayer as dependent variables, with findings that are similar to those presented in Table 4, all of which confirm the non-linear relationship between income and religiosity. The results presented in Tables 5 and 6

support the hypothesis that there is a non-linear relationship (given by a quadratic type of equation) between income and religiosity, even if different measures of religiosity are used in the estimating regression models. In other words, the use of different measures of religiosity providing similar outcomes shows the robustness of the findings and provides better reliability for the conclusion.

Interestingly, when measuring religiosity by weekly attendance of religious services, the turning point (around USD35,000, Table 5; Regressions 5 and 6) is significantly lower than when measuring religiosity by daily prayer (around USD45,000; Table 4; Regressions 5 and 6). In fact, daily prayer is a higher order of religious commitment compared to weekly attendance of religious services. Therefore, a higher level of income is required to turn the effect of income on performing daily prayer from negative to positive, compared to the level of income required for weekly attendance.

Data from high-income countries, such as the US, show a clear decline in religiosity over time, between 2007 and 2019 (Pew Research Center, 2019). Recalling the results of this research that indicate that religiosity has an upward trend at higher level of income, an important question is raised: why is religiosity declining in almost all rich countries, even while these countries continue to become richer? And why is religious practice much higher in the middle and upper-class communities in America (Murray, 2013; Carney, 2019)?

In fact, an accurate answer for the above question requires an individual-level analysis, which is beyond the scope of this current study that uses country-level data. However, a possible answer could be that rising national income might help more people break out of poverty and the low-income status, joining the middle-class ranks. This contributes to the decline of religiosity. However, this decline might be accompanied by an increase in religiosity, resulting from more people gaining very high income. If the decline in religiosity among the poor outnumbers the increase among the rich, an overall decline in religiosity would occur, and vice versa.

A suitable illustrative example in this context is Sweden, a rich country with one of the lowest levels of religiosity in the world. Most people in Sweden have a middle-income status, with income tax rates relatively high by global standards that expressly aim towards a policy of income redistribution and support a very generous social security system. The

majority of Swedes are, thus, neither poor, nor extremely rich. In fact, about 80% of Swedes earn between 60% and 200% of the median income, which stands around USD31,000 (Anxo, 2016).

Table 5: Determinants of Religiosity
(Measured by 'Weekly Attendance' of Religious Service)

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Income	-1.189	-3.095	-2.855	-2.829	-2.567	-1.323	-	-0.152	-0.726
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	-	(0.307)	(0.000)
Income2	0.002	0.039	0.038	0.038	0.036	0.019	-	-	-
	-	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	-	-	-
Inequality	-	-	1.128	1.138	1.400	1.123	1.055	1.012	1.449
	-	-	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Communist	-	-	-	-42.065	-38.583	-44.232	-46.319	-46.778	-41.362
	-	-	-	(0.006)	(0.008)	(0.001)	(0.001)	(0.001)	(0.015)
Muslim	-	-	-	-	0.147	0.093	0.097	0.087	0.172
	-	-	-	-	(0.003)	(0.048)	(0.043)	(0.075)	(0.003)
Education	-	-	-	-	-	-0.400	-0.616	-0.565	-
	-	-	-	-	-	(0.000)	(0.000)	(0.000)	-
Constant	59.219	72.357	25.494	25.499	8.277	26.454	25.656	27.907	-7.831
	(0.000)	(0.000)	(0.009)	(0.007)	(0.428)	(0.013)	(0.018)	(0.012)	(0.510)
R^2	0.427	0.545	0.677	0.705	0.734	0.800	0.777	0.780	0.626
Adjusted R^2	0.421	0.535	0.666	0.691	0.719	0.784	0.766	0.766	0.608
Observations	101	101	91	91	91	84	84	84	91
Turning point	-	40.19	37.27	37.72	35.75	34.27	-	-	-

Notes: Parentheses denote p values. Multivariate OLS regressions.

Table 6: Determinants of Religiosity (Measured by 'Praying Daily')

	[1]	[2]	[3]	[4]	[5]	[6]
Income	-1.233	-2.226	-2.120	-2.191	-1.805	-1.526
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
$Income^2$	-	0.020	0.022	0.022	0.020	0.017
	-	(0.016)	(0.005)	(0.002)	(0.002)	(0.034)
Inequality	-	-	1.029	0.991	1.388	1.282
	-	-	(0.000)	(0.000)	(0.000)	(0.000)

	[1]	[2]	[3]	[4]	[5]	[6]
Communist	-	-	-	-51.206	-43.474	-44.686
	-	-	-	(0.000)	(0.000)	(0.000)
Muslim	-	-	-	-	0.228	0.195
	-	-	-	-	(0.000)	(0.000)
Education	-	-	-	-	-	-0.111
	-	-	-	-	-	(0.316)
Constant	70.540	77.321	34.382	38.015	11.958	18.514
	(0.000)	(0.000)	(0.002)	(0.000)	(0.258)	(0.108)
*R*2	0.450	0.481	0.588	0.663	0.731	0.750
Adjusted R^2	0.445	0.471	0.574	0.648	0.716	0.731
Observations	104	104	93	93	93	86
Turning point	-	55.10	47.96	48.91	44.90	45.69

Notes: Parentheses denote p values. Multivariate OLS regressions.

It is important to highlight that this study uses self-reported data on religiosity that could be influenced by social desirability (Shaver et al., 2021). This is that in some social contexts, people may desire to appear religious, and, thus, they may report higher or lower church attendance than their actual attendance (Hadaway & Marler, 2005; Shaver et al., 2021). To overcome this potential bias in self-reported data, Shaver et al. (2021) suggest that collection of unbiased data on religiosity could be done by third-party methods. However, such methods are very challenging, and some countries might face strong legal and ethical objections.

Bold examples of the bias in self-reported religiosity might be found in communist and Muslim countries, as discussed earlier in this research. People in communist countries live in a social context, where appearing religious is not desirable. On the other hand, in some Muslim countries, appearing to be non-religious might be strongly undesired or even risky. Our study controls for such potential bias by incorporating dummy variables for communist and Muslim countries. Like previous studies in this area (Barber, 2011), this study offers correlational evidence that does not necessary reflect causation. Establishing causal evidence requires time-variant data, a task deferred for future research.

Moreover, the study uses data at a country aggregate level, although with the application of data at the micro (individual) level provided by

the World Values Survey, the European Values Study, the European Social Survey, and the International Social Survey Programme, a solid argument that would support the conclusion of this current study could possibly be established. Collecting time-variant and individual data to overcome the limitations of this study would be the primary focus in future studies. The authors are also aware that such regression results (such as Barro's cross-country regressions) are extremely fragile, hence great care must be considered when continuing such analyses.

5. Conclusion

It has long been argued that as income increases, people become less religious. However, the data suggesting that most the world's richest people are religiously affiliated cannot be simply ignored (New World Wealth, as cited in Frank, 2015). A brief observation of global data on religiosity and income shows that becoming richer does not always mean becoming less religious.

This study offers findings on the relationship between income and religiosity, in which we demonstrated a nonlinear relationship between income and religiosity. Religiosity thus declines—at a decreasing rate—with increasing income. Once incomes reach a specific turning point, increased income, although with little evidence, is associated instead with an increase in religiosity. This suggests that income redistribution plays an adaptive role affecting a country's level of religiosity. In other words, higher income equality leads to larger middle-income groups and thus lower religiosity. Since religiosity is higher in poor countries compared to their rich counterparts, psychological theories have described religiosity as an escape from the fear and anxieties caused by a lower standard of living.

The present study suggests that not only the poor, but also the rich, escape to religion. While the poor seek escape from economic hardship, the rich may do so in search for the meaning of life away from the materialistic world. It is important to acknowledge that this study does not use individual-level data, but rather country-level data. Therefore, the conclusions of this study should be carefully interpreted, as what applies at a country level may not necessarily be valid at an individual level. One should also be aware that the trend of those who believe, but not belong to, certain religions, is also increasing, which implies that although they are not captured in this research,

it does not mean they are less religious (Wilkins-Laflamme, 2021).

Finally, we should state that the explanatory power of the secularisation theory is not at all diminished in the presence of the current findings. This is because the findings of this study provide strong evidence that the relationship between income and religiosity is curvilinear, especially for countries with a relatively low income. But it is also worthy to state that the data only weakly supports the conclusion that the relationship between income and religiosity turns from negative to positive once income reaches a certain value. This is because there are only a few countries that have income higher than the calculated turning points.

Acknowledgements

We would like to acknowledge the financial support provided by the Ungku Aziz Centre for Development Studies, University of Malaya (research grant: PD005-2018). This publication is partially funded by the Faculty of Business and Economics, Universiti Malaya Special Publication Fund.

References

Ahmed, S., Islam, R., & Al-Asheq, A. (2021). Prospective customers' behavioural intention towards Islamic microfinance services in Bangladesh. *Institutions and Economies*, *13*(2), 101–123. https://doi.org/10.22452/IJIE.vol13no2.4

Anxo, D. (2016). The rise and fall of the Swedish middle class? In D. Vaughan-Whitehead (Ed.), *Europe's disappearing middle class?* (pp. 543–585). Edward Elgar Publishing.

Barber, N. (2011). A cross-national test of the uncertainty hypothesis of religious belief. Cross-Cultural Research, 45(3), 318–333. https://doi.org/10.1177/1069397111402465

Barro, R. J. (1996). Democracy and growth. *Journal of Economic Growth*, *1*(1), 1–27. https://doi.org/10.1007/BF00163340

Barro, R. J., & McCleary, R. M. (2003). Religion and economic growth across countries. *American Sociological Review*, *68*(5), 760–781. http://doi.org/10.2307/1519761

Barro, R. J., & McCleary, R. M. (2006). Religion and economy. *Journal of Economic Perspectives*, *20*(2), 49–72. https://doi.org/10.1257/jep.20.2.49

Baumeister, R. F. (1990). Suicide as escape from self. *Psychological Review*, *97*(1), 90–113. https://doi.org/10.1037/0033-295X.97.1.90

Baumeister, R. F., Vohs, K. D., & DeWall, C. N. (2007). Escape theory. In R. F. Baumeister and K. D. Vohs (Eds.), *Encyclopedia of social psychology* (pp. 313–314). SAGE. https://doi.org/10.4135/9781412956253.n190

Bruce, S. (2011). *Secularization: In defence of an unfashionable theory*. Oxford University Press. https://doi.org/10.1093/acprof:oso bl/9780199654123.001.0001

Carney, T. P. (2019). *Alienated America: Why some places thrive while others collapse*. Harper Collins Publishers.

Central Intelligence Agency (CIA) (2020). The world factbook. CIA. https:// www.cia.gov/the-world-factbook/countries/

Clarke, C. S., Bannon, F. J., & Denihan, A. (2003). Suicide and religiosity: Masaryk's theory revisited. *Social Psychiatry and Psychiatric Epidemiology*, *38*(9), 502–506. https://doi.org/10.1007/s00127-003-0668-6

Collegenp (2023, April 20). The significance of religion in society: Examining its impact on politics, morals, and community. *Collegenp*. https://www.collegenp.com/article/the-significance-of-religion-in-society/

Cottee, S. (2015). *The apostates: When Muslims leave Islam*. Hurst.

Ellis, L., Hoskin, A. W., & Ratnasingam, M. (2018). *Handbook of social status correlates*. Academic Press. https://doi.org/10.1016/C2015-0-04501-4

Frank, R. (2015, January 14). The religion of millionaires. *CNBC*. https:// www.cnbc.com/2015/01/14/the-religion-of-millionaires-.html

Freud S. (1927). *The future of an illusion*. W. W. Norton.

Glaeser, E. L., & Sacerdote, B. I. (2008). Education and religion. *Journal of Human Capital*, *2*(2), 188–215. https://doi.org/10.1086/590413

Hadaway, C. K., & Marler, P. L. (2005). How many Americans attend worship each week? An alternative approach to measurement. *Journal for the Scientific Study of Religion*, *44*(3), 307–322. https://doi.org/10.1111/j.1468-5906.2005.00288.x

Herzer, D., & Strulik, H. (2017). Religiosity and income: A panel cointegration and causality analysis. *Applied Economics*, *49*(30), 2922–2938. https://doi.org/10.1080/00036846.2016.1251562

Hobbes, T. (2008). *Leviathan*. Oxford University Press.

Inglehart, R. F. (2020). *Religion's sudden decline: What's causing it, and what comes next?* Oxford University Press.

Luthar, S. S., & Latendresse, S. J. (2005). Children of the affluent: Challenges to well-being. *Current Directions in Psychological Science*, *14*(1), 49–53. https://doi.org/10.1111/j.0963-7214.2005.00333.x

Marx, K. (1970). *Critique of Hegel's philosophy of right* (A. Jolin & J. O'Malley, Trans.). Cambridge University Press (Original work published 1844).

Murray, C. (2013). *Coming apart: The state of white America, 1960–2010*. Random House.

Neumayer, E. (2003). Are socioeconomic factors valid determinants of suicide? Controlling for national cultures of suicide with fixed-effects estimation. *Cross-Cultural Research*, *37*(3), 307–329. https://doi.org/10.1177/1069397103253708

Pajević, I., Sinanović, O., & Hasanović, M. (2005). Religiosity and mental health. *Psychiatria Danubina*, *17*(1), 84–89. https://doi.org/10.2466/pr0.85.7.1088-1088

Pew Research Center (2015). *The future of world religions: Population growth projections, 2010-2050*. https://www.pewforum.org/2015/04/02/religious-projections-2010-2050/

Pew Research Center (2018). *The age gap in religion around the world*. https://www.pewresearch.org/religion/2018/06/13/the-age-gap-in-religion-around-the-world/

Pew Research Center (2019). *In US, decline of Christianity continues at rapid pace: An update on America's changing religious landscape*. https://www.pewforum.org/2019/10/17/in-u-s-decline-of-christianity-continues-at-rapid-pace/#fn-32175-3

Rachmatullah, A., Ha, M., & Park, J. (2019). Relations among education, religiosity and socioeconomic variables. *South African Journal of Education*, *39*(1), 1-13. https://doi.org/10.15700/saje.v39n1a1611

Rousseau, J. J. (1985). *A Discourse on Inequality*. Penguin Books.

Shariff, A. F. (2015). Does religion increase moral behavior? *Current Opinion in Psychology*, *6*, 108–113. https://doi.org/10.1016/j.copsyc.2015.07.009

Shaver, J. H., White, T. A. J., Vakoati, P., & Lang, M. (2021). A comparison of self-report, systematic observation and third-party judgments of church attendance in a rural Fijian Village. *Plos One*, *16*(10), 1–13. https://doi.org/10.1371/journal.pone.0257160

Wilkins-Laflamme, S. (2021). Digital religion among US and Canadian millenial adults. *Review of Religious Research*, *64*, 225–248. https://link.springer.com/article/10.1007%2Fs13644-021-00463-0

Wilson, B. R. (1982). *Religion in sociological perspective*. Oxford University Press.

World Bank (2019). World development indicators. *World Bank*. https://databank.worldbank.org/source/world-development-indicators

Appendix

Table A: Sample of Countries (N = 105)

Afghanistan	Finland	Nicaragua
Albania	France	Niger
Algeria	Georgia	Nigeria
Argentina	Germany	Norway
Armenia	Ghana	Pakistan
Australia	Greece	Panama
Austria	Guatemala	Paraguay
Azerbaijan	Guinea-Bissau	Peru
Bangladesh	Honduras	Philippines
Belarus	Hungary	Poland
Belgium	India	Portugal
Bolivia	Indonesia	Puerto Rico
Bosnia and Herzegovina	Iran, Islamic Republic	Romania
Botswana	Iraq	Russian Federation
Brazil	Ireland	Rwanda
Bulgaria	Israel	Senegal
Burkina Faso	Italy	Serbia
Cameroon	Japan	Slovak Republic
Canada	Jordan	South Africa
Chad	Kazakhstan	Spain
Chile	Kenya	Sweden
China	Korea, Republic	Switzerland
Colombia	Kosovo	Tajikistan
Congo, Democratic Republic	Kyrgyz Republic	Tanzania
Costa Rica	Latvia	Tunisia
Croatia	Lebanon	Turkey
Czech Republic	Liberia	Uganda
Denmark	Lithuania	Ukraine
Djibouti	Malaysia	United Kingdom
Dominican Republic	Mali	United States
Ecuador	Mexico	Uruguay
Egypt, Arab Republic	Moldova	Uzbekistan
El Salvador	Morocco	Venezuela
Estonia	Mozambique	Vietnam