3rd Eurasian Conference on Economics, Finance and Entrepreneurship

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1	Algeria	1	1,45%
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3	Bulgaria	1	1,45%
4	China	8	11,59%
5	Croatia	1	1,45%
6	Georgia	1	1,45%
7	Greece	2	2,90%
8	Hungary	4	5,80%
9	India	7	10,14%
10	Korea	2	2,90%
11	Nigeria	1	1,45%
12	Norway	2	2,90%
13	Oman	1	1,45%
14	Philippines	1	1,45%
15	Romania	1	1,45%
16	Russia	1	1,45%
17	Singapore	1	1,45%
18	Spain	2	2,90%
19	Türkiye	31	44,93%
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	TOTAL	69	100.00%

CONTENTS

Green compensation and benefits – an overview of the reward practices that promote pro-environmental workplace behavior

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Abstract

Objectives - Activities such as green recruitment and selection, green performance appraisal, green training and development, and green compensation and benefits have been identified as key green HRM (GHRM) activities that support organisations in developing a green workforce. Of these four key activities, – green compensation and benefits (GCB) represents the motivational aspect of GHRM practises through which employees are encouraged to engage in desirable behaviour or, in this case, green or environmentally friendly behaviour. Of all the GHRM practises studied, those related to green rewards are the least utilised. Therefore, the main objective of this paper is to provide a comprehensive overview of green tangible and intangible rewards that can be used to achieve the above objective.

Data and methods – A comprehensive literature review was conducted to identify compensation and benefits practices that can promote green behaviour in the workplace. More specifically, 33 studies related to GHRM and 22 studies related to green or pro-environmental behaviours were analysed to provide three clusters of green reward practises.

Findings - the most prevalent practises in direct material rewards, such as individual bonuses, group bonuses and company-wide participation programmes, are highlighted as a possible green motivational tool. However, the findings help to understand how specific types of indirect material rewards, also known as perks and benefits, can be very effective in attracting, motivating and retaining green employees. As the modern view of reward systems encompasses both transactional (material) and relational (non-material) rewards, this paper also discusses non-material motivational tools such as recognition programmes that can lead to greener behaviour.

Conclusions - One of the biggest threats in today's world that is widely discussed in the media is the negative ecological impact on the environment in the long term. Although environmentalists and governments are working tirelessly to mitigate these environmental issues, it is imperative that employers take a more active role in promoting environmentally friendly behaviour as a company value, thus encouraging their employees to become more aware of the importance of their personal contribution to preserving the environment. It goes without saying that a company's human resource management practises have become an indispensable factor in promoting such behaviour, with activities related to compensation and benefits at the forefront.

Key words: green compensation and benefits, green rewards, pro-environmental workplace behaviour, green workforce, green human resource management

Objectives

In response to the growing awareness of pressing environmental issues, organisations are increasingly setting targets and strategies aimed at reducing their negative impact on the environment, one of which is also corporate environmental responsibility (Sharpe et al., 2012). Organisations that adopt 'green' practises as a strategic issue are characterised by integrating environmental protection into their strategic goals and policies as well as their key functions and operations (Galetić et al., 2008; Obeidat et al., 2023; Yassin, 2021), which include human resource management (HRM) practises. Green initiatives within HRM are therefore part of broader corporate social responsibility programmes (Ahmad, 2015) and are intended to support the paradigmatic understanding of the 'triple bottom line' perspective of business performance, i.e. a sustainability framework that measures a company's success in three key areas: profit, people and the planet (Saeed et al., 2019). Green HRM practises therefore aim to encourage employees to adopt environmentally friendly behaviour with the intention of bringing long-term success to the company.

Pro-environmental workplace behavior

Environmental problems are becoming increasingly serious and include, for example, climate change and air, water and soil pollution on a global scale (Osbaldiston & Schott, 2012). The ultimate effects of these problems are drastic changes in the quality and quantity of all life, prompting organisations to take systematic, socially responsible measures, including motivating their employees to behave more responsibly towards the environment. Pro-environmental behaviour (PEB) is a multidimensional and complex construct whose definition remains challenging due to the different perspectives adopted by scholars (Banwo & Du, 2019). For example, PEB is referred to in the literature as environmentally significant behaviors, environmentally friendly behaviors, environmentally sustainable behaviors, and responsible environmental behaviors, among others (see Osbaldiston & Schott, 2012; Lange & DeWitte, 2019).

In general, PEB can be defined as all possible actions aimed at preventing environmental damage and/or protecting the environment in both the public and private spheres (Balunde et al., 2019; Steg & Vlek, 2009). In terms of behaviours, recycling has been the most studied, and although it is an important PEB, energy, water and petrol conservation are also crucial (Osbaldiston & Schott, 2012). It is now widely recognised that organisations can have a major impact on the environment, for example through energy consumption, transport and waste production (Sharpe et al., 2022), and in the workplace context, employees are the key driver for the successful implementation of environmental initiatives (Banwo & Du, 2019).

There are many techniques that can be used to encourage employees to engage in more PEB – providing information or direction, incentivising, making it easier or more convenient, giving feedback (Osbaldiston & Schott, 2012), but compensation management practises, especially in conjunction with other HRM practises such as training and development, have been shown to be effective in developing a green workforce (see Renwick et al., 2013; Pham et al., 2019). Therefore, organisations can achieve better environmental performance through green human resource management (GHRM) because it creates "green employees" by focusing on basic activities such as "green recruitment and selection"," "green training"," "green performance appraisal" and "green compensation and benefits" (see e.g. Haldorai et al., 2019; Masri & Jaaron, 2017; Renwick et al., 2013) the latter being in the focus of this paper.

Green compensation and benefits practices

Rewards are management tool that serve to attract, retain and motivate the best employees while encouraging the development of new knowledge, actions and skills to achieve the organisation's goals (Jerez-Gómez et al., 2007 after Yong et al., 2020). More importantly, rewards can link the interests of the organisation with the interests of employees as they focus employees' attention on the most important aspects of their work and motivate them to maximise their efforts (Jackson et al., 2011).

When rewards are linked to environmental awareness, unacceptable behaviours are minimised and acceptable behaviours are reinforced (Jackson et al., 2011). In addition to sustainable behaviour, green rewards have been linked to empowerment, better decision making and improved corrective action and prevention, as well as product and process innovation to become green (e.g. Chen et al., 2022). It is generally accepted that to improve the environmental performance of organisations, it is important to introduce a reward system that includes both financial and non-financial rewards for employees (Saeed et al., 2019; Jabbour, 2011; Renwick et al., 2013). While financial or monetary rewards refer to various types of incentives or bonuses, non-financial rewards can be distributed in the form of various perks and benefits such as green travel benefits (Saeed et al., 2019).

The initial review of the green compensation and benefits literature revealed two important findings. First, although green rewards have been found to be more effective than other practises in the HRM system in aligning employee performance with organisational environmental goals (see Jackson & Seo, 2010), they appear to be the least used of all HRM practises reviewed (Masri, 2016). Secondly, in the available empirical studies that have attempted to analyse different GHRM practises, the scales used to assess the compensation and benefits aspects are exclusively constructed in such a way that they do not provide detailed insights into specific practises. More specifically, respondents are usually asked to rate the extent to which a very general practise is applied in their organisation or to state their agreement with the reward practice characteristics using a Likert point scale. Examples include: "Environmental performance is recognized publicly" (Jabbour et al., 2011), as well as "My organization rewards environmental achievements (sabbatical, leave, gifts, bonuses, cash, premiums, promotion)" or "My organization provides incentives to encourage environmentally friendly activities and behaviors (e.g. recycling and waste management)" (Saeed et al., 2019).

While attempting to capture general characteristics of a green compensation and benefits system based on HR expert perceptions is certainly worthwhile, the fact remains that more specific information on compensation practises and processes would provide valuable information for practitioners, academics and the general public alike. Therefore, the **main objective** of this paper is to provide a detailed overview of financial and non-financial rewards while identifying the underlying processes through which the different types of rewards are designed, such as job evaluation and performance appraisal. **Specific objectives** include identifying and explaining the key elements of green rewards in relation to specific groups of reward practises and commenting on the potential downsides that can occur when using them.

Approach

The general approach to writing the paper involves desk research, where a number of available studies were identified and analysed to provide a more detailed overview of possible green compensation and benefits practises. More specifically, in addition to the basic textbooks in the field of HR and compensation management, both empirical and review papers focusing on GHRM and PEB were sourced from various databases (Scopus, WOS, Google Scholar), after which a detailed analysis followed to produce several bundles of practises that can be used to promote pro-environmental behaviours. A classification of green rewards and benefits was proposed based on the usual criteria studied in theory and practise. Rewards are usually addressed in the literature in terms of their nature, i.e. "materiality", and we distinguish between transactional (tangible, material) rewards and relational (intangible, non-material) rewards. This is in line with the approach popularised at the beginning of the new millennium – the total rewards model – according to which neither of the two reward categories is more important than the other, but they should form an integrated whole to achieve the desired strategic goals (e.g. Armstrong, 2010; Galetić, 2015). Three groups of practises that encourage and reward pro-environmental behaviour in the workplace are therefore described in detail below: (1) direct material rewards – fixed salary, (2) direct material rewards – variable salary, (3) indirect material rewards, (4) non-material rewards. Due to the wide scope of non-material practises and the fact that they are generally not considered an area of compensation

management, non-material rewards are only mentioned in this article through the practise of combining material and non-material rewards (i.e. combination of a money bonus and public recognition).

Results

Findings related to direct material fixed compensation

Direct material rewards comprise of base salaries and performance-related salaries at both individual and group level, which are often also referred to as basic remuneration. The base salary that individuals receive in exchange for their work is usually the most important source of their financial security. Salary therefore plays a key role in employees' personal finances and social wellbeing (Milkovich et al., 2013), but it is also the biggest cost factor for employers as, in many countries, this a fixed part of salary which employees receive regularly and irrespectively of own or group performance. In terms of green practices in this field, several aspects should be considered by HR and compensation professionals, as presented in the following table.

Table 1. Green aspects of direct material fixed rewards for employees

Element	Main processes and practices	
Base salary	**Job analysis and job evaluation**	Selecting job characteristics related to environment and comparing them among jobs to establish pay differences. Job analysis is a prerequisite to conduct analytical job evaluation methods.
	Merit-based pay	Selecting performance criteria related to environment for the purposes of annual merit rating.
	Skills-based pay	Basing salary on green skill acquisition blocks that results in base pay differences among employees.

This fundamental part of the overall salary package represents its "stable" element, which reflects the complexity of the job performed and is usually paid monthly, regardless of individual performance. To determine the differences in complexity between different jobs in an organisation and consequently achieve fair pay, employers can use various job evaluation methods. Among them, the point method of job evaluation is the most objective as it uses different job characteristics to analytically compare jobs in an organization. These job characteristics or compensable factors are usually defined by HR experts and selected to fit the characteristics of the organisation, but typically include education, skills, responsibilities, work experience and working conditions. In the context of environmental management, the structure of an organisation's base salary can also be used to reward employees who contribute to the achievement of environmental goals by taking into account factors such as knowledge of environmental regulations and assessment of responsibility for decisions with potential environmental impact when conducting job evaluation studies (Jackson et al., 2011), which may be more important for companies operating in hazardous industries such as the oil and gas or the high-polluting industries in general. It should be noted that **job analysis**, as the hub for all other HRM practises (Singh, 2008), is also fundamental to the job evaluation process, as its end result is a job description that should include all necessary information on selected compensable factors. In other words, job descriptions can serve to identify various tasks and responsibilities related to environmental management for each job (Renwick et al., 2013; Shah et al., 2019).

Another process related to base pay is **merit pay** which results in a permanent increase in base salary, usually at the end of a year or at work anniversary. This increase results from the grades assigned by supervisor to employees at the end of the evaluation process of the employee's work performance, behaviour or characteristics (Jackson et al., 2018; Milkovich et al., 2013). They are often expressed as a percentage of the value of the base salary and the payouts are usually not large – for example, in the range of 2 to 12 per cent – but the addition to base salary offers the potential for significant

long-term salary growth. In the context of promoting PEB, specific green employee attributes, green behaviors/competencies and environmental performance targets should be carefully considered when basing employee evaluations and potential long-term salary increases on them. The practice seems to be especially applicable in companies operating in high-polluting industries who employ professional staff specialized in engineering, quality assurance, occupational safety and the like.

Structures in which pay is largely dependent on the characteristics of the employee and not on the characteristics of the job are known as person-based salary structures, one of which is also **skills-based pay**. This type of structure relates the base salary to the breadth or depth of the specific skills that the person/employee possesses that are relevant to the job (Milkovich et al., 2013). Normally, all employees start with a fixed salary that is more or less the same for everyone covered by the salary structure. Over time, salary increases are earned by demonstrating skills that are valued by the organization – the salary structure defines the skills that are rewarded, and the amount of salary increases for each additional skill (Jackson et al., 2018). As skills-based pay is typically found in the manufacturing sector (Galetić, 2015), certain skill blocks that employees should possess and expand over time could also be related to the preservation of the environment.

Findings related to direct material variable compensation

In contrast to conditional remuneration systems such as merit-related or seniority-related increases, which are permanently incorporated into base salary, a fundamental feature of variable incentives is that they must be earned anew (Armstrong, 2010). The term "performance-related pay" is often used synonymously with the term "variable pay", because it is designed to provide employees with pay increases based, at least in part, on some measure of individual or group performance and independent of their inputs (for example, how long they work) (DeVaro et al., 2020). Such plans include, for example, piece-rates, individual pay-for-performance (PFP) bonuses, spot bonuses, gainsharing and profit-sharing. We distinguish between the level at which performance is measured, i.e. the individual level (the level of the individual employee) and the group level (i.e. the level of the team, department or organization). The most important aspects of these incentives regarding the promotion of PEB are shown in Table 2.

Table 2. Green aspects of direct material variable rewards for employees

Element	**Main processes and practices**	
Individual incentives	**Pay-for-performance bonuses**	Assessing performance dimensions or green behaviour competences on a regular basis, comparing them against previously set standards and rewarding the most successful employees with bonuses (via performance appraisal process).
	Spot bonuses	On-the-spot bonuses for outstanding green performance that the manager notices in the employee and rewards immediately.
Group incentives	**Gain-sharing**	Groups of employees make "green" suggestions for business improvement, the board reviews them and decides on the implementation of the best suggestion.
	Other practices	Profit-sharing and stock-sharing makes sense to be used as management staff motivation techniques, especially for meeting ESG-related goals.

The most common system based on which **individual bonuses** are distributed is the one related to a regular performance appraisal process, as in the case of merit-related pay. In this sense, green performance appraisal has been extensively mentioned in the literature and can be defined as the extent to which certain employees behave and achieve results in terms of greening in each period (Anton, 2016 after Ardiza et al., 2021). It is assumed that when a behaviour is measured to assess a person, its perceived value increases and efforts to comply with the same are increased (Mishra, 2017), especially when achieving or exceeding the predefined standards leads to an attractive reward. Including green

behaviors and objectives in the performance appraisal system is therefore crucial and will facilitate the adoption of these behaviours by employees (Mishra, 2017; Shah et al., 2019). Monthly, quarterly, semi-annual or annual cash PFP bonuses, based in part on the employee's behavioural and technical competency assessments, should be awarded to employees who exceed standards (e.g. Ahmad, 2015). In the context of PEB, this practise is already well established for executives, where, for example, a variable part of the CEO's remuneration package, usually in the form of a short-term, but more often also a long-term bonus, is based on various ESG indicators.

Unlike PFP bonuses, which are categorised as non-discretionary, i.e. based on a well-established, formal performance appraisal system, **spot bonuses** are discretionary rewards given to employees for particularly commendable performance and are awarded "on the spot", i.e. when supervisors learn of a successful employee's job performance (Milkovich et al., 2013). It is a unique type of bonus that, as the name suggests, can be awarded at any point in the year (Mathis et al., 2017). Discretionary bonuses are awarded on an *ad hoc* basis to employees who perform exceptionally well, often without regard to predetermined targets. The bonus thus aims to recognise and demonstrate immediate and spontaneous appreciation and recognition for the exceptional contribution of individuals to the environment that exhibits characteristics of extra-role behavior. In other words, workers could proactively recognise hazards, participate in the development of current green initiatives and consider contemporary environmental issues in their job performance (Ababneh, 2021). Examples of these behaviours, which go beyond the actual work, range from careful use of office lighting and the use of unbleached paper to carrying out energy audits on one's own initiative and identifying additional cost and resource-saving opportunities (Steg & Vlek 2009).

Along with employee profit sharing and company stock ownership plans, gainsharing plans are part of the "Shared Capitalism" movement – a set of compensation practises based, at its core, on the principle that an employee's salary or wealth is directly tied to the performance of a department or – more commonly – an entire organisation (Freeman et al., 2010). **Gainsharing plans** involve measuring the costs and productivity of the organisational unit and then sharing future gains from savings between the employer and employee (Galetić, 2015; Jackson et al., 2018). Employer-employee cost-sharing plans assume that employees can help to continuously reduce costs and improve productivity by, for example, avoiding waste of materials and labour, developing new or better products or services, or working smarter (Jackson et al., 2018). In terms of PEB, gainsharing can be applied so that groups of employees can make "green" suggestions for business, and then the board reviews the suggestions and decides on the implementation of the best suggestion. The savings resulting from the implementation of the proposal are shared between employees and employers. An example of a practise similar to gainsharing is Xerox's "Earth Awards" programme, which recognised teams of employees around the world who have contributed innovative ideas to protect the environment and improve the company's performance, including a process that has reduced water consumption in a key manufacturing process (see Trellis.net, 2004).

Findings related to indirect material compensation

In addition to the elements that are paid directly in money, the salary also includes a number of rewards that the employer can offer the employee as a kind of service to which the objective value of money can be added but is paid indirectly to the employee. This salary element has an important influence on the competitiveness of employers, as it has been shown that the younger generation of employees are increasingly looking for a variety of benefits and privileges when choosing their potential employer (e.g. Galetić et al., 2015). The most common classification criterion based on which perks and benefits are analysed is the one related to their content. In that sense, we differentiate between pension, health and security-related, time-off work-related and services-related perks and benefits. Possible green practices applicable to these three categories of perks and benefits are shown in Table 3.

Table 3. Green aspects of indirect material variable rewards for employees

Element	Main practices	
Pension, health and security-related benefits	**Paying contributions to green investment/ pension funds**	Paying or subsidizing contributions to green funds that invest in green and/or socially responsible companies.
Time off-work-related benefits	**Extra days off work for taking green vacation**	Days off-work can be granted for using green transport and travel, especially when going to vacation (e.g. traveling by train instead of airplane).
Services-related benefits	**Green commuting benefits**	The benefits of green commuting include rewards commuting to and from work by which employees are encouraged to reduce their carbon footprint and develop a greater awareness of environmental protection.
	Flexi-place	Option of either full remote work or hybrid work to commute less or waste energy (utilities).
	Other perks and services	Can include, for example, (1) food-related benefits – offering food in the workplace that is sourced from local family business; offering organic food options; (2) other benefits (discounts on environmentally-friendly products)

It is now widely recognised that perks and benefits serve to attract employees to the company. That is why many employers are now building their employer brand by communicating their perks and benefits extensively and publicly. To attract environmentally conscious talent and encourage employees to engage more with PEB, organisations are proactively promoting their image as a quality 'green employer of choice' (Arulrajah et al., 2015; Jackson et al., 2011), which can be more easily built on communication about the indirect rewards package. One of the most popular green options related to the pension, health and safety benefit bundle relates to investing in employees' retirement as a highly valued security need. Employers in many countries are now putting together pension packages, particularly those offered on a voluntary basis. In the case of green practises, these operate on the basis of paying or subsidising contributions to green investment or pension funds that invest in green and/or socially responsible companies. Capital flows into these types of funds are expected to continue to be significant in the future due to the gradual transfer of wealth to millennials and rising investor awareness of climate change and related measures, including due to the increasing frequency and severity of natural disasters (Capota et al., 2022).

Time off work is an important bundle of benefits whose function is to enable rest periods. It is usually determined by a country's legal framework, which sets minimum requirements for daily, monthly or annual rest periods. Apart from this mandatory part that employers must offer, such as a certain number of weeks of annual leave, there are also voluntary options available to employers to encourage more PEB. For example, extra days off can be granted to employees who volunteer as part of PEB, or to those who choose a low-carbon travel option during annual leave, e.g. train instead of plane (as flying is the fastest growing source of greenhouse gases) (see e.g. Climate Perks, n.d.; Ledsom, 2021).

Of all the perks and benefits practices associated with PEB, **green travel benefits** seem to be the most prevalent in both literature and practise. They mostly relate to commuting and can include the employer's initiative to cover part or all of the cost of transport services or schemes that take employees to and from work using more energy-efficient modes of transport such as public transport (e.g. train, bus or underground), but also the promotion of bike-to-work schemes, which are particularly popular in the UK where green tax incentives exist to encourage bicycle use (e.g. Ahmad, 2015; Beck Krala et al, 2019; Saeed et al, 2019; Martocchio, 2017). In addition, employers can reimburse the costs of transport in the employee's private car, although it should be noted that employers can also encourage their employees to adopt environmentally friendly behaviour in this case and suggest the use of car sharing or car pools.

Among the other service-related employee benefits, **location-based flexible working arrangements** stand out. Originally introduced to address work-life balance (WLB) issues, and further supported by the relatively new EU WLB Directive (2019), this type of location-based flexibility in work organisation can now also be linked to favourable outcomes for the wider environment. To save both the time and financial resources normally spent on commuting (e.g. Klindžić & Huljić, 2024), employers can offer options for home working, remote working or even hybrid working. Finally, **other** service-related perks and benefits are many and diverse, however, two specific types can be singled out. First, food-related benefits at work might include offering meal options that contain organically grown ingredients which can also be sourced locally. Secondly, employers might offer discounts on various types of eco-friendly products.

Findings related to combining material and non-material rewards

Although some authors believe that material rewards are a more effective tool to align employee performance with organisational goals (e.g. Jackson & Seo, 2010), others believe that non-material rewards such as **public recognition and praise** replace financial rewards (e.g. Jackson et al. 2011; Saeed et al., 2018). Recognition is an extremely popular non-material tool of employee motivation as it pays special attention to employees' actions, efforts and behaviour or work performance. Praise or recognition usually occurs as part of the performance appraisal process or when a manager notices very positive behaviour outside of the role that needs to be praised immediately. Used correctly, feedback derived from observing such behavior is the most powerful tool available to organisations to mobilise employee energy towards achieving the organisation's strategic goals, while at an individual level it enhances self-confidence and self-directed learning (Armstrong, 2010). Green recognition-based rewards such as company-wide public recognition are used in large US companies and offered at various levels: e.g. by CEOs annually for individual, team and departmental contributions to waste reduction, company-wide team awards and in non-traditional forms, such as the opportunity for employees to participate in green events/rallies (Renwick et al., 2013).

Despite their obvious positive potential impact on employee motivation, most researchers recognise that public recognition should probably not be given in isolation from monetary rewards. In other words, a **combination of monetary and non-monetary rewards** is more effective in motivating employees to contribute to the organisation's green goals (e.g. Renwick et al., 2013; Tang et al., 2018). In fact, an older study shows that money, feedback and social recognition individually have a significant effect on job performance (Stajkovic & Luthans, 2003 after Luthans et al., 2021). However, when used in combination, they have the greatest (synergistic) effect on job performance compared to money alone, social recognition alone or the other combinations of tangible and non-tangible rewards.

Implications and recommendations

The article presents possible green practises in the area of compensation management and points out some limitations in the application of these practises. Overall, the implications for science and practise are manifold. The main implication or recommendation for **researchers** is that it is necessary to gain a detailed insight into the different elements of compensation systems, and to achieve this, more comprehensive measures should be developed. For example, the differences between various direct and indirect material rewards should be captured, with perks and benefits likely to offer more scope than the other (direct, fixed and variable) components. Furthermore, when collecting data on green reward management practises, different categories of employees should be considered (e.g. executives, professionals, administrators, labourers), as not all types of rewards are equally applicable to all these categories. Finally, instead of Likert scales that capture perceptions, more factual information could be collected that allows comparisons between organisations (e.g. percentages of employee categories covered by a particular reward type).

The implications and recommendations for HR and compensation **professionals** relate to the limitations and specific impacts that reward practises can have. If you are trying to design a green reward system that encourages employees to practise more PEB, be aware that certain rewards come with certain problems. For example, it is widely recognised that developing effective monetary incentives can be challenging because it is difficult to accurately and fairly value pro-environmental behaviour and performance (Fernandez et al., 2003). Therefore, for certain industries and employee categories, it may be more appropriate to offer spot bonuses or perks to encourage PEB, especially environmentally friendly extra-role behaviour. Another potential issue that should be considered is related to pay-for-performance (PFP) practises. Poorly designed PFP practises can lead to employee behaviours that maximise measured performance but are detrimental to stakeholder interests. In addition to the well-known examples of unethical behaviour in senior management (Jackson et al., 2011), linking rewards to performance against environmental targets can lead to similar manipulation, so that deliberate steps are taken to falsify a performance appraisal to make performance look better than it actually is without this being immediately discovered (DeVaro, 2019). Similarly, there is a risk that employees will avoid reporting environmental issues for fear of sanctions (Brio et al., 2007 after Jackson et al., 2011), similar to the case of rewards linked to workplace safety.

Conclusion

One of the biggest threats in today's world that is widely discussed in the media is the negative ecological impact on the environment in the long term. Although environmentalists and governments are working tirelessly to mitigate these environmental issues, it is imperative that employers take a more active role in promoting environmentally friendly behaviour as a company value, thus encouraging their employees to become more aware of the importance of their personal contribution to preserving the environment. It goes without saying that a company's human resource management practises have become an indispensable factor in promoting such behaviour, with activities related to compensation and benefits at the forefront.

References

1. Ababneh, O. (2021), How do green HRM practices affect employees' green behaviors? The role of employee engagement and personality attributes, *Journal of Environmental Planning and Management*, *64*(7), 1204-1226
2. Ahmad, S. (2015) Green Human Resource Management: Policies and practices, *Cogent Business & Management*, *2*(1), 1030817
3. Ardiza, F., Nawangsari, L. C., & Sutawidjaya, A. H. (2021), The influence of green performance appraisal and green compensation to improve employee performance through OCBE, *International Review of Management and Marketing, 11*(4), 13-22.
4. Armstrong, M. (2010), *Armstrong's Handbook of Reward Management Practice: Improving Performance through Reward*, London: Kogan Page
5. Arulrajah, A. Opatha, H. & Nawaratne, N. (2015), Green Human Resource Management Practices: A Review, *Sri Lankan Journal of Human Resource Management*, *5*(1), 1-16
6. Balunde, A., Perlaviciute, G. & Steg, L. (2019), The Relationship Between People's Environmental Considerations and Pro-environmental Behavior in Lithuania, *Frontiers in Psychology*, *10*, 2319.
7. Banwo, A. & Du, J. (2019), Workplace pro-environmental behaviors in small and medium-sized enterprises: an employee level analysis, *Journal of Global Entrepreneurship Research*, *9*, 34
8. Beck Krala, E., Scott, D. & Klimkiewicz, K. (2019), Socially responsible and sustainable rewards programmes: the new frontier, in: Perkins, S. (ed.), *The Routledge Companion to Reward Management*, London: Routledge, 97-111
9. Capotă, L., Giuzio, M., Kapadia, S. & Salakhova, D. (2022), Are ethical and green investment funds more resilient? ECB Working Paper Series No 2747.
10. Chen, F.H., Tsai, Y-T. & Oen, W.A. (2022), Configurations of green human resource management practices on supply chain integration, *International Journal of Engineering Business Management*, 14.
11. Climate Perks (n.d.), https://www.climateperks.com/
12. DeVaro, J. (2020), *Strategic Compensation and Talent Management*, Cambridge: Cambridge University Press
13. Fernández, E., Junquera, B., & Ordiz, M. (2003), Organizational culture and human resources in the environmental issue: a review of the literature, *The International Journal of Human Resource Management, 14*(4), 634–656.
14. Freeman, R. Blasi, J. & Kruse, D. (2010), Introduction to "Shared Capitalism at Work: Employee Ownership, Profit and Gain Sharing, and Broad-based Stock Options", in: Freeman, R. Blasi, J. & Kruse, D. (eds.), *Shared Capitalism at Work: Employee Ownership, Profit and Gain Sharing, and Broad-based Stock Options*, Chicago: University of Chicago Press, 1-37
15. Galetić, L. (2015), *Kompenzacijski menadžment [Compensation Management]*, Zagreb: Sinergija
16. Galetić, L., Načinović Braje, I. & Klindžić, M. (2015), Environmental performance as a function of strategic orientation and organization design: case of Croatian firms, *Proceedings of 4th International Conference "An Enterprise Odyssey: Tourism - Governance and Entrepreneurship"*, p. 253-255
17. Galetić, L., Načinović Braje, I. & Klindžić, M. (2015), Adapting reward strategies to millennials' pay preferences, *5th European Reward Management Conference*, Brussels: EIASM
18. Haldorai, K., Kim, W. & Garcia R. (2022), Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management, *Tourism Management*, *88*, 104431
19. Jabbour, C. J. (2011), How green are HRM practices, organizational culture, learning and teamwork? A Brazilian study, *Industrial and Commercial Training*, *43*(2), 98 – 105

20. Jackson, S. E., & Seo, J. (2010). The greening of strategic HRM scholarship, *Organization Management Journal*, *7*(4), 278–290.

21. Jackson, S. E., Renwick, D. W. S., Jabbour, C. J. C., & Muller-Camen, M. (2011), State-of-the-Art and Future Directions for Green Human Resource Management: Introduction to the Special Issue, *German Journal of Human Resource Management*, *25*(2), 99-116.

22. Jackson, S., Schuler, R. & Werner, S. (2018), *Managing human resources*, New York: Oxford University Press

23. Klindžić, M. & Huljić, A.H. (2024), Work from home and happiness – and empirical research study, *Proceedings of the IISES International Academic Conference*, Prague

24. Lange, F. & Dewitte, S. (2019), Measuring pro-environmental behavior: review and recommendations, *Journal of Environmental Psychology*, *63*, 92-100

25. Ledsom, A. (2021), The New Work Perk? Remote-Working Holiday Packages Or More Time Off If You Don't Fly, *Forbes*, https://www.forbes.com/sites/alexledsom/2021/11/21/the-new-work-perk-remote-working-holiday-packages-or-more-time-off-if-you-dont-fly/

26. Luthans, F., Luthans, B. & Luthans, K. (2021), *Organizational Behavior. An Evidence-Based Approach*, Charlotte: IAP

27. Martocchio, J. (2017), *Strategic Compensation: A Human Resource Management Approach*, Boston: Pearson

28. Masri, H. (2016), *Green HRM*, M.A. Thesis, Nablus: University of Nablus

29. Masri, H. & Jaaron, A., (2017), Assessing Green Human Resources Management practices in Palestinian manufacturing context: An empirical study, *Journal of Cleaner Production*, *143*: 474-489

30. Mathis, R.L., Jackson, J.H., Valentine, S.R. & Meglich, P.A. (2017), *Human Resource Management*, Boston: Cengage Learning

31. Milkovich, G., Newman, J. & Gerhart, B. (2013), *Compensation*, New York: McGraw-Hill

32. Mishra, P. (2017), Green human resource management A framework for sustainable organizational development in an emerging economy, *International Journal of Organizational Analysis*, *25*(5), 762-788

33. Obeidat, S.M., Abdalla, S. & Al Bakri, A.A.K (2023), Integrating green human resource management and circular economy to enhance sustainable performance: an empirical study from the Qatari service sector, *Employee Relations: The International Journal, 45*(2), 535-563

34. Osbaldiston, R. & Schott, J. (2012), Environmental Sustainability and Behavioral Science: Meta-Analysis of Proenvironmental Behavior Experiments, *Environment and Behavior*, *44*(2), 257–299

35. Pham, N. Tučkova, Z., & Jabbour, C. (2019), Greening the hospitality industry: How do green human resource management practices influence organizational citizenship behavior in hotels? A mixed-methods study, *Tourism Management*, 72, 386-399

36. Renwick, D. Redman, T. & Maguire, S. (2013), Green Human Resource Management: A Review and Research Agenda, *International Journal of Management Reviews*, 15(1), 1–14

37. Saeed, B.B., Afsar, B., Hafeez, S., Khan, I., Tahir, M., & Afridi, M.A. (2019), Promoting employee's pro-environmental behavior through green human resource management practices. *Corporate Social Responsibility and Environmental Management, 26*(2), 424–438.

38. Shah, M. (2019), Green human resource management: Development of a valid measurement scale, *Business Strategy and the Environment*, *28*(5), 771–785

39. Sharpe, E., Ruepert, A., der Werff, E., & Steg, L. (2022), Corporate environmental responsibility leads to more pro-environmental behavior at work by strengthening intrinsic pro-environmental motivation, *One Earth*, *5*, 825–835.

40. Singh, P. (2008.), Job analysis for a changing workplace, *Human Resource Management Review*, *18*(2), 87-99.

41. Steg, L., & Vlek, C. (2009), Encouraging pro-environmental behaviour: an integrative review and research agenda, *Journal of Environmental Psycholo*gy, *29*, 309–317

42. Tang, G., Chen, Y., Jiang, Y., Paillé, P. & Jia, J. (2018), Green human resource management practices: scale development and validity, *Asia Pacific Journal of Human Resources, 56*(1), 31-55

43. Trellis.net (2004), Xerox Employees Mix Innovation, Initiative to Protect the Environment, https://trellis.net/article/xerox-employees-mix-innovation-initiative-protect-environment/

44. Yassin, A. (2021), The impact of green human resource management practices and knowledge sharing on sustainable performance: a conceptual framework, *International Journal of Education Humanities and Social Science*, *4*(2), 115-134

45. Yong, J., Yusliza, M-Y, Ramayah, T., Jabbour, C., Sehnem, S., & Mani, V. (2020), Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management, *Business Strategy and the Environment*, *29*(1), 212–228.

Smartphone Addiction: Mental Health Disturbance of the Adolescence

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Abstract

The present study itends to know the side effects and negetive impects of smartphones over uses or miss uses. Smartphone use is necessary in this time, but we have to know about the uses and misuses of smartphones. In adolescents age there are meny chances for misuses of smartphone. Smartphone over use can make your study weak and some times phones overuse can creat mental disturbences in your mind also.

Purpose of this study is to awaire people about effects and side effects of smartphones.

Key Word: Addiction, Mental Health, Mental Health Disturbances(illness), Adolescence

Introduction

Mobile cellphone dependancy considerably affects adolescent lives, as maximum use them for war avoidance. Young identifies era addiction as a compulsive urge to apply era in preference to fixing troubles. Excessive cellular phone use strengthens technical abilties however weakens sensible ones, causing kids to restrain out of doors sports and live of their fable global. Adolescents' anxiety and melancholy growth once they play video games, main to violence and changing their personalities. Social media dependency and mobile phones extensively effect adolescent social, cognitive, and persona development. Video sport violence and social media websites have profound outcomes on adolescent boom. Adolescent persona adjustments suggest early mobile cellphone addiction, in line with the 5-factor version, a dominant trait psychology framework. It identifies 5 to 8 elements in personality traits, and is extensively utilized by children, adolescents, and adults for numerous functions.

1.1 Adolescents and Connection with Social Media

Adolescence is the developmental stage from 10 to 19 years old. when a child becomes functionally independent and reaches maturity. It is a critical and difficult period in a child's life, involving physical and mental growth, Excessive energy stages, and a crucial transition from adolescence to maturity level. Adolescence is a transitional stage between childhood and adulthood, characterized by physical, emotional, and social changes. Adolescents use social media, IM, and online platforms like Facebook and WhatsApp to communicate, document their lives, and seek support. Addictions to the internet, mobile phones, video games, and TV are now being considered for inclusion in DSMV.

1.2 Adolescent's Personality Development and Smartphone

Adolescents are psychologically hooked on social media systems, leading to terrible vocabulary, grammar, and spelling. Overuse can bring about dangerous life, terrible time management, and expanded hazards of melancholy, anxiety, and other mental problems. Adolescents who excessively use the net, phones, video games, and television may enjoy loneliness because of reduced social interactions. Mobile telephones are used for verbal exchange, having a look, and leisure, leading to dependency. Adolescents with cell phone dependence disease may additionally conflict to forestall accomplishing those behaviors, with mobile telephones, the internet, and video games being the most commonplace.

1.3 Concept of Mental Health

Mental health, as described by way of the World Health Organization, refers to an man or woman's health, allowing them to recognize their capabilities, address lifestyle's stresses, work productively, and make a contribution to their community. Mental fitness troubles can impact thinking, temper, and behavior, with biological elements like genes and brain chemistry, life reviews like trauma or abuse, and family records of mental fitness troubles contributing to their development.

Key Words

Addiction

A person with an addiction uses a substance, or engages in a behavior, for which the rewarding effects provide a compelling incentive to repeat the activity, despite detrimental consequences.

- **Reviewed by Psychology Today Staff**

Addiction is a treatable, chronic medical disease involving complex interactions among brain circuits, genetics, the environment, and an individual's life experiences.

- **ASAM**

Mental Health

"Mental Health means the person's physical, mental, social, and spiritual vision is a state of complete goodness".

- **WHO**

Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make healthy choices. [1]. Mental health is important at every stage of life, from childhood and adolescence through adulthood.

- **CDC**

Mental Heralth Disturbence (Illness)

A mental illness is characterized by a clinically significant disturbance in an individual's cognition, emotional regulation, or behaviour.

- **WHO**

Adolescence

Adolescence is the developmental stage from 10 to 19 years old, when a child becomes functionally independent and reaches maturity. It is a critical and difficult period in a child's life, involving physical and mental growth, high energy levels, and a critical transition from childhood to adulthood. Adolescence is a transitional stage between childhood and adulthood, characterized by physical, emotional, and social changes.

- **Durba Chatterjee Mukherjee**

Objectives of the Study

To Determine the Positive and Negative Impects of Smartphone on mental Health of Adolescents.

To Determoine the Effects of Smartphones on Education of Adolescents.

To Determine the Effects of Smartphones on Social life of Adolescents.

Aim of the Study

This study is made up of to know the following impacts on mental health: Stress, Anxiety, Sleep disease, Depression, ADHD etc. The impacts of smartphones on the mental health of adolescents will be known from the study and should be helpful to understand the affected people and improve their mental state.

Important Of the Study

This study is helpful to investigate the condition of students who using smartphones regularly. This study will be for trainees of intellectual health clinicians. This look at is likewise useful to researchers who are studying Mental Health. From this study, clinicians can understand patients mental state, and they can help them to improve their mental health situation and lifestyle also.

Conclusion

This study is helps an understanding of adolescents and students also who are suffering from mental problems with the studies, lifestyle and career or professional future just because of using of smartphone. It will contribute to enhancing students career adaptability. If they can change their daily routine and avoid their phone, they can improve their self with the best results.

References

Dienlin, T, & Johannes, N. (2020). The impact of digital technology use on adolescent well-being. Dialogues Clin Neurosci, 22(2), 135-142. https://doi.org/10.31887/DCNS. 2020.22.2/tdienlin

Liu, M., Pang, W., ... Guo, J. (2022). A Meta-analysis of the Effect of Mobile phone Technology on Creative Performance. Educ. Inf. Technol. https://doi.org/10. 1007/s10639-022-10981-1

Malik, Hafiz Abid Mahmood, Muhammad, Abdul Hafeez, Aqeel, Sehrish, & Amin, Ahsan. (2021). The Impact of Social Media on the Personality Trait of Undergraduates students: A Descriptive Analytical Approach.

R. Vaishali, & K. Indira. (2022). The impact of mobile phone addiction on the identity of teenagers and the effect of intervention. AIP Conference Proceedings 2385. https://doi.org/10. 1063/5.0071330

Books

Comas-Díaz, L., & Griffith, E. E. H. (Eds.). (1988). *Clinical guidelines in cross-cultural mental health.* John Wiley & Sons

Anita, Steward (1992). Measuring the functions and well-being; the Medical Outcomes Study Approach. Sahitya Mudralay private limited.

Journal

Eisenberg, D., Downs, M., & Golberstein, S. (2009). Stigma and help-seeking for mental health among college students. Medical Care Research and Review, 66(5), 522–541.

Survey Report

The knowledge and awareness of different facts of India appears to be the lowest in cuisine, as per India Quotient research

Written by **PTI**

April 18, 2022 5:04:40 pm

Webliography

https://www.financialexpress.com/lifestyle/travel-tourism/most-indians-unaware-about-countrys-history-cultural-diversity-and-even-food-reveal

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6056453/

https://misq.org/skin/frontend/default/misq/surveys98/survrefs.htm

https://link.springer.com/chapter/10.1057/9780230391147_1

http://hdl.handle.net/10603/255333

http://hdl.handle.net/10603/39584

http://hdl.handle.net/10603/32363

https://www.marketing91.com/cross-cultural-communication/

https://cmha.bc.ca/documents/cross-cultural-mental-health-and-substance-use-2/#:~:text=Culture%20is%20related%20to%20mental,such%20as%20discrimination%20and%20isolation.

Geopolitical Risk and Renewa Ble Energy Nexus in Turkey

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Abstract

In periods when global conflicts and therefore geopolitical risks increase, countries may postpone clean energy projects because they see them as costly. On the other hand, since fossil energy prices fluctuate more during these periods, the tendency towards renewable energy may increase. Therefore, the effects of geopolitical risk on renewable energy may vary from country to country. Accordingly, this paper investigates the effects of geopolitical risk on renewable energy for Turkey in the period 1982-2023. In the study where novel wavelet-based and quantile-based techniques are used, the findings obtained show that geopolitical risk generally has positive but weak effects on renewable energy consumption.

Keywords: Geopolitical risk, renewable energy, wavelet analysis, quantile-based technique

1. Introduction

Especially about the current transitions of energy across the world, the link between geopolitical risk and renewable energy has gained much recognition as a key area of research. Indeed, based on various international studies, geopolitical risks include a variety of elements such resource competitiveness and economic instability that may impact the use and investment in renewable energy resources (Che et al. 2023). Research indicates that geopolitical threats could affect the use of renewable energy in two ways. On one hand, with many countries seeking to enhance their energy security and reduce dependence on fossil fuel sources, increasing geopolitical tensions are often countered with increased investments in renewable energy. For instance, Alsagr and Hemmen (2021) indicate that in developing countries, the adoption of renewable energy is positively linked with financial development and geopolitical risk, meaning countries could use renewable energy as a strategic response to geopolitical uncertainties. Additionally, Acheampong and Aluko (2023) postulate that geopolitical matters form one of the critical elements toward the attainment of net zero emissions due to their capability of driving the transition of energy toward renewable energy sources. These findings are supported by the works of Cai and Wu (2021), who note that geopolitical risks have increasingly changed in nature over time, and their impact on renewable energy resource use is no exception. In contrast, geopolitical uncertainties may well serve as a discouraging factor in investing in renewable energy sources. As seen in oil-importing nations,

where geopolitical tensions can impede the development of renewable energy infrastructure, conflict and instability can provide an unfavourable investment climate (Agaton, 2022). According to Bazilian et al. (2019), the shift to renewable energy can cause new geopolitical conflicts, particularly between powerful nations vying for supremacy in clean technologies.

Given the strategic location and the dependence of Turkey on energy, the relationship between geopolitical concerns and renewable energy is a complex one. The need for an efficient energy policy is underlined by the dependence of Turkey on imported fossil fuels, which gives priority to the development of renewable sources, with an energy dependency rate of about 75%, as Ugurlu and Gokcol (2017) pointed out. The geopolitical context highly influences the energy policies of Turkey while pursuing energy security and the management of regional disputes. Besides being a strategic step in lessening the effects brought about by geopolitical tensions, the switch to renewable energy is also a question of environmental sustainability. According to studies, renewable energy may reduce geopolitical concerns. For example, Cai and Wu (2021) underline that renewable energy can reduce geopolitical tension by decreasing dependence on volatile markets for fossil fuels. This is especially important for Turkey, which has been affected throughout its history by regional wars threatening its energy supplies. This opinion is also supported by the work of Acheampong and Aluko (2023) when they indicated that strong renewable energy framework will, among other things, be the route to addressing geopolitical concern issues that may confront the determination for net zero emissions.

Overall, the connection of geopolitical worries to renewable energy has its potential and challenges. The geopolitical concern and renewable energy link dominate the energy strategy of Turkey. Giving priority to renewable energy development could help Turkey enhance energy security and reduce reliance on imported fossil fuel to decrease the negative impacts of geopolitical tensions. What will help Turkey get through these politically complicated times, according to research, is its heavy commitment to renewable energy.

2. Empirical Strategy

In this empirical analysis, the relationship between geopolitical risk and renewable energy is examined in the context of Turkey. For this purpose, the period 1982-2023 is analyzed with novel quantile-based techniques. Namely, the correlation relationship between the variables is examined with the wavelet quantile correlation technique (WQC), and the quantile-based effects of geopolitical risk on renewable energy are examined with the quantile-on-quantile technique (QQR). Finally, the wavelet quantile regression technique (WQR) is used for robustness check. While collecting data for the variables, geopolitical risk (GPR) data are taken from Caldara and Iacoviello (2022). Renewable energy consumption data (REN) are obtained from the Ourworldindata database.

3. Empirical Results

At this stage of the study, the correlation relationship between geopolitical risk and renewable energy is analyzed with the WQC technique. In Figure 1, where the findings are presented, D1-D2 periods represent the short term, D3-D5 periods represent the medium term and S5 period represents the long term. According to the findings, there is a positive correlation between GPR and REN in most quantiles. Especially in all quantiles of the medium term and in the high quantiles of REN in the long term, the positive correlation relationship is evident.

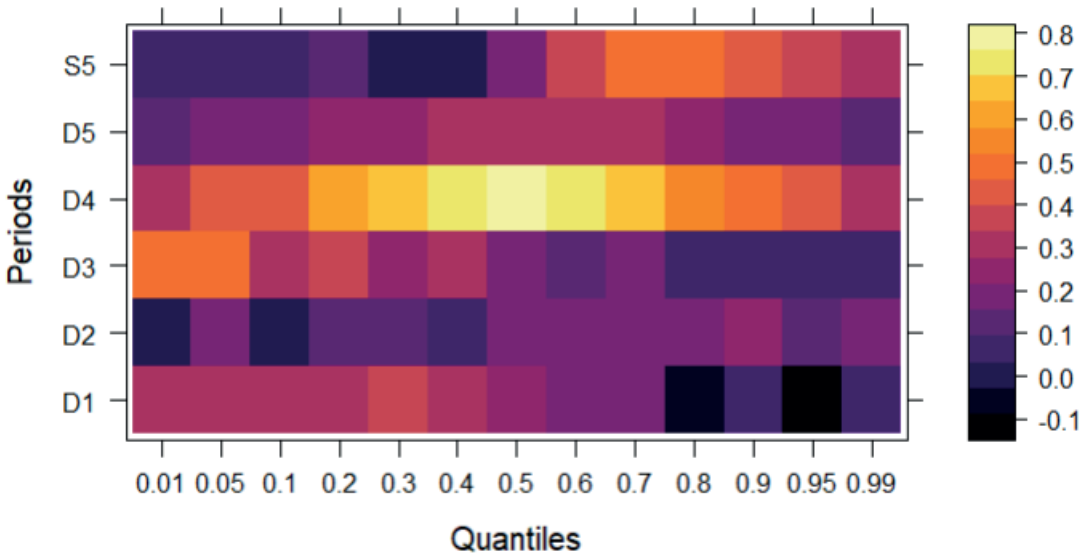

Figure 1. WQC results on the impact of GPR on REN

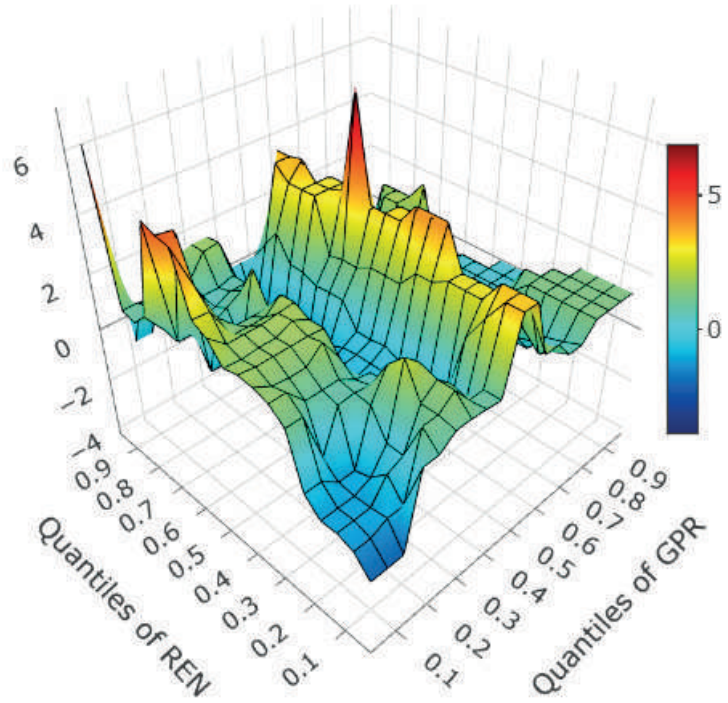

Figure 2. QQR results on the impact of GPR on REN

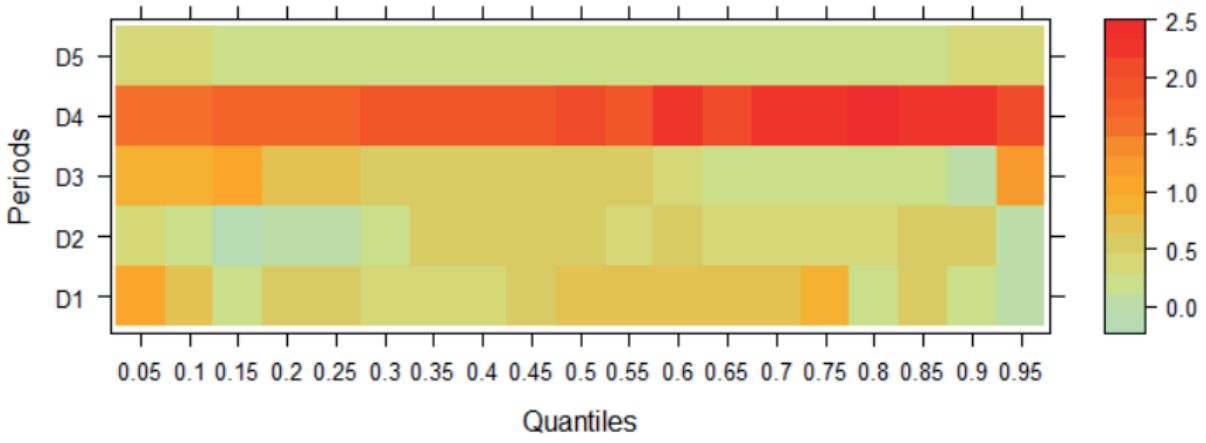

Figure 3. WQR results on the impact of GPR on REN

The interaction between different quantiles of both GPR and REN is plotted in Figure 2. According to the results obtained here, there is a negative interaction between the lower quantiles of GPR and REN. On the other hand, as the quantiles of REN of the lower quantiles of GPR increase, the positive effect of GPR on REN becomes more pronounced. Similarly, although it sometimes increases in the higher quantiles of REN, a weak positive effect is generally valid.

WQR results showing the effects of GPR on REN are given in Figure 3. According to the findings, most of the quantiles have positive but low effects. For the short term of D1-D2, the positive effect is dominant. For the medium term of D3-D4, the positive effect increases significantly and this increasing effect peaks in the high quantiles of REN. In the long term of D5, it is concluded that the effect weakens.

4. Conclusions

The relationship between geopolitical risk and the use of renewable energy underlines how the cleaned-up energy resource is revolutionizing political and economic landscapes in the world. Most of the geopolitical threats associate with the volatility of the markets for fossil fuels, hence bringing into light the weaknesses of the traditional systems of energy. Renewable energy has become increasingly used as a strategic tool for enhancing energy security and reducing dependence on unstable sources of fossil fuels as countries take steps to mitigate these risks. WQC, QQR, and WQR methodologies were applied to this study to analyze the effect of geopolitical risk on renewable energy use in Turkey for the period from 1982 to 2023. By applying wavelet-based and quantile-based new methodologies, the present study points out that the impact of geopolitical risk on the adoption of renewable energy sources is positive but mostly marginal.

Therefore, policies improving energy security and accelerating the deployment of renewables should be priorities for Turkey to further reinforce the role of renewable energy as a hedge against geopolitical threats. It means enhancing financial incentives, bringing geopolitical risk into energy planning, and scaling up investments in renewable infrastructure. Diversification of energy resources, development of innovative technologies such as energy storage, and regional cooperation for the trade of renewable energy-are what policymakers should keep at the top of their agenda.

References

Acheampong, A. and Aluko, O. (2023). The roadmap to net-zero emission: do geopolitical risk and energy transition matter?. Journal of Public Affairs, 23(4).

Agaton, C. (2022). Will a geopolitical conflict accelerate energy transition in oil-importing countries? a case study of the philippines from a real options perspective. Resources, 11(6), 59.

Alsagr, N. and Hemmen, S. (2021). The impact of financial development and geopolitical risk on renewable energy consumption: evidence from emerging markets. Environmental Science and Pollution Research, 28(20), 25906-25919.

Bazilian, M., Bradshaw, M., Gabriel, J., Goldthau, A., & Westphal, K. (2019). Four scenarios of the energy transition: drivers, consequences, and implications for geopolitics. Wiley Interdisciplinary Reviews Climate Change, 11(2).

Cai, Y. and Wu, Y. (2021). Time-varying interactions between geopolitical risks and renewable energy consumption. International Review of Economics & Finance, 74, 116-137.

Caldara, Dario and Matteo Iacoviello (2022), "Measuring Geopolitical Risk," American Economic Review, April, 112(4), pp.1194-1225.

Chu, L. K., Doğan, B., Ghosh, S., & Shahbaz, M. (2023). The influence of shadow economy, environmental policies and geopolitical risk on renewable energy: A comparison of high-and middle-income countries. Journal of Environmental Management, 342, 118122.

Uğurlu, A. and Gökçöl, C. (2017). An overview of turkey's renewable energy trend. Journal of Energy Systems, 1(4), 148-158. https://doi.org/10.30521/jes.361920

A study of the effectiveness of in service teacher education programme after classroom observation

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Key terms

IN SERVICE TEACHERS: Those teachers who are doing teaching regularly or who are in service are termed as in service teachers.

UPPER PRIMARY TEACHERS Those who are teaching classes 6^{th} to 8^{th} are called upper primary teachers.

SECONDARY SCHOOL TEACHERS Those teachers who are teaching 9^{th} and 10^{th} classes are known as secondary school teachers.

Abstract

A study evaluating the effectiveness of in-service teacher education programs after classroom observation found that these programs generally enhance teaching practices and boost teacher confidence. By observing teachers who had recently completed the training, researchers noted improvements in their instructional methods and classroom management. Teachers reported feeling more confident in their abilities, and student engagement and performance also improved, though results varied by subject and grade level. The study suggests that while in-service training can be beneficial, ongoing support and tailored programs may further increase its effectiveness.

Introduction

Education is the process of facilitating learning. It is the acquisition of knowledge, skills, values, beliefs, and habits. Education is also denoted as a course of study to acquire a body of knowledge or skills undertaken to enhance one's ability to do a particular job and be able to earn more money. Education is the development and refinement of one's personality, without necessarily an eye to economic advantages. Education can take place in formal or informal settings and any experience that has a formative effect on the way one thinks, feels or acts may be considered as educational.

Given the increasing significance and visible impact of Entrepreneurship in wealth-creation and employment-generation, National Knowledge Commission, 2008 considers it critical to India's growth and development. It has undertaken this study to explore factors that have advanced Entrepreneurship in India as also various other factors that could further encourage and facilitate even greater growth (NKC, 2008).

'The Right of Children to Free and Compulsory Education Act' or 'Right to Education Act also known as RTE', is an Act of the Parliament of India enacted on 4 August 2009, which describes the

modalities of the importance of free and compulsory education for children between 6 and 14 in India under Article 21A of the Indian Constitution. India became one of 135 countries to make education a fundamental right of every child when the act came into force on 1 April, 2010. The title of the RTE Act incorporates the words 'free and compulsory'. 'Free education' means that no child, other than a child who has been admitted by his or her parents to a school which is not supported by the appropriate Government, shall be liable to pay any kind of fee or charges or expenses which may prevent him or her from pursuing and completing elementary education. 'Compulsory education' casts an obligation on the appropriate Government and local authorities to provide and ensure admission, attendance and completion of elementary education by all children in the 6-14 age groups. With this, India has moved forward to a rights based framework that casts a legal obligation on the Central and State Governments to implement this fundamental child right as enshrined in the Article 21A of the Constitution, in accordance with the provisions of the RTE Act (RTI, 2010).

Various policies and commissions have formulated recommendations regarding improvement of education system because education is henceforth crucial for developing or understanding of the self and the environment. It is inherent part of human personality. The education provides a picturesque of sociological, psychological and emotional relationship existing among various human beings.

Need and significance

The teacher education programme is to develop highly qualified teachers who are knowledgeable, skilled, effective leaders, innovative and action-oriented role models. Teacher trainees should be inspired to be motivated agents of novelty, advocates of creativity, energy and risk taking.

For a good teacher, every element of knowledge, skills, personality and interests is of potential value. In-service training includes everything that happens to a teacher from the day of appointment to the retirement, directly or indirectly in way which he/she executes his/her professional duties.

In-service teacher training may be understood as professional development, or sometimes as part of wider professional development or growth. The career development is understood as growth through natural promotion, from one stage of teacher's professional career to another. In –service teacher training is usually defined as the offering organized programmes for practicing teachers, meant to assist them as one of the plausible planned steps to support their development. These planned situations, provides, possibilities and events supporting teachers' professional development have been becoming more and more varied in the last two decades. New information technologies, modern learning theories, a much better mobility of teachers, and many more factors, is what makes for a variety of in-service teacher training programmes expanding study of texts and other documents in the Internet, e-learning discussion forums, international visits, student exchange programmes and mainly in- school activities, such as action researches, project work, supervision, visits, team teaching, discussion groups, and so on.

Objectives

1. To check the effectiveness of in-service teacher education programme after class room observation.

Rationale of the study

An educator can comprehend the prerequisites and wanted objectives to likewise satisfy them. For this, he is required pre-administration preparing program. However, tragically, it has been seen that, when an educator leaves the everyday schedule on the last day of his term, he at no point ever knows about or from it in the future. He goes quite far to show in a customary way in his group. This has been perceived by UGC, NCERT, SCERT, DIET and other expert foundations at Rudimentary and Senior Optional school level and as an order for proficient improvement of educators. Such countless confirmations are

there which demonstrate that In-administration educators' preparation program altogether impact the mentalities and capability of educators that straightforwardly way to deal with be a powerful instructor.

Hypothesis

1. There is no significant effect of in-service teacher education programme after class room observation.

Delimitation

The following delimitations seen from my point of view:

1. The study has been confined to the upper primary School teachers.
2. The study has been confined to the secondary school teachers.
3. The study has been confined to the Delhi.

Method of the study

Normative survey method has been used in the present study according to the objectives and as the resources available to the research. The survey is now accepted as fundamental instrument of researches in social sciences. The normative survey method is essential in the present study.

Population and sample

Investigator has classified her sample according to the subject discipline, courses with learning study at three levels as primary, upper primary and secondary level. There is equal distribution of teachers from Delhi.

Data of 300 school teachers have been collected with equal distribution.

Statistics used

Mean, S.D. and t –test was used for analysis of data.

Analysis of data

The effectiveness of in-service teacher training programs with respect to its organization, content, classroom transaction and modalities has been analyzed. But the most imperative aspect of teacher training is the student there in classroom observation of the trained teachers was undertaken so as to elicit the actual impact of the in-service teacher training programme. The result of the analysis has been highlighted as below:

Table 1 Classroom Observation of Trained Teachers (N=300)

S. No.	Item Description	Specific Description	Percentage
1.	Introduction of the topic	Stating the topic Review of previous Posing a problem Writing on blackboard	250(83.34%) 110(36.67%) 50 (16.67%) 240 (80%)
2.	Presentation of new concepts	Only teacher talking Discussion & explanation	240(80%) 60(20%)
3.	Explanation of the concepts	With examples Without examples With demonstration	105(35%) 175(58.33%) 20(6.67%)
4.	Asking questions by the teachers to test	Factual knowledge Understanding Application Student opinions	285(95%) 5(1.67%) 5(1.67%) 5(1.67%)
5.	Addressing questions by the teachers	Whole class Individual who volunteer Individual who did not volunteer	275(91.67%) 20(6.67%) 05(1.67%)
6.	Student participation in the discussion	Sometimes Never Often	195(65%) 75(25%) 30(10%)
7.	Teachers response in discussion	Sometimes Never Often	195(65%) 75(25%) 30(10%)
8.	Student praise for participation in discussion	Sometimes Never Often	196(65.33%) 72(24%) 32(10.67%)
9.	Treatment of students by teacher	Authoritarian Respectful In different Equal footing	235(78.33%) 15(5%) 45(15%) 05(1.67%)
S. No.	**Item Description**	**Specific Description**	**Percentage**
10.	Use of resource material in classroom	Sometimes Never Often	196(65.33%) 72(24%) 3210.67%)
11.	Activities organized during lesson	Role Play Game Group Work Conducting experiments Field Study	01(0.33%) 01(0.33%) 265(88.33%) 30(10%) 03(1%)
12.	Attentive students	A few Some Most All Lesson disrupted by students	70(23.33%) 120(40%) 105(35%) 05(1.67%) Nil
13.	Coverage of lesson	In classroom In classroom and outside Outside classroom	280(93.33%) 20(6.67%) Nil
14.	Usage of textbook to	Explain the content Ask students to read Reading at end to summarise	20(6.67%) 275(91.67%) 05(1.67%)

15.	Evaluation of students	Oral Assignments Written Not done	40(13.33%) 20(6.67%) 10(3.33%) 130(43.33%)
16.	Conclusion of lesson	Abrupt Summarizing main points Giving assignments Highlighting some points for reflection	225(75%) 10(3.33%) 65(21.67%) Nil

From Table 1 it can be observed that majority of teachers (83.34%) stated the topic as introduction of the topic and almost all of them (80%) used blackboard. Further, only 36.67% reviewed the previous work and only 16.67% posed a problem before commencement of the actual topic. In addition to, 80% of the students highlighted that only teacher do the talking in the classroom whereas only 6.67% of the participants highlighted that discussion and explanation was employed by the teacher.

From Table 1 it can be seen that 58.83% teachers even after training taught without citing examples in the classroom. Only 35% presented examples before the students and 6.67% used demonstration to clarify the conceptual knowledge of the students. Furthermore, 95% sample students reported that 95% teacher asked questions to elicit factual knowledge whereas only 1.67% used questions to find out understanding, application and students' opinions respectively.

The Table also highlights that majority (92%) teachers address questions to the whole class whereas only 6.67% and 1.67% address questions on individual basis to volunteer students and in volunteer students respectively. Further, 65% reported that they sometimes participate in the discussion whereas 25% and 10% demonstrated that they never and often participated in classroom discussion respectively. Also, 65% reported that sometimes teachers responded in whereas 25% and 10% felt that the teacher never and often responded in classroom discussion respectively.

It can also be seen from Table 1 that 65.33% students remarked that they were sometimes appreciated for participation in the discussion whereas 24% and 10.67% stated that they are never and often praised respectively. In addition, majority of the participants felt the authoritarian treatment by the teachers.

From Table 1 it can also be seen that 65.33% students reported that their trained teachers had sometimes used resource material in the classroom whereas group work is the most preferred activity of most (88.33%) of the teachers. Furthermore, in terms of attentiveness in the classroom 35% participants reported that most of the students remain attentive whereas 40% highlighted that some students pay attention in the classroom.

It can also be seen from Table 1 that most (93.33%) of the classroom transaction takes place in the classroom whereas textbook is mainly (91.67%) used for students to read in the classroom. Evaluation of the students is mostly not done (43.33%) by the teachers followed by oral questioning by some teachers (13.33%). In conclusion, it be stated that most (75%) of teachers end lesson abruptly whereas 21.67% and 3.33% give assignments and summarize main points respectively.

Findings and Conclusion:

Majority of teachers (83.34%) stated the topic as introduction of the topic and almost all of them (80%) used blackboard.

Further, only 36.67% reviewed the previous work and only 16.67% posed a problem before commencement of the actual topic.

In addition to, 80% of the students highlighted that only teacher do the talking in the classroom whereas only 6.67% of the participants highlighted that discussion and explanation was employed by the teacher.

58.83% teachers even after training taught without citing examples in the classroom.

Only 35% presented examples before the students and 6.67% used demonstration to clarify the conceptual knowledge of the students.

Furthermore, 95% sample students reported that 95% teacher asked questions to elicit factual knowledge whereas only 1.67% used questions to find out understanding, application and students' opinions respectively.

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References

1. R.A. Sharma; “In service Education for Teachers”, p. 196, (Meerut, 1989).
2. M.B. Butch; “In service Education for School Teachers”, Retrospect and Prospects, (1968).
3. NCERT; “Report on the Working Group on In service Education of Teachers”, (1986).
4. R.K. Baker; “Planning School Policies for INSET in Hoyle”, (1980).
5. R.B. Banerjee; “Research in In service Primary Education in India”, Teachers Journal of Indian Education, 7(6), (1982).
6. C.A. Castellini; “Analysis Inquiry into In service Educational programmes conducted by Secondary Teachers Training College of Gujarat State”, IV Survey of Research in Education, p.927, (1988).
7. M.P.J. Das; “A study of Mental health of Teachers serving in the primary schools of Puri Town, V. Survey in Eduation, p.23, (1988).
8. K.M. Ehrig; “Pre service Teachers’ Conceptions of Effective Reading instructions, Lesson plan & Educational of Instructional outcomes”, a case study Dissertation Abstract International, Vol. 53, No.(4), (1992).
9. J.E. Gold Smith; “The Effect of an activity Based Model towards the Reduction of Science Teaching Anxiety in pre service Elementary Science Teacher”; Dissertation Abstract International, Vol. 47, p.4044-A, (1987).
10. Singh; “A critical study of the programmes of the pre service and In service Education of teachers of Higher Education in India”, III Survey of Research in Education, pp.846-847, (1980).

Crowding Out on Different Spending Types in Finland

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Abstract

This study investigates the effects of different types of public expenditures on economic growth for Finland in the context of the validity of the crowding-out effect. In this context, the effects of defense expenditures, education expenditures, health expenditures and social protection expenditures on national income are investigated with the novel quantile-on-quantile technique in the period 1990-2022. In this way, the effects of different levels of public expenditure types on different levels of national income are observed. According to the findings, while the crowding-out effect is valid for defense expenditures and social protection expenditures, the effect of health expenditures on national income is generally positive.

Keywords: Social Protection, Health Expenditures, Crowding-Out

1.Introduction

Government spending is one of the most influential ways a nation's economy grows. Among all other areas of public spending, expenditures on defense, education, health, and social protection are outstanding because they represent a nation's strategic priorities and development objectives. These expenditures can have various immediate and long-term effects on the supply and demand sides of the economy. The impact of defence expenditure on economic growth has been analyzed in numerous studies with variable success. According to some findings, the expenditure on defence may raise demand and generate jobs, which will increase economic growth. This may be more possible when money is utilized to develop such technologies and infrastructure that can be used for civilian purposes (Kollias and Paleologou, 2010). For instance, Dudzevi\riūtė et al. (2016) estimate that investment in education and training with defence expenditure develops human capital, which speeds up the economic growth of a nation. On the other side of the coin, however, another set of findings indicates that high military spending may crowd out the essential public investments elsewhere, negatively affecting the overall economic growth (Aizenman and Glick, 2006). For instance, Mylonidis (2008) concludes that military spending tends to adversely affect the long-run economic growth of the European Union members.

It is commonly acknowledged that spending on education is a key factor in economic expansion. The human capital required to boost productivity and encourage innovation is increased by educational investment (Shafuda and De, 2020). Research has indicated a strong correlation between GDP growth

and government investment on education, particularly in emerging nations. For instance, Alam et al. (2022) established that education expenditure significantly contributed to the GDP growth of Saudi Arabia, which further supported the idea that higher spending on education yields better economic outcomes. Moreover, Hanushek and Woessmann (2007) indicated that cognitive skills through high-quality education are closely linked with economic performance, which again highlights the importance of the quality rather than the quantity of education.

Another important determinant of national income is health spending. Health investment can lead to a healthy workforce that raises economic output and productivity (Shafuda and De, 2020). Studies have shown that public healthcare investment improves labour market participation and increases economic growth by extending life expectancy and lowering the burden of sickness. For instance, the results by Shafuda and De 2020 depict the long-run strong association between GDP growth and health spending through improved human resources. Efficiency in the health system and the peculiar health problems a nation is facing may, however, influence how effective health spending is.

By providing a safety net that allows people to invest in their health and education, social protection spending, which includes welfare programs and unemployment benefits, may also have some implications for economic growth (Bose et al., 2007). During recessions, these expenditures may smooth consumption and lift aggregate demand. The relationship is complicated, though; budgetary imbalances may result from an over-reliance on welfare programs without commensurate economic growth, even as social protection lessens poverty and inequality (Bose et al., 2007). Well-targeted social protection programs, studies have shown, enhance the development of human capital, necessary for sustained economic growth (Alshahrani and Alsadiq, 2014). These various expenditure areas related to defence, education, health, and social protection are interdependent in terms of their impacts on national income and remain context specific. Health and education investments have more proximate and positive returns in terms of economic performance, though under special conditions, investment in defence may spark growth. Social protection spending is a key factor in maintaining economic stability and promoting human capital development, but its efficacy depends on the general performance of the economy and the efficiency with which the programs are managed.

2. Empirical Procedure

In order to see whether different types of public expenditures create a crowding-out effect, the effects of defense expenditures (DEF), health expenditures (HEAL), education expenditures (EDU) and social protection expenditures (SOC) on economic growth (GDP) are investigated. In this context, the period 1990-2022 is considered for Finland. In addition, since the number of observations is not sufficient for the technique planned to be used, the obtained data are converted to quarterly data with the quadratic-sum technique.

While creating the data sets subject to empirical analysis, DEF, HEAL, EDU and SOC data are obtained from the Eurostat database, while GDP data are obtained from the World Development Indicators database. For GDP, per capita gdp in US dollars with 2015 fixed prices is used, and for public expenditure types, the percentage share of the relevant expenditure type in total public expenditure is used. In order to separate the effects of public expenditure types on GDP for both different levels of public expenditure types and different levels of national income, the novel quantile-on-quantile (QQR) technique is used.

3. Empirical Results

First of all, the effects of defense expenditures on national income can be seen in Figure 1 in a quantile-based manner. According to the results, defense expenditures negatively affect national income in all quantiles. The negative effect in question is relatively lower in higher quantiles of national income. In addition, the magnitude of the negative effect becomes more evident in higher quantiles of DEF.

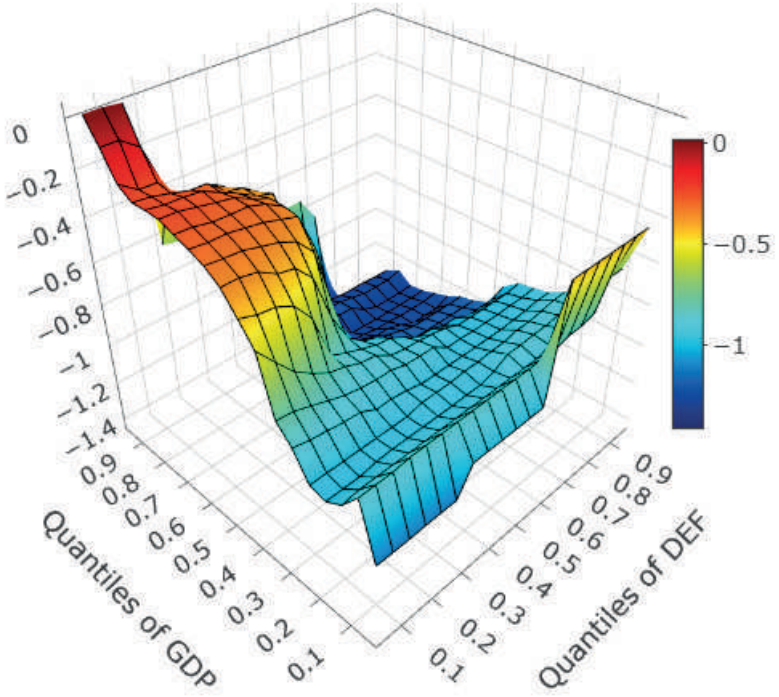

Figure 1. Impact of DEF on GDP

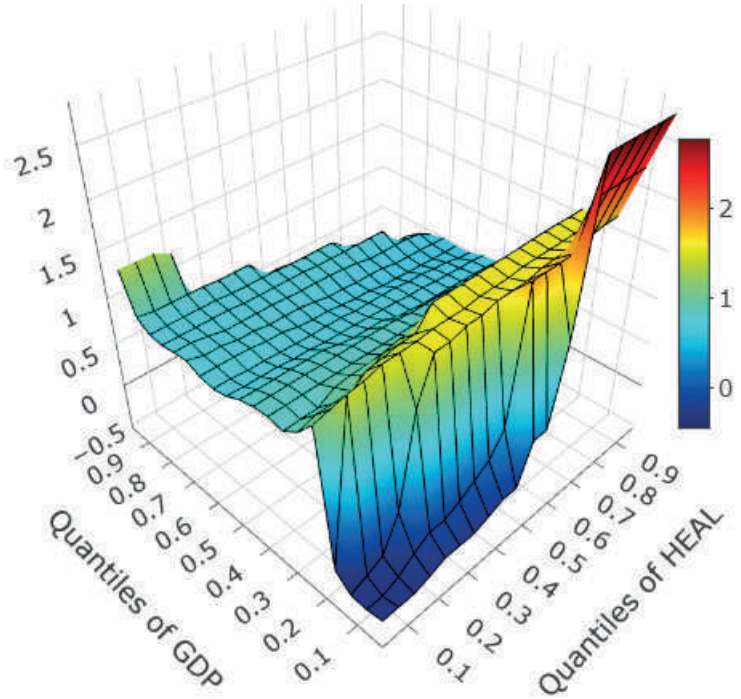

Figure 2. Impact of HEAL on GDP

The effects of health expenditures on GDP for different quantiles are shown in Figure 2. According to the findings, HEAL generally affects GDP positively. Only at low quantiles of GDP, the negative effect of HEAL on GDP is evident. On the other hand, as GDP quantiles increase, the effect of HEAL on GDP becomes positive.

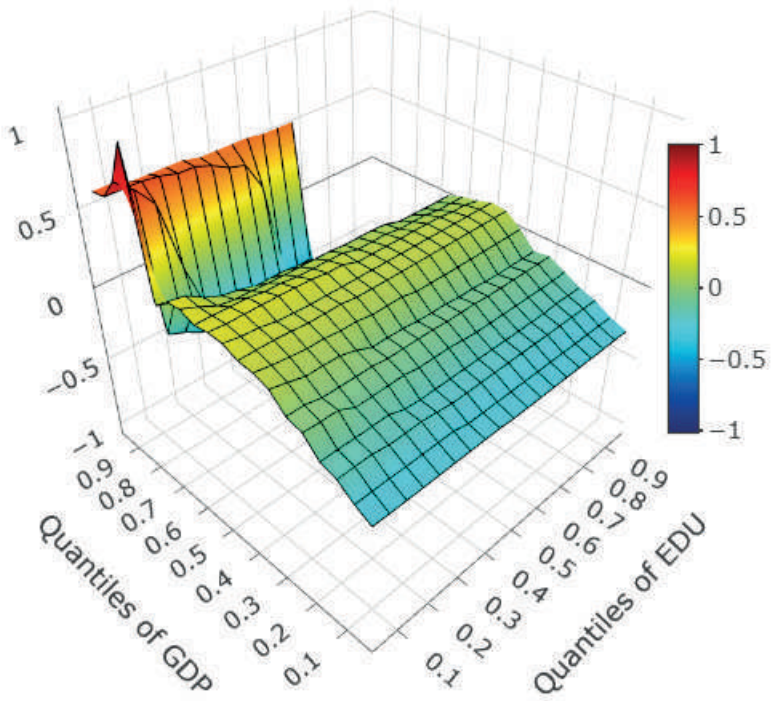

Figure 3. Impact of EDU on GDP

Figure 3 shows the findings regarding the effects of education expenditures on GDP. Accordingly, it can be seen that EDU generally has a negative effect on GDP. On the other hand, the effect turns positive at higher quantiles of GDP. As the quantiles of GDP decrease, the negative effect becomes more pronounced. Therefore, it can be said that the crowding-out effect is valid for education expenditures in Finland.

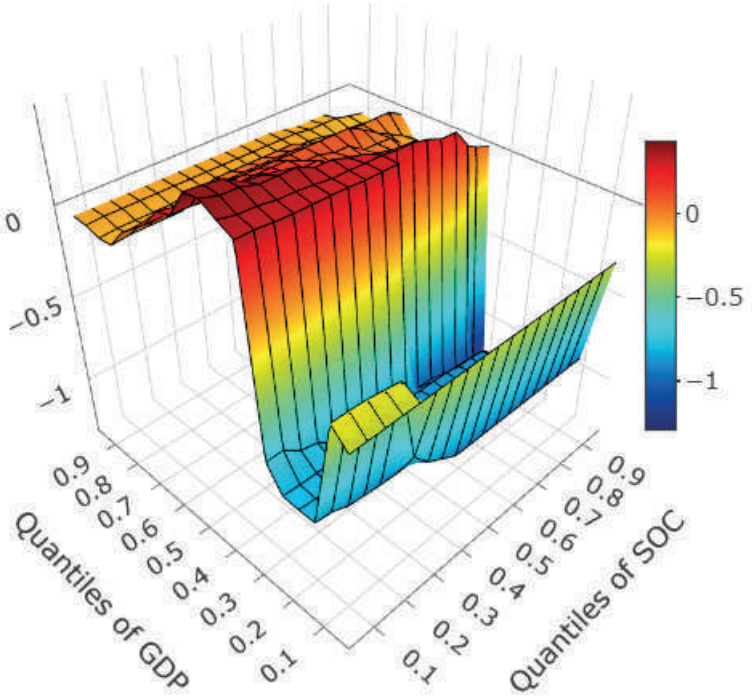

Figure 4. Impact of SOC on GDP

The effects of social protection expenditures on GDP are shown in Figure 4. Accordingly, the effect of SOC on GDP is negative in all quantiles. The negative effect of SOC decreases significantly in the higher quantiles of GDP and approaches zero. The effect is also close to zero in the middle quantiles. In contrast, the effect of SOC is clearly negative in the lower quantiles of GDP.

4. Conclusions

Spending by the government has a significant impact on how a country's economy grows. Defence, education, health, and social protection spending are among the most important areas of public spending because they represent a nation's strategic priorities and developmental goals. These expenses have a range of immediate and long-term effects on the economy's supply and demand sides. In this context, this study examines the effects of defence expenditures, education expenditures, health expenditures, and social protection expenditures on national income in Finland for the period 1990-2022. According to the findings, while the crowding-out effect is valid for defence expenditures and social protection expenditures, the effect of health expenditures on national income is generally positive. Finland should therefore try to shift resources from less effective spending on defence and social protection to areas where there is more room for growth, such as health and education, to maximize the returns of public spending on national income. Under the Finnish conditions, dual-use technology should be emphasized in defence financing, while social protection programmes should be made more targeted and employment-related. While matching educational spending with labour market demands may promote longer-term growth, better investment in preventative healthcare and innovation can help raise productivity. Evidence-informed policymaking and public-private investment can ensure such initiatives are sustainable and financially productive. If Finland can cross-sectorially synergise with a more balanced budget approach to policy and financial management, it might be able to minimize any crowding-out effects and maximise the benefits of public spending for economic growth.

References

Aizenman, J. and Glick, R. (2006). Military expenditure, threats, and growth. Journal of International Trade & Economic Development, 15(2), 129-155.

Alam, F., Singh, H., & Singh, A. (2022). Economic growth in saudi arabia through sectoral reallocation of government expenditures. Sage Open, 12(4).

Alshahrani, S. and Alsadiq, A. (2014). Economic growth and government spending in saudi arabia: an empirical investigation. SSRN Electronic Journal.

Bose, N., Haque, M., & Osborn, D. (2007). Public expenditure and economic growth: a disaggregated analysis for developing countries*. Manchester School, 75(5), 533-556.

Dudzevičiūtė, G., Peleckis, K., & Peleckienė, V. (2016). Tendencies and relations of defense spending and economic growth in the eu countries. Engineering Economics, 27(3).

Hanushek, E. and Woessmann, L. (2007). The role of education quality for economic growth..

Kollias, C. and Paleologou, S. (2010). Growth, investment and military expenditure in the european union-15. Journal of Economic Studies, 37(2), 228-240.

Mylonidis, N. (2008). Revisiting the nexus between military spending and growth in the european union. Defence and Peace Economics, 19(4), 265-272.

Shafuda, C. and De, U. (2020). Government expenditure on human capital and growth in namibia: a time series analysis. Journal of Economic Structures, 9(1).

Esl Students' Perception of Using Present it Right! Linktree Media in Learnıng Oral Presentation Skills

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ABSTRACT

This study is designed to investigate students' views of the usage of Present It Right! Linktree in ESL classroom using the Theory of Diffusion of Innovation (DOI). Specifically, this study focuses on the perceptions of Communicative English 1 and 3 students towards oral presentation topics through Present It Right! Linktree. The teachers use the Canva application to produce more interactive and attractive learning materials: videos, slides, exercises, and others. The materials were distributed to students with only a single link, called Present It Right! Linktree. Linktree is a third-party application used for collecting various learning media application links to students with only one type of link. This current study employs a quantitative approach comprised of 236 Communicative English students. The researchers have used a set of questionnaires adapted from a study by Atkinson (2007) and consist of 19 items on a six - Likert scale (1: strongly disagree, 2: disagree, 3: slightly disagree, 4: slightly agree, 5: agree and 6: strongly agree). Furthermore, the Statistical Package for Social Sciences (SPSS) was utilized to analyze the variables in this study. The result indicates that the students have a positive perception towards Present It Right! Linktree (M=5.40, SD= 0.80). The result from this study is believed to shed light on the usage of Linktree in the classroom to make it easier for teachers to share various learning media application links to boost students' motivation in learning.

Keywords: Linktree, learning media, ESL students

1. Introduction

Oral presentation skills are one of the most important proficiencies needed to complete one's study and prepare graduates for real work situations. A study by Kadir@Shahar & Abdul Raof (2021) asserts that the oral presentation is now a commonly required assessment that students are required to complete, to meet course requirements. However, for the students, delivering a presentation orally could be difficult, but communicating in English using the target language English will likely be more difficult. This somehow affects their motivation to learn this skill and their perception of learning oral presentation skills in the classroom.

To accommodate these situations, a helpful learning environment is necessary. Possessing high-quality teaching material is crucial for creating an enjoyable educational setting for students. In line with the creation of Education 4.0, where incorporating technology into teaching and learning is essential, therefore, teaching methods outside of the classroom such as learning media can be used by the lecturers (Solat, et al., 2022). As a result, learning and teaching become more successful and effective (Afriyose, Sudjarwo, & Sugeng Widodo, 2022).

1.1 Problem Statement

The purpose of developing Present It Right! Linktree is to enhance the existing teaching and learning for one of the topics in the DUE10012 and DUE30022 courses, which are presentation skills. This topic is quite challenging as the allocated time is only 1-hour lecture for 2 weeks, but the coverage is quite broad where it should cover the pre-, present, and post-presentation delivery. Therefore, it is quite a challenge for DUE10012 & DUE30022 lecturers to prepare compact notes with ample exercises and room for the students to practice and work on their tasks. In addition, there was no module or specific textbook for these courses yet. The lecturers usually use PowerPoint slides or other reference books to produce simplified notes for this topic. Hence, a different strategy is needed to facilitate the learning process.

1.2 Research objectives

The project of developing Present It Right! Linktree aims to create enticing and captivating educational resources that address the topic of presentation skills. Thus, the research objective for this study is:

1. to investigate the students' perceptions of using this Present It Right! Linktree.

2. Literature review

2.1 The Diffusion of Innovation (DOI) Theory

The theory of diffusion of innovations served as a basis of an instrument that was developed to determine how well an application connects with the intended audience (Atkinson, 2007). Ausawanetmanee, et al., (2023) mentioned that there are five characteristics of Roger's DOI theory: relative advantage, compatibility, complexity, trialability, and observability. Meanwhile, the theoretical framework applied in this study is the theory of diffusion of innovation to explain how individuals perceive an idea, behaviour, or product as new or innovative. As a result, these perceptions will either motivate or dissuade a person from moving forward with adoption (Zulkifli, 2023).

2.1 The definition of each characteristic of DOI

Relative advantage: The degree to which an innovation is perceived as being better than the idea it supersedes (Atkinson, 2007). This study intends to discover students' perceptions of whether using Present It Right! Linktree is a better medium to facilitate their learning.

Compatibility: As cited in (Raman, et al., 2023) according to Rogers (2003), compatibility is the degree to which an innovation fits the requirements, experiences, and values of possible adopters. To promote the usage of Present It Right! Linktree to DUE10012 and DUE30022 students, the researchers are required to ensure this medium is compatible with the students' need.

Simplicity/Complexity: The degree to which an innovation is perceived as relatively difficult to understand and use. This study uses the term Simplicity to ensure that the characteristics have the same directionality in their association with adoption (Atkinson, 2007). It is believed that students will likely use Present It Right! Linktree if they perceive it as easy to use.

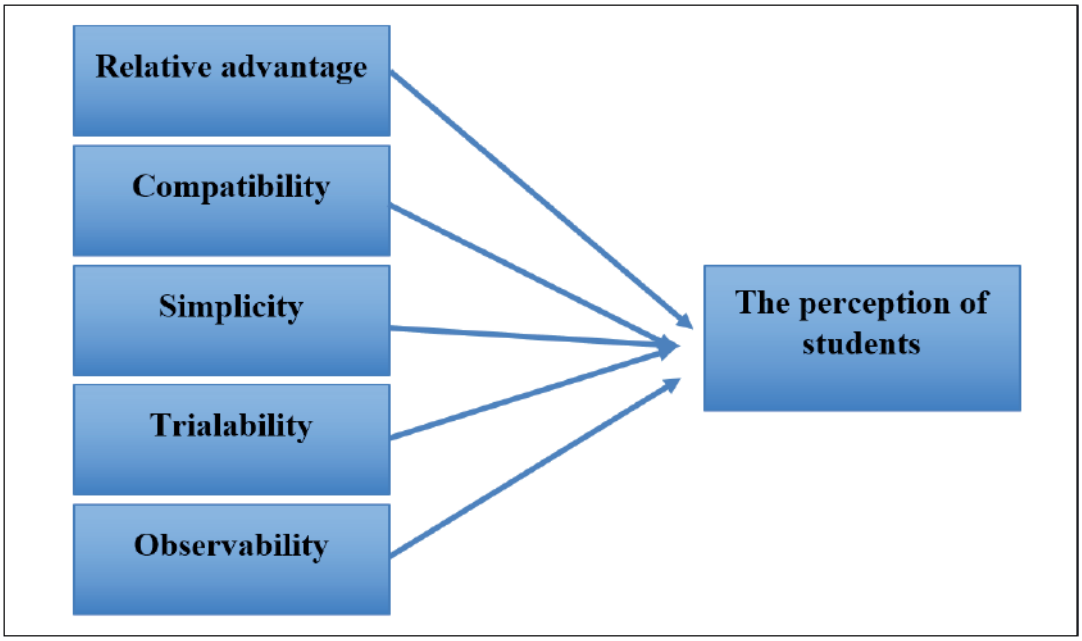

Figure SEQ Figure * ARABIC 1: Diffusion of Innovation adapted from Donmez-Turan, Zehir, & Tunc, (2015)

Trialability: It relates to how easily an innovation can be tested before adoption (Raman, et al., 2023). Innovations that can be tried before adoption are adopted more rapidly than those that cannot.

Observability: Refers to the degree to which the innovation's results are visible to others. In this study, the researchers believe that when students observe their peers show interest in and use the Present It Right! Linktree, they are more likely to adopt it too.

2.2 Present It Right! Linktree

Learning media is a tool for the teaching and learning process that can be utilized by everyone to encourage teaching students (Qur'ani, Nurhijrah, Syarifa Suryana, & Israwati Hamsar, 2023) by stimulating their thoughts, feelings, attention, and abilities or skills by integrating technology (Nanda & Sitti Fatimah, 2023). In this study, the lecturers use the Canva application as a teaching medium where they can use their creativity to make interactive multimedia teaching materials such as e-books. E-books, or known as electronic books, are digital books that can be accessed through electronic devices such as computers and cell phones. They feature text, photos, audio, and video content (Rahayu, Ika, & Siti, 2020). As for the students, the usage of e-books helps them to learn independently to develop their knowledge and assists their learning process regardless of their learning speeds.

The lecturers in this study decided to develop Present It Right! Linktree since the topic breaks down into 3 subtopics and three lecturers are required to create the e-books respectively. Therefore, there are already three different links from the Canva applications that need to be shared with students. Hence, Linktree application is used due to its purpose to facilitate lecturers posting of educational links, documents, or applications that will be sent to students (Afriyose, et al., 2022) without considering the total number of links (Iftinan & Miftakhul, 2022). Then, the lecturers post the link to Present It Right! Linktree in other social media platforms such as Telegram and WhatsApp (Figure 2). As an example, there are group chat features in WhatsApp, which lets several users form huge groups (Lindawati, Baso, & Sultan, 2022) and by doing so, students from the same group chat can quickly get access to the Present It Right! Linktree and the material of presentation skills topic.

Figure SEQ Figure * ARABIC 2: The interface of Present It Right! Linktree

3. Methodology

This current study employed a quantitative method to achieve the research objective. A total of 236 students were involved from several classes taking DUE10012 and DUE30022 courses in Politeknik Sultan Idris Shah. The instrument used was adapted from a study by Atkinson (2007). It consists of 19 items under five domains which are 1) relative advantage, 2) compatibility, 3) simplicity, 4) trialability, and 5) observability. The overall internal consistency value or Cronbach's Alpha among all the items is high (.984) as stated in Table 1 below.

Table 1: Reliability Test Result according to Dimensions

Cronbach's Alpha	N of Items
.984	19

The researchers distributed this survey via Google form and administered it to their respective DUE10012 and DUE30022 students. In two weeks, the survey received responses from 236 students. The data then were analysed through descriptive statistics by using the Statistical Package for Social Science (SPSS).

The students' perceptions were categorised based on Daskalonska, Nikolova, & Alogjozovska (2023) where according to the researchers, students' perceptions can be categorised into six (6) levels as exhibited in Table 2 below.

Table 2: Interpretation of the six-point Likert scale

Scales	Options	Mean Score range	Perceptions
6	Strongly agree	5.20 – 6.00	Very positive
5	Agree	4.36 – 5.19	Positive
4	Slightly agree	3.52 – 4.35	Partially positive
3	Slightly disagree	2.68 – 3.51	Partially negative
2	Disagree	1.84 – 2.67	Negative
1	Strongly disagree	1.0 – 1.83	Very negative

4. Discussion of analysis and findings

This study aims to investigate students' perception of using Present It Right! Linktree as a medium for teachers to offer more materials and source references for ESL students in a polytechnic who are preparing for their presentation assessments.

Table 3: Overall mean score of students' perception of the usage of Present It Right! Linktree in Politeknik Sultan Idris Shah

	N	Mean	SD
Overall students' perception	236	5.393	.803

*1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly agree

To discover the perceptions of students in the usage of Present It Right! Linktree, the researchers used the Means and Standard Deviation for each item. Table 3 above presents the overall mean score of students' perception of using Present It Right! Linktree (M= 5.393, SD= 0.803). Generally, the finding portrayed that the respondents strongly agreed upon all items and had a very positive perception of Present It Right! Linktree.

Table 4: Mean score for each item in the questionnaire

Items	N	Mean	SD.
Dimension 1: Relative advantage			
1. 'Present It Right' Linktree material is better than using workbooks for learning about presentation.	236	5.51	.848
2. 'Present It Right' Linktree material is more interesting than other materials I have used for the course.	236	5.52	.812
3. Using 'Present It Right' Linktree material made learning about the presentation a better experience than I would have otherwise.	236	5.47	.852
4. I learned about presentation more quickly because of using the 'Present It Right' Linktree material.	236	5.46	.852
5. 'Present It Right' Linktree material offered me real advantages over the way I usually take classes.	236	5.44	.913
Dimension 2: Compatibility			
6. 'Present It Right' Linktree material fits right into the way I like to take courses.	236	5.39	.889
7. I think other classes should also use 'Present It Right' Linktree material to learn more about presentation.	236	5.39	.990
8. The name 'Present It Right' made me want to use the material.	236	5.39	.900
9. 'Present It Right' Linktree material helped me learn about technology while also learning about presentation.	236	5.41	.892
Dimension 3: Simplicity			
10. I had no difficulty finding the information that I wanted.	236	5.32	1.03
11. I had no difficulty understanding how to get around the 'Present It Right' Linktree material.	236	5.38	.940
12. I had no difficulty understanding how the 'Present It Right' Linktree material technically worked.	236	5.39	.932
13. I had no difficulty in getting the slide note to work.	236	5.40	.965
Dimension 4: Trialability			
14. Being able to try out 'Present It Right' Linktree material was important in my decision to use it in the future.	236	5.36	.891
15. I am more likely to want to use 'Present It Right' Linktree material because of is part of this pilot test.	236	5.31	.909
16. I really won't lose much by trying 'Present It Right' Linktree material, even if I don't like it.	236	5.36	.886
17. I like being able to try out 'Present It Right' Linktree material before deciding whether I like it or not.	236	5.38	.874
Dimension 5: Observability			
18. Other students seemed interested in the 'Present It Right' Linktree material when they saw me using it.	236	5.28	1.00
19. My instructor for this communication class seemed to like using the 'Present It Right' Linktree material.	236	5.45	.896
Total mean score	236	5.479	.786

*1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly agree

Table 4 above shows the mean score for students' perception of using Present It Right! Linktree according to all items from the questionnaire. The mean score ranged from 5.28 to 5.52. The highest mean score is item number 2 (M= 5.52, SD=.812) indicating that almost all respondents strongly agreed with the statement "Present It Right' Linktree material is more interesting than other materials I have used as part of the course". On the other hand, the lowest mean score was found to be item number 18 (M= 5.28, SD= 1.00) indicating that most of the respondents agreed with the statement "Other students seemed interested in the 'Present It Right' Linktree material when they saw me using it." Generally, these results depict that majority of students had very positive perception of using Present It Right! Linktree.

Table 5: Mean score of students' perception of the usage of Present It Right! Linktree in Politeknik Sultan Idris Shah

Dimensions	N	Mean	SD
Dimension 1: Relative advantage	236	5.479	.786
Dimension 2: Compatibility	236	5.395	.852
Dimension 3: Simplicity	236	5.373	.934
Dimension 4: Trialability	236	5.352	.845
Dimension 5: Observability	236	5.369	.900
Total mean score	236	5.393	.803

*1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly agree

Table 5 above illustrates the mean score for the five dimensions of the Diffusion of Innovation namely relative advantage, compatibility, simplicity, trialability, and observability. The mean score ranged from 5.352 to 5.479. The highest mean score is the relative advantage (M=5.479, SD=.786) indicating that all respondents either agreed or strongly agreed that Present It Right! Linktree is better than any learning materials they have used before. Conversely, the dimension with the lowest mean score is trialability (M=5.352, SD=.845) representing that almost all respondents agreed to try out Present it Right! Linktree before it is implemented in the classroom for real. All in all, the overall mean score obtained reflects students' perception of using Present It Right! Linktree and it is proved that they had a very positive perception of the product due to its compatibility, simplicity, trialability, observability, and especially its relative advantage.

5. Conclusion and future research

An ESL lecturer must employ effective teaching strategies to get the students comfortable and interested in the materials as well as the topic learned. This allows students to focus on the learning process (Lindawati, Baso, & Sultan, 2022). Concerning this, the teachers need to ensure that the students possess a positive perception of the lesson they learned. The purpose of this study is to investigate the perception of ESL students of the usage of Present It Right! Linktree. According to the result, the students had a very positive perception of the product. It also proved that a collaborative learning media (Linktree and Canva applications) named Present It Right! Linktree is one of the media that can support learning activities that cater to cover presentation skills topics to ESL students. The conclusion from the research results includes:

1. Lecturers can prepare learning materials using more than one medium such as Canva application, YouTube, WordWall, and other interactive applications.
2. Students give a very positive response to the use of collaborative learning media by clicking on one link, using Linktree.

Therefore, ESL lecturers who bear the obligation of fostering students' assimilation skills should make a significant effort to pique students' interest in the classroom (Nanda & Sitti Fatimah, 2023) by utilizing Canva and other third-party tools as it will enhance students' understanding of the material covered. Moreover, our students are digital natives who rely heavily on technology in their daily lives. What's most interesting is how much technology they utilize for communication, socializing, and Internet searching (Popovici & Mironov, 2015).

In this study, some limitations may be addressed in future studies (Kassim, 2024). First, it may be recommended that the number of respondents in future studies be increased by adding DUE50032 students as they also will be assessed in delivering oral presentations to improve reliability and validity. Second, the researchers should include correlative analysis to determine if demographic factors such as

program of study and gender have any correlation with their perception. It may be recommended that in future studies these factors be analyzed for deeper results.

Acknowledgement

The researcher would like to thank our institution, the Politeknik Sultan Idris Shah which has provided the opportunity for researchers to carry out this research smoothly. The researchers also express their sincere thanks to the DUE10012 and DUE30022 students who willingly participated in this study. It is hoped that this article can be used as a guide for ESL lecturers to create more innovative yet interesting learning materials for students and can be used as a reference for future research.

References

Afriyose, N., Sudjarwo, & Sugeng Widodo. (2022). Development of Discovery Learning based Linktree Learning Media to improve Geography Learning Outcomes in High School. East Asian Journal of Multidisciplinary Research (EAJMR), 1625-1634.

Atkinson, N. (2007). Developing a Questionnaire to Measure Perceived Attributes of EHealth Innovations. American Journal of Health Behavior, 612-621.

Ausawanetmanee, P., Thavorn, J., Chandrachai, A., Klongthong, W., Vchirawongwin, V., & Ekgasit, S. (2023). Consumer Acceptance of an Innovative Bio-QR Code Traceability System for Edible Bird's Nest. Journal of Open Innovation: Technology, Market and Complexity, 1-15.

Daskalonska, N., Nikolova, A. H., & Alogjozovska, N. J. (2023). The Use of Metacognitive Listening Strategies by English Language Learners. European Journal of English Language Teaching, 19-33.

Donmez-Turan, A., Zehir, C., & Tunc, A. O. (2015). A Theoretical Model Proposal: Personal Innovativeness and User Involvement as Antecedents of Unified Theory of Acceptance and Use of Technology. Procedia - Social and Behavioral Sciences 210, 43-51.

Iftinan, Q. T., & M. H. (2022). Collaborative-social media as Utilization of Advertising text Learning Media. International Conference on Learning and Advanced Education, 1755-1770.

Kadir@Shahar, H., & Abdul Raof, A. (2021). Speaking Apprehension: Evidence from Oral Presentations in Content Subject Classes. International Journal of Language Education and Applied Linguistics (IJLEAL), 80-88.

Kassim, W. Z. (2024). Google Classroom: Malaysian University Students' Attitudes Towards Its Use as Learning Management System. Brazilian Journal of Development, 207-223.

Lindawati, N., B. J., & S. B. (2022). Students' Perception on the Use of WhatsApp in Learning EFL during COVID-19 in at Remote Area. Journal of Excellence in Language Education, 391- 404.

Nanda, M., & Sitti Fatimah. (2023). Students' Perception of Canva as A Media in Learning English: A Descriptive Study at SMA N 6 Sijunjung. Journal of English Language Teaching, 176-187.

Popovici, A., & Mironov, C. (2015). Students' Perception on Using eLearning Technologies. The 6th International Conference Conference Edu World 2014 "Education facing Contemporary World Issues", 1514-1519.

Qur'ani, B., Nurhijrah, Syarifa Suryana, & Israwati Hamsar. (2023). Training on making Interesting Percentage Learning Media Using Canva Training of Interesting Learning Media Making Training Using Canva. IMPACTS: International Journal of empowerment and Community Services, 45-51.

Rahayu, W. P., I. Z., & S. M. (2020). Learning Media of Canva Based on Flipbook in the Subjects of Creative Products and Entrepreneurship to Improve Students' Digital Technopreneurship Competence. Advances in Economics, Business and Management Research vol. 179, 220-229.

Raman, R., Mandal, S., Das, P., Kaur, T., JP, S., & Nedungadi, P. (2023). University Students as Early Adopters of Chat GPT: Innovation Diffusion Study. Research Square, 1-32.

Solat, N., Abdullah, M., Nik Min, N., Musa, N., Salim, A., Md. Juperi, N., & Ishak, M. (2022). iMoFE@tree (Instructional Materials for Office Furniture and Equipment @ Linktree. Malaysia Journal of Invention and Innovation (MJII), 66-72.

Zulkifli, A. F. (2023). Applying the Theory of Diffusion of Innovation to Evaluate Students' Acceptance of Swimming Courses Online. Asian Journal of University Education (AJUE), 423-435.

The Relationship Between Abundance of Natural Resources, Economic Globalization and Carbon Emissions in Turkey

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Abstract

The quantity of natural resources is directly related to the factors of economic globalisation, in which carbon emission also comes into consideration. On one hand, economic globalisation can facilitate transmission in green technologies; on the other hand, it gives rise to resource consumption and carbon-intensive industrial activities. This paper, therefore, uses the ARDL approach to examine the impact of globalisation, economic growth, trade openness, and the richness of natural resources on carbon emissions in Turkey within the period 1974-2021. The results indicate that short-run economic growth increases carbon emissions, globalisation decreases short-run carbon emissions but has an insignificant impact on long-run carbon emissions, the abundance of natural resources decreases short-run carbon emissions but contributes to environmental degradation by increasing long-run carbon emissions, and trade openness decreases short-run carbon emissions but increases it over time.

1.Introduction

The complex and multi-dimensional relationship that exists between natural resource abundance, economic globalization, and carbon emission has constituted a major talking point in recent scholarship. Natural resources are one of the major factors that influence economic activities and carbon emissions (Xiaoman et al. 2021). A number of theoretical frameworks and empirical methods can be applied to explain the relationship between these elements. It has been established that the quantity of natural resources impacts carbon emissions in two ways. On one hand, utilization of fossil fuels and other forms of resources, normally associated with high carbon outputs, may lead to increased emissions. For instance, Ghazouani and Maktouf (2023) argue that trade openness and natural resource exploitation in oil-exporting countries exert negative impacts on environmental quality in the long run and are associated with higher carbon emissions due to the over-exploitation of resources. On the other hand, natural resources could lead to efficiency gains and economic growth that may result in reduced emissions. For example, the heightened availability of renewable energy sources could result in increased energy

efficiency and reduced carbon emissions, as Balsalobre-Lorente et al. (2018) mention and point out benefits related to the increase in renewable electricity consumption over environmental quality.

Economic globalisation complicates the interaction. Globalisation can lead to increased trade and investment. These scale effects result in increased carbon emissions Ameer et al. (2022). Nevertheless, globalisation can also support greener methods and technologies for a reduction in carbon emissions. In fact, Ameer et al. (2022) found that the relationship between globalisation and carbon dioxide emission in China is negative. Therefore, under some conditions, globalisation may result in superior environmental performance. Moreover, the mediating role of globalisation and natural resources in influencing carbon emissions is conditional on the quality of institutions. Robust institutional frameworks can reduce emissions and improve natural resource management by encouraging sustainable activities. Strong institutional frameworks, according to Xue et al. (2021), can maximize the benefits of globalization and abundance of natural resources. This is evident in the relationship between improved ecological outcomes and reduced carbon emissions and effective governance.

Conclusion: Abundance of natural resources is in interactive relationship with economic globalization and carbon emissions both positive and negative. Globalization and exploitation of resources can cause more emissions, but the latter can also provide scope for efficiency gains and technical advancement that may reduce their adverse impact on the environment. The quality of institutional structures and governance is thus very influential in the way these dynamics will be realized with success, and can either help or harm sustainable practices.

2.Empirical Analysis

The empirical model created to examine the effects of globalization, economic growth, trade openness and natural resource abundance on carbon emissions in Turkey during the period 1974-2021 is as follows;

$$CO_{2t} = a_0 + a_1 GDP_t + a_2 NRA_t + a_3 GLO_t + a_4 TO_t + u_t$$

All model variables are CO = representing the carbon emissions per capita; the national income per capita as GDP; natural resource rents as NRA; globalisation as GLO; trade openness as TO. Thus, each variable was all taken from the World Bank WDI database and thereafter subjected to logarithmic transformation. Table 1 shows the result of ARDL Bound test, which is considered for determining the long-run association of the variables. In this respect, if the F statistic value is considered in Table 1, then the series have a long-term association even at the 1% level of significance. Considering the existence of long-term association of the series, coefficient estimates were estimated and are reflected in Table 2.

Table 1. ARDL Bounds Test Results

Model	Lags	F-statistic
CO2=f(GDP,NRA,TO,GLO)	(3,3,1,3,3)	6.2026***
critical values	**I (0)**	**I (1)**
%10	2.68	3.53
%5	3.05	3.97
%1	3.81	4.92

Note: Critical values are taken from Pesaran et al. (2001).

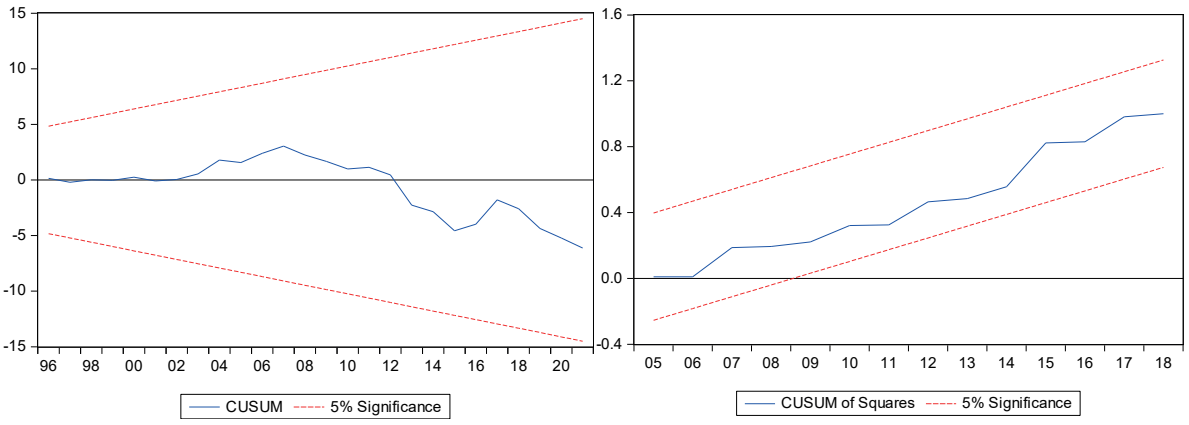
Table 2 lists the model specification tests once more and the assumption tests conducted for the model before going on to the coefficient estimates of the series. When the results are analysed, the results of the LM test indicate that the model does not have an autocorrelation problem, the ARCH test indicates that there is no heteroscedasticity problem, the RAMSEY test indicates that the correct functional form

is used, and the Jarque Bera test, which is used to determine whether the series has a normal distribution, indicates that the series meet the normal distribution condition.

Table 2. Short-Term and Long-Term Coefficient Estimators

Dependent Variable: CO2	*Coefficient*	*Probability*
Short Term		
GDP	0.018980***	0.000
GLO	-1.976005***	0.000
NRA	-0.398267*	0.0630
TO	-1.070884***	0.000
ECT	-1.599822***	0.0000
Long Term		
GDP	0.025345***	0.0000
GLO	-0.039102	0.9473
NRA	1.329161**	0.0325
TO	0.025345**	0.0109
Specification Tests		
LM	2.2066	0.1328
ARCH	1.3061	0.2597
JB	0.7057	0.7026
RAMSEY	1.3852	0.1787
CUSUM	*Stable*	*Stable*
CUSUMQ	*Stable*	*Stable*

Note: *, **, *** indicate statistical significance at 10%, 5% and 1% levels, respectively. F-statistics were used when applying hypothesis tests.



The coefficients from the model show that economic growth raises carbon emissions in both the short and long run; globalization lowers carbon emissions in the short but has no statistically significant effect on it in the long run; abundance of natural resources lowers carbon emissions in the short but degrades the environment by raising them in the long run; and trade openness is a short-run lower and long-run raiser of carbon emissions.

3. Conclusion

The relationship between the quantity of natural resources, economic globalization, and carbon emissions is crucial for sustainable development. While using abundant natural resources for economic growth, countries can have environmental problems, especially higher carbon emissions. Economic

globalization may facilitate green technology transfer but also possibly result in increasing resource consumption and carbon-intensive industries. This is clearest in “resource curse” phenomena. In this context, the present book analyzes how globalization and abundance of natural resources interact with carbon emissions and sustainable development plans. Having these aspects in mind, the current paper discusses how the rents of natural resources and globalisation influence the level of carbon emissions in Turkey from 1974 to 2021. The coefficients of the model group show that while economic growth increases carbon emissions both in the short and long term, globalisation, on one hand, reduces carbon emission in the short but has no statistically significant impact on it over the long term. Abundance of natural resources reduces carbon emission in the short term but finally degrades the environment by increasing them, while trade openness reduces carbon emissions in the short term but increases them over the long term.

The carbon emission of Turkey should be decreased by minimizing the environmental effects of economic growth using investments in green technologies, energy efficiency incentives, and carbon tax applications. Transfer of green technology should be provided, and environmentally friendly foreign trade regulations must be enacted in order to make use of the carbon-reducing impact of globalization. Natural resources must be used in a sustainable manner, and the resultant revenue should be invested in renewable energy projects. The environmental impact of trade must be curtailed through carbon border adjustments and promotion of exports of green products.

References:

Ameer, W., Amin, A., & Xu, H. (2022). "does institutional quality, natural resources, globalization, and renewable energy contribute to environmental pollution in china? role of financialization". Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.849946

Balsalobre-Lorente, D., Shahbaz, M., Roubaud, D., & Farhani, S. (2018). How economic growth, renewable electricity and natural resources contribute to co2 emissions?. Energy Policy, 113, 356-367. https://doi.org/10.1016/j.enpol.2017.10.050

Ghazouani, T. and Maktouf, S. (2023). Impact of natural resources, trade openness, and economic growth on co2 emissions in oil-exporting countries: a panel autoregressive distributed lag analysis. Natural Resources Forum, 48(1), 211-231. https://doi.org/10.1111/1477-8947.12318

Xue, J., Rasool, Z., Nazar, R., Khan, A., Bhatti, S., & Ali, S. (2021). Revisiting natural resources—globalization-environmental quality nexus: fresh insights from south asian countries. Sustainability, 13(8), 4224. https://doi.org/10.3390/su13084224

Xiaoman, W., Majeed, A., Vasbieva, D. G., Yameogo, C. E. W., & Hussain, N. (2021). Natural resources abundance, economic globalization, and carbon emissions: Advancing sustainable development agenda. *Sustainable development*, *29*(5), 1037-1048.

Development of Project Based Learning for Student Teachers and Its Effectiveness in terms of 21st Century Skills

Miss Smruti Salve

Dr. Rekha Chavhan

1.1 INTRODUCTION

Globalisation is on a fast track economy redefined and the way network communication has exploded all resulted in a change. Global economies need educated people as citizens of today and tomorrow. Learning in the 21st century is definitely a lot different from learning in any other century. How can students be prepared to succeed in the 21st Century? This question is of paramount importance to the country's educators, employers, parents and the public. Our community vibrancy, personal quality of life, economic viability and business competence depends on a well prepared citizenry and workforce.

Education provides the bedrock from which our national and individuals prosper and rise together. Today's education system needs to bridge the gap between what students learn and how they live. Hence, it is very important to prepare students for the challenges of work and life in the 21st Century. There is a profound gap between what students learn in schools and the skills they need in typical 21st century community and workplaces. To successfully face rigorous needs of higher education courses, career challenges and globally competitive workforce, schools must align classroom atmosphere with real world environment by infusing 21st century skills into their teaching and learning practices. Our education system must focus on innovation teaching and learning practices such as inquiry baked and project based learning methods so that students connect curricular studies with real life situation develop higher level thinking skills, work in teams and develop a scientific temperament and attitude. Project based learning can play a major role in developing such a classroom environment and bring in a paradigm shift in education practices across the world. Project based learning is a dynamic approach to teaching in which students explore real world problems, challenges, simultaneously developing cross curriculum skills while working in small collaborative groups.

Concept of Project Based Learning

Project-based learning (PBL) or project-based instruction is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world. Project Based Learning also provides students with multiple opportunities to enhance skills that will be needed in the future. Students learn how to collaborate and bounce off ideas to each other. They will develop their critical thinking and problem solving skills. This allows them to learn different ways of thinking and how to come to conclusions more efficiently. Skills gained through project based learning and business marketing education are

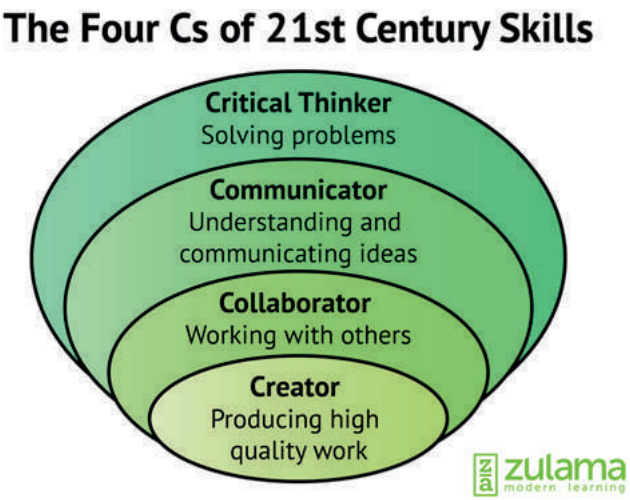
those that employers look for. With ample Project Based Learning opportunities students can succeed in multiple content areas in the classroom, along with building upon and hoving skills that they can utilize to be successful.

21st Century Skills

It is a skill set that enables an individual to cope up and succeed in facing the challenges in real life leading to holistic progress of the individual.

The 21st Century is considered the knowledge era worldwide. The 21st Century era is a cycle of endless transformation and innovation. The purpose of education in the 21st Century should be not just to make a student knowledgeable but to add rational thought and self sufficiency. Globalisation is another trend shaping the future skills demands. Individuals need to develop enough skills and education to compete for good jobs.

Contemporary education highlights learner focused and learner centred education. It should be collaborative and students are rigorously participating in learning. UNESCO (1997) said "The formal education system tends to emphasise the acquisition of knowledge to the detriment of other types of learning, but it is vital to conceive education in a more encompassing fashion in the light of opportunities of the 21st Century.



Recommendation of NEP 2020 : National Education Policy 2020 the first education policy for the 21st Century was implemented in India in the year 2020. The policy has strongly recommended changes required for 21st Century school education: Learning should be holistic, integrated, enjoyable and engaging. Experiential learning within each subject and explorations of relations among different subjects will be encouraged and emphasised despite the introduction of more specialised subjects and subject teachers. In all stages experiential learning will be adopted, including hands on learning, arts, integrated and sports integrated education. Developing 21st Century skills & competencies in students demands pedagogical shifts. The responsibility of educators in education is to ensure that today's students are ready to live, learn, work & thrive in this high tech, global, highly participatory world.

The World Bank Group (2003), as well as partnership for 21st Century skills (2003) recommends that learners' requirement in the present and future situation is to acquire critical thinking, effective communication, teamwork, continuous learning and use of technology skills to help the global knowledge economy and be productive world citizens. Certain skills & knowledge will be necessary for students to develop to be able to work and contribute to a globalized information society. The most important skills which are the need of the hour are 4C's critical thinking, collaboration, communication, creativity and innovation skills.

1.2 THEORETICAL FRAMEWORK OF PROJECT BASED LEARNING

There are multiple theories that reside at the base of Project Based Learning. The main theories that are embedded throughout are John Dewey's Learning by Doing, Piaget's theory of Cognitive Constructivism, Roger's Experiential Learning, Vygotsky's theory of Social Constructivism. Kolb's Experiential Learning model .

Dewey's Learning by Doing(1896)

It is often said that John Dewey is the father of project-based learning. He believed students should have opportunities to take part in their own learning. He believed that students would succeed in environments where they are able to have interaction, both socially and with curriculum, and are able to learn through experience. In his Pedagogical Creed, Dewey states there are two sides to the educational processes, psychological and sociological. While the psychological side is the basis, neither side is more important than the other. "Without insight into the psychological structure and activities of the individual, the educational process will, therefore, be haphazard and arbitrary". Dewey also discusses the sociological aspect of the educational process. This side of the educational process is there for the preparation of future life. A student is trained to be able to "…have the full and ready use of all his capacities…" . Many of the key points in Dewey's creed center on the total development of the child. In order for a child to become successful and a functioning member of society they need to be well rounded and have experiences that allow for the full development of skills needed in the world after the completion of their education.

Piaget's Theory of Cognitive Constructivism(1936)

In Piaget's The Child's Concept of the World (2007), he discusses that an individual is born with schemas in their brain. These schemas are what allow one to go through the processes of both accommodation and assimilation. Through the process of assimilation new information is added and adapted to existing schemas. Therefore, unless schemas are being reshaped or new ones are formed the student will only understand the information as the existing schema allows. Piaget's theory has been adjusted and adapted by many constructivist theorists. However, one thing remains constant: students construct their knowledge by building up existing knowledge and through experiences.

Although Piaget's never directly associated his theories with education, it is easy to see where it can be applied. One way constructivism can be applied to education is through discovery learning. Discovery learning is the idea children learn best by actively exploring and physically doing. The practice of constructivist theories allows for the creation of an environment that is conducive for project-based learning.

Roger's Experiential Learning (1951)

Experiential learning is the active process in which students learn information through discovery and exploration. It is a student centered approach, addressing each student's needs and wants. Learning happens from both successes and mistakes and helps students develop new skills, attitudes and problem solving techniques. According to Rogers some principles of Rogers theory are significant learning takes place when the subject matter is relevant to the personal interests of the student; learning which is threatening to the self(eg new attitudes or perspectives) are more easily assimilated when external threats are minimum; learning proceeds faster when the threat to the self is low; self initiated learning is the most lasting and pervasive.

Vygotsky theory of Social Constructivism (1962)

One thing that Piaget's theory did not account for is the social aspect of the learning environment. The addition of the social aspect would lead to the further development of constructivism into social constructivism by Vygotsky. Vygotsky believed in learning by experience and through social and interpersonal interaction . Vygotsky led the development of the Zone of Proximal Development (ZPD). The ZPD is described as "the current or actual level of development of the learner and the next level attainable through the use of meditating semiotic and environmental tools and capable adult or peer facilitation" (Shabani, Khatib and Ebadi, 2010: 238). A student is only able to accomplish so much individually. They are able to accomplish a higher-level task, which may be on the outside of their ZPD, by collaborating with higher level peers or an adult. The next time this same student needs to accomplish this higher-level task, it will be within their ZPD and they will be able to accomplish it on their own.

While the term was never directly used by Vygotsky in his writings, ZPD is the beginnings of scaffolding. Scaffolding, by definition, is the variation in instruction techniques which are used to assist students in developing a greater understanding of a content so that, in the end, they will achieve more independence in their learning. When providing this type of assistance, a teacher will provide successive levels of temporary support for a student. As the student gains the skills necessary for the task and begins to further comprehend the material the teacher provides less and less support allowing for the student to assume responsibility for their learning. It is often used when there are gaps in learning among students in the same classroom. A teacher can provide the support needed at each learning level, allowing the higher level students to work independently (Great Schools Partnership, 2015: 1). This can also feed into ZPD and Vygotsky's social constructivism by allowing higher-level students to work with struggling students. They can collaborate and while the higher level student is further engraining the information by explaining it to another student, the struggling student is able to accomplish a more advanced task with appropriate assistance. In all areas of the constructivist theory there is a reflection component. In order for the newly acquired knowledge to be applied to a learner's already existing knowledge base they need to have time to reflect on the new information. This allows for synthesis to occur and for the knowledge to be readily available for the learner to utilize in the future.

Kolb's Experiential Learning Theory (1984)

Experiential Learning Theory is built upon the basis that learning is a process. Through this process different concepts are derived, modified and manipulated by experiences . There are many scholars who have done work with experiential learning theory. However, they all have the following six concepts about learning in common: 1. Learning is best conceived as a process, not in terms of outcomes. 2. All learning is re-learning. 3. Learning requires the resolution of conflicts between dialectically opposed models. 4. Learning is a holistic process of adaptation. 5. Learning results from synergetic transactions between a person and the environment. 6. Learning is the process of creating knowledge. As previously mentioned, learning is the process of creating knowledge. Knowledge, according to Experiential Learning Theory, is created from grasping and transforming experiences.

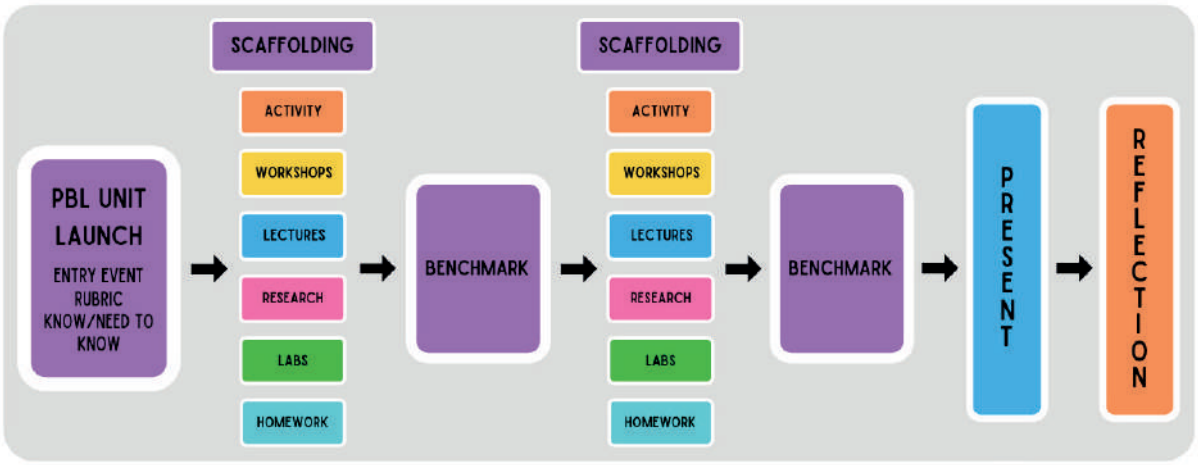
The Experiential Learning Theory model is composed of four segments, two related to grasping experience and two related to transforming experience. The four components are: concrete experience, abstract conceptualization, reflective observation and active experimentation. Together the four components are often referred to as the Cycle of Experiential Learning. In the cycle, concrete experiences are building blocks for observation and reflection. This reflection is then used to form abstract concepts, which can then be the basis for experimentation. This experimentation then provides the opportunity for new experiences to draw upon. Experiential Learning Theory can also be aligned with team or group learning. A project based learning environment will utilize the concepts in Kolb's Experiential Learning Theory. Students collaborate on a problem drawing from experiences that they have had.

They can then reflect on and conceptualize the new information that has been presented to them in their problem or challenge. This then allows them to find solutions for the problem or challenge creating new experiences.

Difference between Project Based Learning and Project Method

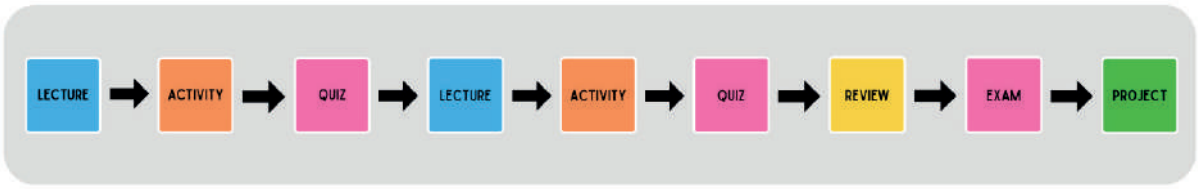
Project based learning poses an authentic problem, challenge, need or issue at the start of the PBL Unit in the form of an entry event. At the start of the PBL unit, students either receive or codesign a rubric outlining what tasks or end product they will have to cre

ate or complete. From the start students understand the need to learn the course content and skills in order to complete each step or benchmark of the PjbL unit. The end goal is clear from the beginning. Student learning is meaningful because they need to acquire content knowledge and skills in order to solve the problem, challenge, need, or issue that has been posed to them. The PBL unit involves a community partner and ends with a community publicly presented product that will be used even after the PBL unit has been completed. The PBL process involves feedback and revision throughout as well as reflection.



Project Method of Teaching

It is a culminating event that happens at the end of a traditional unit after all student learning has already taken place. In the project method the knowledge and skills taught in the unit are not necessarily needed to complete the project and the project itself does not typically reflect all of the student learning. Oftentimes the project has no real world connection and after being graded the project is no longer needed. In many cases the major assessment of student learning outcomes has already been completed in the form of quizzes and tests and the project itself reflects only a few, if any, of the learning outcomes.



Key elements of Project Based Learning

The Buck Institute of Education has done an extensive amount of research on project-based learning. They have developed curriculums, curriculum additions and resources, along with writing many articles and creating informational videos on the use and implementation of project based learning. According

to the Buck Institute there are eight essential elements of project design, the basis for project-based learning.

These essential elements are as follows:

1. Key knowledge, Understanding, and Success Skills - A project should be focused on student learning goals. It should also include standards-based content and skills. These skills include critical thinking, collaboration and self management.

2. Challenging Problem or Question - The challenge level of the problem or question should be appropriate for the student(s) working to solve it. The problem or question should also be meaningful to the student(s).

3. Sustained Inquiry - A continued process of student(s) asking questions, finding resources to answer the questions and applying the new information.

4. Authenticity - A project should contain a connection to the real world. If there is no real-world connection, there should be an impact or relation to students' own interests

5. Student Voice and Choice - Students should have a say in what they create and how it is created.

6. Reflection - Students and teachers both reflect on the project. What was effective? What obstacles were encountered and how were they overcome?

7. Critique and Revision - Feedback is given and received by students. It is then used to improve the project process and product.

8. Public Product - Students' work becomes public.

The Buck Institute Model of Project Based Learning

The Buck Institute created a similar model for best project-based teaching practices. This model assists teachers in making the transition to a project-based style from a traditional style of teaching. It shows there are many traditional methods that make the transition from traditional to project based. This model comes with the following seven aspects.

1. ***Design and Plan*** - Based on content and students, a teacher develops a project that allows for student choice.

2. ***Align to Standards*** - Content standards are used in the creation or adaptation of a project to ensure that key aspects from the content area are included and addressed by the project.

3. ***Build the Culture*** - Student inquiry and independence are promoted by the teacher. Collaboration and high quality of the work completed are also encouraged.

4.***Manage Activities*** - Tasks, schedules, checkpoints and deadlines are all set by the teacher working with the students. The finding and utilizing of resources and the creation of the final product are also done by the teacher working with the student.

5. ***Scaffold Student Learning*** - In assisting students in reaching their project goals, the teacher utilizes a variety of tools and strategies for support based on student(s) need(s).

6. ***Assess Student Learning*** - Both formative and summative assessments are used by the teacher to assess the students both on an individual level and as a collaborative team. Peer evaluations are completed as well.

7. ***Engage and Coach*** - Teachers work alongside students. They identify student needs and provide support they need. They also supply the student with encouragement and redirection as needed.

Project-Based Learning and 21st Century Skills

There are many skills required in today's society that are not necessarily imparted through the use of traditional teaching methods. These skills are often referred to as 21st century skills. Skills in this bracket include things like communication, collaboration, critical thinking and problem solving, and self-direction skills .

Project-based learning provides the students with the opportunity to take part in social learning situations. Collaboration and social learning also provides students with the chance to assume responsibility. They learn to be more independent and accountable for their work. In project based learning situations, students become accountable to their peers. When students do not follow through with their responsibilities to their peers they often experience greater consequences than if they just held a responsibility to the teacher . Students have a greater motivation to take responsibility because they do not want to let their peers down. There is a greater consequence to letting peers down than there is to letting the teacher down.

21st century skills: This is the umbrella term includes the following skills

- **Critical thinking skills** refer to students being able to analyze complex problems, investigate questions for which there are no clear-cut answers, evaluate different points of view or sources of information and draw appropriate conclusions based on evidence and reasoning.
- **Collaboration skills** refers to students being able to work together to solve problems or answer questions to work effectively and respectfully in teams to accomplish a common goal.
- **Communication skills** refer to students being able to organize their thoughts, data and findings and share these effectively through a variety of media, as well as orally and writing.
- **Creativity and Innovation skills** refer to students being able to generate and refine solutions to complex problems or task based on synthesis, analysis and then combining or presenting what they have learned in new and original ways.

Principles of Project Based Learning

1. ***The Project Based Learning is learner driven and gives learners choice***

It is vital that teachers trust their learner's ability to complete the project and that they provide positive reinforcement and support to learners. Giving up a measure of control is essential if the learners are to fully benefit from the experience and claim ownership of the project. Learner choice does not imply total learner freedom as the project operates within the expectations of set outcomes and standards of work. Within these parameters learners are encouraged to explore their own solutions and ways of working. The choice of overall topic i.e the driving question, may be set by the Teacher yet the answer will be determined by the learner's specific interests and approach to addressing the question. As a result, different teams will answer the question with different solutions.

2. ***Project Based Learning is realistic***

The Project and the methods employed to reach its resolution should relate to authentic real life scenarios. The problem or question may be directly relevant to the learner's life, that of their wider community or their potential future lives.

3. ***Project based learning embraces teamwork and collaboration***

Project Based learning is a team centered activity which encourages learners to form communities of enquiry to answer their question or solve their problem. Successful teamwork requires many skills and

attitudes and implicit in the nature of teamwork is that different members bring different attributes to the team and project leading to its success.

4. ***Project Based Learning requires high quality work.***

There is an expectation in Project based learning reinforcing the message of the growth mindset, that learners expand effort and apply themselves to produce work that leads to high quality outcomes. Teachers should positively reinforce these virtues and acknowledge the positive outcomes that result and trust in learners' abilities to achieve them. The public real life nature of the outcomes is another driving factor encouraging high quality work.

5. ***The Project Based Learning provides a public forum for the project outcome.*** Learners are asked to apply themselves to the project over an extended period of time to produce an authentic, high quality outcome. It is only fitting and motivating that their work and application be acknowledged and celebrated publicly and the learners are able to present work that they can take pride in. This is an authentic outcome of an authentic task. The public display and recognition of the work also shares the messages that the teacher and the institution value the principles of learner centeredness embedded in the project

Steps of Project Based Learning

1. Identification of a Problem / Framing Driving question

This is the leading step in Project Based Learning. Teachers or students identify a problem or an

From their surroundings that requires meticulous work and demands a resolution. This problem can be related to the Curriculum and may be affecting the School, City, community. This is an inquiry based step that requires great attention to detail and group work because the learning goals of students will be based on the precise mapping of the driving problem statement.

2. Project Planning

The next step is to design a learning plan for the project which means that the teachers assess how the problem or opportunity connects with the standards he/she is intending to teach. The best approach is to involve the students in this process so that they can feel included. Select the project path which corresponds to the syllabus or curriculum. Integration of multiple subjects for better student engagement and dynamic learning should be done. Learning resources and content should be at students disposal while they are working on the project.

3. Scheduling the Project

This is the third step of the Project Based Learning which involves setting a timeline and schedule for Project activities. Students should be given a set date or time frame for the project activities. Schedule can be set by working collaboratively with the students.

4. Monitor the Progress

In PBL, a Teacher is engaged in the process right from the beginning to the end. Teachers should constantly monitor students' work and progress. The role of Teacher in PBL is that of a facilitator who strives to make the learning experience worthwhile for the students.

5. Assessment

This step involves assessing the learning outcomes and participation of students. Teachers can use rubrics to record students progress and their learning outcomes. Rubrics allows Teachers to grade against certain standards and give effective feedback to the individual students at the end of the project. Besides Teachers experts the audience can also be consulted to give feedback.

6. Evaluation of the Experience

This step involves reflecting what worked and what did not during the whole process. Reflection helps teachers to improve instructional strategies in the future. Teachers are also able to incorporate changes in their teaching strategies.

(https://www.educationise.com/post/6-steps-to-implement-project-based-learning-in-the-classroom)

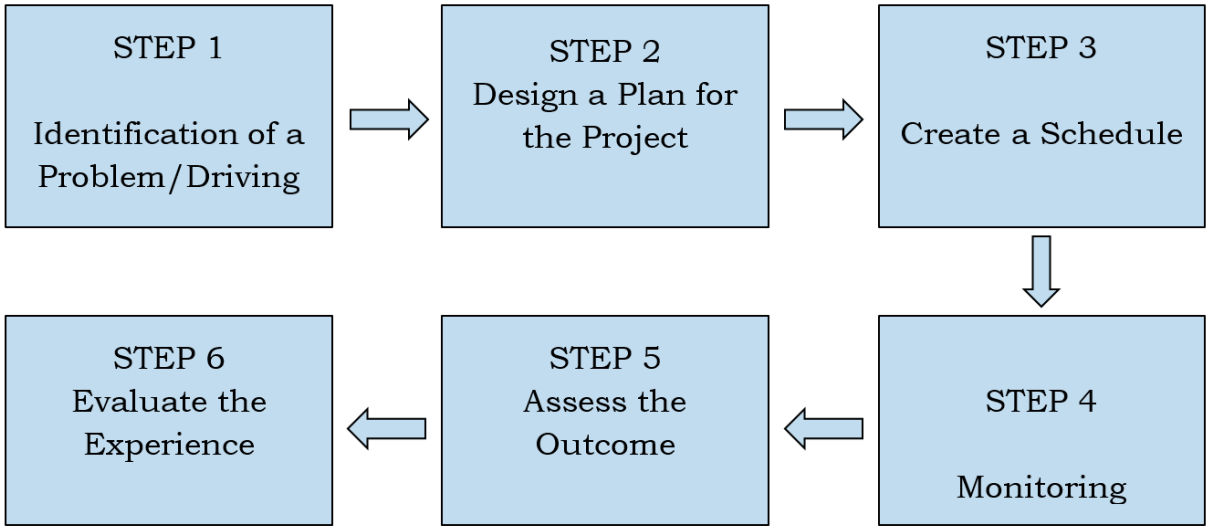


Figure 1: Steps of Project Based Learning

References:

Basjaruddin (2016) Implementation of Project Based Learning in Mechatronic Lab Course at Bandung State Polytechnic, International Journal of Evaluation and Research in Education, v5, n4, p284-291. Retrieved on February 27th, 2018, from world wide web https://eric.ed.gov/?q=+project+based+learning&pg=10&id=EJ1132222.

Bron (2019) Project Based Learning for teaching Transmedia Communication, Journal of Problem Based Learning, v7, n1, p141-151. Retrieved February 26th, 2018, from world wide web https://files.eric.ed.gov/fulltext/EJ1237710.pdf.

Carabba (2018) The Impact of Project Based Learning and Direct Instruction on the Motivation and Engagement of Middle School Students, Language Teaching and Educational Research, v1, n2, p163-174. Retrieved February 27th, 2018, from world wide web https://eric.ed.gov/?id=ED591136.

Celik (2018) The Impact of Project Based Learning on Achievement and Students View in AutoCAD Programming Course, Journal of Education and Learning, v7, n6, 67-80, 2018, Retrieved February 26th, 2018, from world wide web https://eric.ed.gov/?q=+project+based+learning&pg=4&id=EJ1191198.

Chi Syan (2018) Peer feedback to facilitate Project Based Learning in an Online Learning, International Review of Research in Open and Distance Learning, v14, n5, p258-276. Retrieved on February 27th, 2018, from world wide web https://eric.ed.gov/?q=+project+based+learning&pg=7&id=EJ1017548.

Duman (2018) The Effect of Project Based Learning on Students' Attitude towards English Classes, Journal of Education and Training Studies, v6, N11, p186-193. Retrieved February 26th, 2018, from world wide web https://eric.ed.gov/?q=+project+based+learning&pg=12&id=EJ1208469.

Hasani (2017) Using PBL in writing an educational article, Universal Journal of Educational Research, v5, n6, p960-964. Retrieved February 26th, 2018, from world wide web https://eric.ed.gov/?q=+project+based+learning&pg=4&id=EJ1143913.

Holmes (2016) Exploring the Effect of Project Based Learning in Maths Education, Journal of Education Research, v109, n 5, p449-463. Retrieved on February 27th, 2018, fr

Can The Public Sector Lead Growth? Quantile-Based Findings for Turkey

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Abstract

The relative ability of the public sector to spur economic development remains a highly contested issue in both economic theory and economic policy. The public sector can spur growth by correcting market failures, by investing in infrastructure, or by ensuring fair distribution. Others, however, strongly feel that overly aggressive governance depresses private sector innovative drive, creates inefficiencies, and strains finances. Therefore, this paper considers the quantile-based and marginal effects of public spending on Turkey's national revenue, using the years 1970-2022 as a basis. In this context, real GDP per capita is used to proxy national income, while the public sector is proxied by the percentage share of public expenditures in national income, denoted as GOV. When the analysis findings are interpreted in general, it can be said that public expenditures have a positive effect on economic growth.

Keywords: Public sector, economic growth, quantile-based effects

1. Introduction

Much literature has focused on the role of the public sector in economic growth, and several opinions exist as to how helpful it is. A fair amount of the literature, especially on developing countries, does suggest that economic growth can be attained through judicious public spending and good governance. For instance, Gani (2011) shows that economic growth is positively related to good governance in the public sector; such findings suggest that macroeconomic stability and judicious public expenditure are the factors that attract investment and stimulate growth in countries with good governance systems. This finding supports the suggestion by Alimi (2023) that improving efficiency in government serves to better economic transformation and expansion processes, especially for developing countries facing a host of socio-economic problems. The empirical relationship between public expenditure and economic growth is complex and situation-specific. For instance, some studies find the expenditure of the public has hurt growth in certain regions such as the MENA region (Saad and Ayoub, 2019). Other studies, on their part, have underscored the importance of effective spending by governments in specified areas like infrastructure and education. Bose et al. (2007) find that public spending on education is crucial for economic growth to take place, challenging earlier studies which found that the same had no significant

bearing. Along related lines, a study about Nepal by Rana (2021) points to the importance of strategic public investment on grounds that capital as well as ongoing spending is having long-term positive influences on the level of economic growth.

In the public sector, too, leadership is an influential factor in bringing growth. Wright et al. (2011) discuss how transformational leadership can enhance the commitment and motivation of staff in public organisations, leading to an improvement in service delivery and financial outcomes. Khan and Islam (2014) also agree with this argument by citing that responsive governance framework and national development goals are related to the emergence of strong public sector leadership. Furthermore, because leadership is a determining factor for organisational performance and economic growth, Vandenabeele et al. (2013) also highlight that leadership in the public sector plays a very crucial role in developing the economic sector in Turkey. Indeed, via investment incentives, public-private partnership, or strategic policies for regional development, economic progress can be taken forward by the public sector itself. Public investment incentives to reduce regional inequalities are among the major ways through which the public sector contributes to economic growth. For instance, regional inequality, which is one of the main barriers to economic growth in developing countries like Turkey, has been proven to be surmounted by governmental policies that utilize public investment incentives (Sağdıç et al., 2021). Apart from investment incentives, PPPs also play a critical role in enhancing the pace of economic growth. To assist industries like energy that are essential to sustainable growth, the Turkish government is depending more and more on PPPs (Balcılar et al., 2023).

In summary, the public sector may drive growth, but how well it does so depend on the leadership in public institutions, the quality of governance, and the smart distribution of public funds. There are indeed instances, particularly in developing countries, that when these factors complement each other, the contribution of the public sector to economic growth is high-as empirical evidence has established.

2. Econometric Informations

To observe the quantile-based effects and marginal effects of public expenditures on national income in Turkey, the period 1970-2022 is taken as basis. In this direction, the percentage share of public expenditures in national income (GOV) is used as a representative of the public sector, and the real GDP per capita (GDP) data is used as a representative of national income. Data for both variables are obtained from the World Development Indicators database.

In the empirical procedure, firstly, the wavelet quantile regression (WQR) technique is used to observe the effect of GOV on GDP in different quantiles of GDP and in different periods (short, medium and long term). Then, the quantile-on-quantile regression (QQR) technique is used to see the interaction between different quantiles of both GOV and GDP. Finally, the marginal effects of different quantiles of GOV on different quantiles of GDP are analyzed with the QQKRLS technique.

3. Results

Figure 1 presents the results of the WQR technique that analyzes the effects of GOV on GDP for different quantiles of GDP. In the graph, periods 2-4 represent the short term, periods 8-16 represent the medium term, and periods 32 represent the long term. In this context, although negative effects are seen in some quantiles and some periods, there is generally a positive effect or close to 0. It is seen that the positive effect is more valid in the long term.

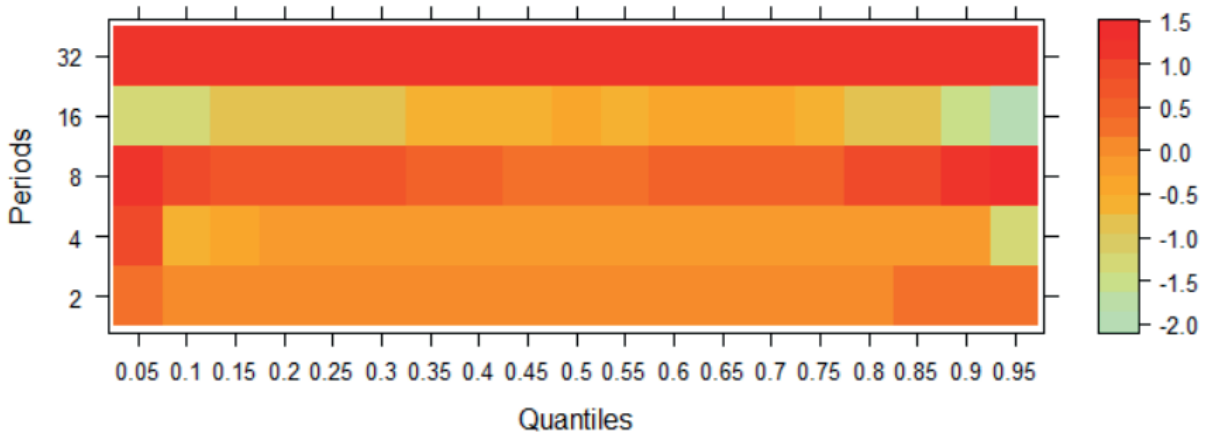

Figure 1. WQR results for the impact of GOV on GDP

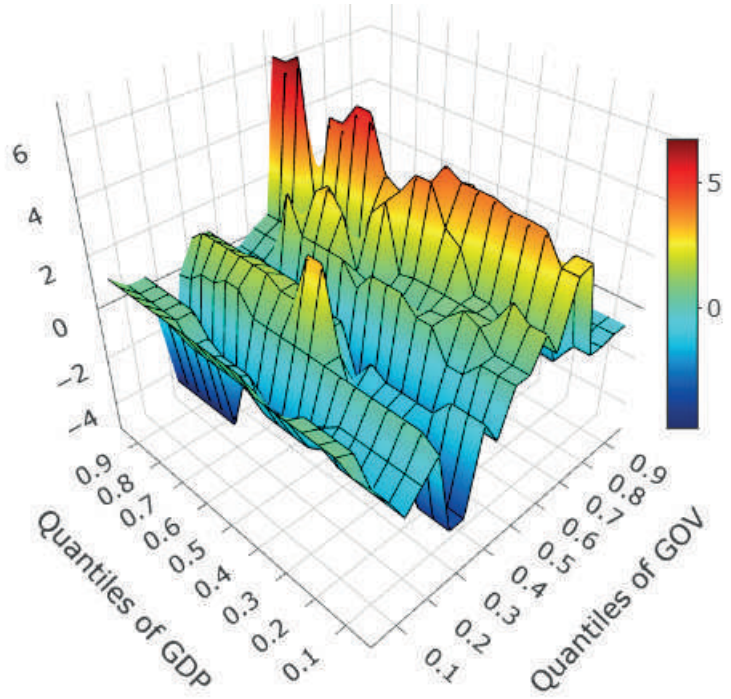

Figure 2. QQR results for the impact of GOV on GDP

In the second stage, the interaction between different quantiles of both GOV and GDP is analyzed with the QQR technique and presented in Figure 2. When the results are examined, findings consistent with the WQR results are noticeable. Namely, although occasional negative effects are seen in the low quantiles of GOV, the positive effects of GOV are generally evident. Moreover, the negative effect of GOV on GDP reaches its highest levels in the high quantiles of GOV and GDP.

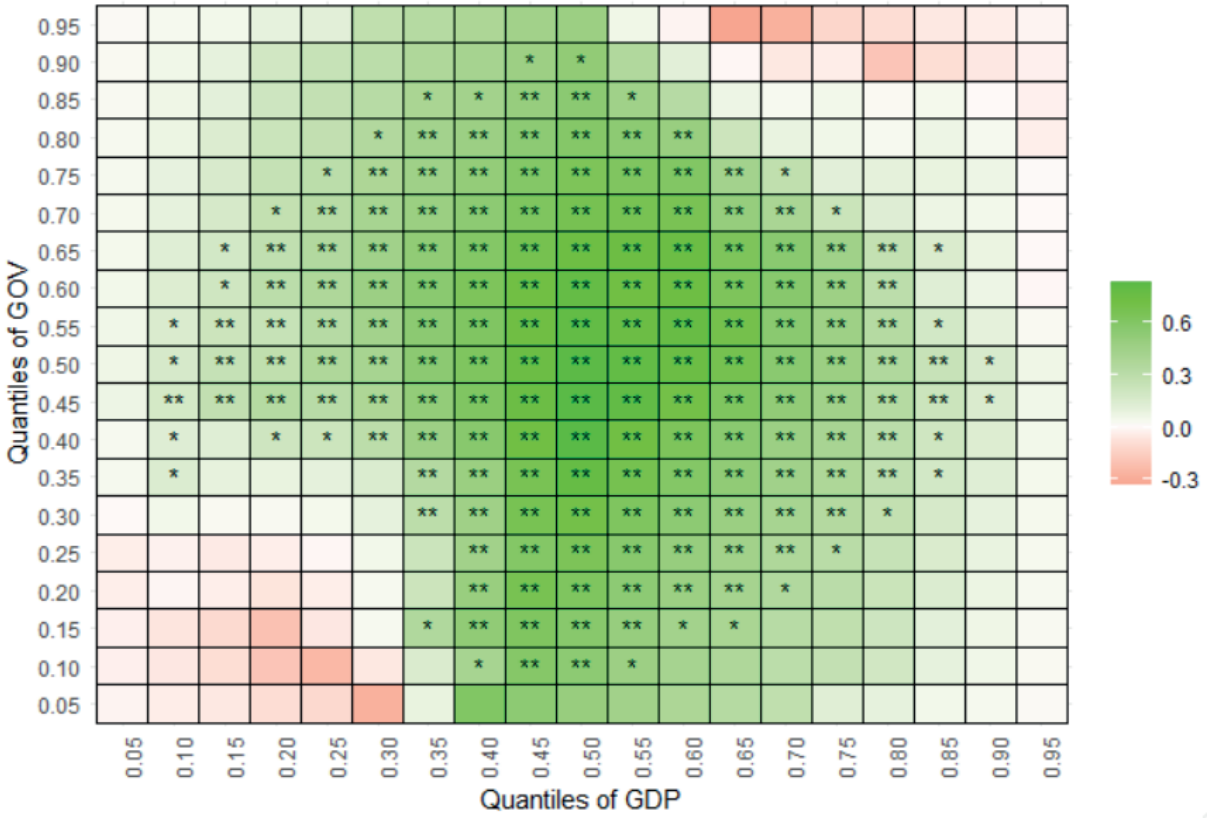

Figure 3. QQKRLS results for the impact of GOV on GDP

Finally, the results of the QQKRLS analysis, which express the marginal effects of different quantiles of GOV on different quantiles of GDP, are presented in Figure 3. According to the findings, although there are negative effects similar to the other analysis results, these effects are statistically insignificant. Positive effects are generally concentrated in the middle quantiles of GDP, as opposed to all quantiles of GOV.

4. Conclusions

The period between 1970 and 2022 was considered for calculating the quantile and marginal effects of public spending on national income in Turkey. In this respect, data on real GDP per capita was used as a proxy to represent the indication of national income, while the percentage share of public expenditures in national income showed the indication of the public sector. Data for the two variables were retrieved from the World Development Indicators database. In the empirical process, the effect of GDP on GDP was first observed at different quantiles of GDP and for a period-in short, medium, and long run-with the help of the wavelet quantile regression technique. Then the QQR technique was applied to assess the relationship of GDP with different quantiles of GDP. Finally, the marginal effects of different GDP quantiles on different GDP quantiles were analyzed using the QQKRLS method.

Based on the results of the WQR technique, there is generally an effect around positive or zero when some quantiles and periods show negative effects. The validity of the long-term positive effect is more valid. Whereas in the low quantiles of GOV, there are occasionally negative effects, the positive impacts of GOV are more significant, and the results are very much comparable to the WQR technique. Finally, the result of the QQKRLS analysis-which shows the marginal effects of the various quantiles of GOV on the different quantiles of GDP-provides some negative impacts, often similarly shaped to other analyses discussed here, but all these impacts become statistically negligible. These positive

benefits, when contrasted against all quantiles of GOV, are concentrated within the middle quantiles of GDP. In this line, effective use of technology and innovation policies supporting middle-income level, expansion of social assistance and employment incentives oriented toward low-income groups, and long-term infrastructure, education, and health investments-all these will have to be pursued if the highest possible impact from public expenditures on national income in Turkey is to be achieved. Budget discipline should be adhered to in order to ensure macroeconomic stability, procedures for monitoring and assessment need to be strengthened to efficiently spend public expenditure, and spending should be planned in strategic development objectives.

References

Alimi, N. (2023). Governance and economic growth in developing countries: a panel threshold regression analysis. Ekonomski Horizonti, 25(2), 117-133. https://doi.org/10.5937/ekonhor2302117a

Bose, N., Haque, M., & Osborn, D. (2007). Public expenditure and economic growth: a disaggregated analysis for developing countries*. Manchester School, 75(5), 533-556. https://doi.org/10.1111/j.1467-9957.2007.01028.x

Gani, A. (2011). Governance and growth in developing countries. Journal of Economic Issues, 45(1), 19-40. https://doi.org/10.2753/jei0021-3624450102

Khan, M. and Islam, M. (2014). Public sector leadership development in bangladesh: present state and future prospect. The International Journal of Leadership in Public Services, 10(1), 17-30. https://doi.org/10.1108/ijlps-06-2013-0016

Rana, S. (2021). Government expenditure and economic growth: the case of nepal. The Lumbini Journal of Business and Economics, 9(1-2), 114-124. https://doi.org/10.3126/ljbe.v9i1-2.45994

Saad, W. and Ayoub, H. (2019). Remittances, governance and economic growth: empirical evidence from mena region. International Journal of Economics and Finance, 11(8), 1. https://doi.org/10.5539/ijef.v11n8p1

Vandenabeele, W., Andersen, L., & Leisink, P. (2013). Leadership in the public sector. Review of Public Personnel Administration, 34(2), 79-83. https://doi.org/10.1177/0734371x13511160

Wright, B., Moynihan, D., & Pandey, S. (2011). Pulling the levers: transformational leadership, public service motivation, and mission valence. Public Administration Review, 72(2), 206-215. https://doi.org/10.1111/j.1540-6210.2011.02496.x

Balcılar, M., Uzuner, G., Nwani, C., & Bekun, F. (2023). Boosting energy efficiency in turkey: the role of public–private partnership investment. Sustainability, 15(3), 2273. https://doi.org/10.3390/su15032273

Sağdıç, E., Karas, G., & Yildiz, F. (2021). Türkiye'de yatirim teşviklerinin bölgesel ekonomik büyüme üzerindeki etkisi: ampirik bir analiz. Sayıştay Dergisi, 32(121), 39-64. https://doi.org/10.52836/sayistay.966483

Comparative Analysis of Machine Learning Models for Stock Price Prediction: A Case Study of Google, Tesla, and Netflix

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Abstract

this paper investigates the prediction of stock prices using five machine learning models: Linear Regression, XGBoost, LightGBM, Random Forest, and Long Short-Term Memory. The experiment uses ten years of closing price data for three companies—Google, Netflix, and Tesla—from January 2, 2014, to December 31, 2023. The models' performance is evaluated using Root Mean Square Error (RMSE) and R-squared (R^2). Results show that LR outperforms other models with the lowest RMSE and highest R^2, especially for Netflix and Tesla. XGBoost performs poorly, as compared, in predicting Google stock prices.

Keywords: Machine learning; Stock prediction; LSTM; Financial forecasting

1. Introduction

Following a 25% rise in the S&P 500 in 2023, stocks are now seen as overvalued, leading to conservative expectations for corporate earnings and economic growth. Analysts from Morgan Stanley and J.P. Morgan predict a slowdown in economic growth due to higher interest rates and tighter lending conditions, though they expect market stabilization by mid-2024. Ongoing inflation and geopolitical issues could, however, pose risks to market performance [1].

This study aims to predict stock prices using five machine learning models: Linear Regression (LR), XGBoost, LightGBM, Random Forest (RF), and Long Short-Term Memory (LSTM). Each model has distinct characteristics. LR is straightforward and often a starting point for stock price prediction, though it may struggle with nonlinear relationships. XGBoost is renowned for handling large datasets and complex patterns, providing accurate forecasts. LightGBM is optimized for efficient training on large-scale datasets. RF aggregates predictions from multiple decision trees, enhancing accuracy and mitigating bias and overfitting. LSTM excels in handling sequential data like time series, capturing intricate temporal sequences and long-term dependencies. We evaluate the models using RMSE and R2 metrics, assessing their accuracy and effectiveness in predicting stock prices. The historical data of Google, Netflix, and Tesla indices, covering approximately ten years from January 2, 2014, to December 31, 2023, is used for this purpose.

This paper has several significant implications. Firstly, it offers valuable support for investment decision-making processes by providing accurate predictions of stock prices, aiding investors, financial institutions, and businesses in making informed choices regarding investments, risk management, and strategic planning. Secondly, this study contributes to the advancement of financial forecasting methodologies, enhancing the accuracy and reliability of predictions in the finance sector, by employing advanced machine learning models such as XGBoost, LightGBM, RF, and LSTM. Furthermore, the inclusion of approximately 10 years of historical data from major companies like Google, Netflix, and Tesla enables long-term trend analysis, providing insights into market behavior and dynamics. Overall, this paper can provide comprehensive insights into stock price prediction with improved decision-making tools, considering the diverse dynamics of financial markets.

The paper is organized as follows: Section 2 reviews related literature, Section 3 introduces the models and evaluation metrics, Section 4 presents the experimental results, and Section 5 concludes the study and suggests directions for future research

2. Literature Review

Stock markets are naturally noisy, non-parametric, non-linear, and deterministic chaotic systems [2]. To achieve profit maximization, researchers have developed methods for forecasting stock prices accurately and effectively over the years. Feature selection from financial data is another difficult task in stock prediction, for which many approaches have been suggested [3] (2019). There are traditional methods, statistical methods, and machine learning models to facilitate the prediction of stock markets. Long-short-term memory and LightGBM are examples of effective models used in modern times to predict financial time series with remarkable accuracy.

Long short-term memory (LSTM) networks were introduced by Hochreiter and Schmidhuber [4]. It is a type of Recurrent Neural Network (RNN) specifically designed to handle sequential data such as time series, speech, and text [5]. It is designed to obtain constant error flow through time and to protect this error flow from undesirable perturbations [6]. Memorizing information for a longer period is the default behavior of the LSTM model. Studies show that LSTM is also a good mechanism for music composition [6]. Due to its capability of storing past information and using previous prices, LSTM is very useful in predicting stock prices. Fischer and Krauss used LSTM networks for the classification problem of predicting directional movements for the constituent stocks of the S&P 500 from 1992 until 2015 [7]. The authors concluded that the LSTM network could effectively extract meaningful information from the financial time series data. Based on prediction accuracy and daily returns after transaction costs, LSTM outperforms random forests, standard deep networks, and logistic regression [7].

XGBoost is a widely adopted scalable tree-boosting system extensively employed by data scientists to achieve cutting-edge results across standard classification benchmarks [8]. For instance, it found application in predicting target gene expression, gaining recognition for its robust expansion and adaptability [9]. The model incorporates multiple tree models to fortify the learner model. A distinguishing feature of XGBoost is its automatic utilization of CPU multi-threading for parallel computing, enhancing calculation speed [10]. Beyond functioning as a standalone predictor, it seamlessly integrates into diverse real-world production pipelines, notably contributing to tasks such as ad click-through rate prediction [11]. XGBoost is the default choice for ensemble methods, playing a pivotal role in challenges like the Netflix prize [12]. Its popularity and acclaim are underscored by its performance in Kaggle competitions, where among the 29 challenge-winning solutions in 2015, 17 utilized XGBoost. Notably, eight solutions exclusively relied on XGBoost for model training, while others often combined it with neural networks in ensembles [9]. The model's scalability in various scenarios positions XGBoost as a solution capable of effectively and accurately addressing a wide array of problems [13].

In the last decade, neural regression has been used with considerable success to solve regression and classification problems [14] (2021). For example, in the field of neuroscience prediction, regression

is a commonly used statistical tool, and linear regression by far is the most commonly used form of regression [15]. In recent years, nonparametric algorithms have been combined with regression models to increase their effectiveness, such as the decision tree [16]. The decision tree is a tree-like structure consisting of a root node at the top connected to layers of intermediate nodes ending in a series of terminal nodes (leaves) consisting of binary decisions that continue until a certain stopping criterion is reached [17] (2020). This method usually produces highly accurate results. However, with such a large number of parameters to be determined from data, there is a risk of overfitting [18]. Therefore, an ensemble learning method, Random Forests, was introduced, which consists of many (often hundreds) decision trees [16]. It averages the prediction of each decision tree in the ensemble, leading to a reduction in bias and overfitting, and an increase in accuracy [19].

LightGBM was first proposed by Microsoft Research in 2016. It is a machine-learning algorithm based on the decision tree in a gradient-boosting framework [20]. Multiple experiments and comparisons with existing models show that the proposed model provides accurate load forecasting results. LightGBM has been widely used in many fields. For example, Wang et al. [21] used LightGBM to forecast industrial customers' load in China, Australia, and Ireland, and the results show high effectiveness in generating efficient and distributed data. Given the stock market data properties, LightGBM is also applicable for predicting stock volatility for specific periods [22].

In Research has been done to compare different prediction models on the stock market. Li [23] compared the performance of three models, CNN, LSTM, and LightGBM, in terms of volatility and found that LightGBM is the most effective in predicting short-term stock volatility. Liu [24] analyzed the pros and cons of stock market prediction done by HMM and LSTM built on top of GMM and XGB. In the end, they concluded that XGB-HMM-LSTM achieved the highest accuracy of 80.69%.

Since the efficaciousness of LSTM, XGBoost, linear regression, and has experienced several rounds of edition and enhancement and has already been widely recognized by investors [25]. This paper will further examine, analyze, and compare the accuracy of prediction among LSTM, XGBoost, linear regression, and LightGBM, using a given data set, hoping to find the best method to deal with stock market prediction.

3. Models

This section provides an overview of the ML models and evaluation metrics used in this study.

3.1. Linear Regression (LR)

A linear regression model describes the relationship between a dependent variable, y, and one or more independent variables, x. The dependent variable is also called the response variable. Independent variables are also called explanatory or predictor variables. The multiple linear regression model is

$$y_i = \beta_0 + \beta_1\ x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \varepsilon_i, i = 1,\cdots,n \quad (1)$$

where n is the number of observations, y_i is the response variable, β_i is the ith coefficient, where $\beta_0$is the constant term in the model. Sometimes, design matrices might include information about the constant term. $x_{ij}$is the ith observation on the jth predictor variable, $j = 1,\cdots,p$, ε_i is the ith noise term, that is, random error. If a model includes only one predictor variable ($p = 1$), then the model is called a simple linear regression model.

3.2. XGBoost

XGBoost, short for Extreme Gradient Boosting, employs a specialized objective function that optimizes model performance through gradient boosting. The objective function can be expressed as

$$obj(\theta) = \sum_{i=1}^{n} l(y_i, \hat{y}) + \sum_{k=1}^{K} \Omega((f_k) \quad (2)$$

The approximated using Taylor expansion is

$$obj^{(t)} \approx \sum_{i=1}^{n} l\left[\left(y_i, \hat{y}^{(t-1)}\right) + g_i f_i(x_i) + \frac{1}{2} h_i f_t^2(x_i)\right] \quad (3)$$

$$obj^{(t)} \approx \sum_{i=1}^{n} l\left[\left(y_i, \hat{y}^{(t-1)}\right) + g_i f_i(x_i) + \frac{1}{2} h_i f_t^2(x_i)\right] + \Omega(f_t) + C \quad (4)$$

where $l(y_i, \hat{y})$ represents the training error of the sample x_i, $\Omega((f_k)$ represents the regular term of the first tree, k represents the total number of trees, f_k represents k the first tree, $\hat{y}_i$ represents the prediction result of the sample x_i, and C is a constant. This formulation effectively balances model complexity and prediction accuracy, making XGBoost widely used in various ML applications due to its robust performance and optimization capabilities.

3.3. LightGBM

LightGBM is an optimized gradient boosting framework that improves upon XGBoost with several key enhancements. It utilizes a histogram-based decision tree algorithm to discretize continuous features into bins, reducing memory usage and speeding up model training and optimization.

Tree Building Strategies: In contrast to XGBoost's level-wise approach, LightGBM adopts a leaf-wise strategy. This method splits the leaf node with the highest gain at each step until a stopping criterion is met, optimizing training speed and often yielding better predictive accuracy.

Depth Regularization: LightGBM includes depth regularization in its leaf-wise growth strategy by limiting the maximum depth of trees. This helps prevent overfitting by restricting excessive node splitting, thereby enhancing the model's generalization performance.

3.4. Random Forest (RF)

Random Forest is a powerful ensemble learning method widely used for regression tasks due to its ability to handle complex relationships and noisy data. The method combines multiple decision trees $\{T_j(x)\}_{j=1}^{N}$ to predict a continuous target variable Y to improve predictive accuracy and robustness. The final prediction Y for an input x is computed as

$$\hat{Y}(x) = \frac{1}{N} \sum_{j=1}^{N} T_j(x) \quad (5)$$

where $T_j(x)$ denotes the prediction of the j-th decision tree. Each decision tree $T_j(x)$ is trained independently on a random subset of the training data using a randomly selected subset of features. This randomness helps to decorrelate the trees and improve the ensemble's predictive performance.

3.5. Long Short-Term Memory (LSTM)

$$i_t = \sigma(w_i[h_{t-1}, x_t] + b_i)$$
$$f_t = \sigma(w_f[h_{t-1}, x_t] + b_f)$$

$$o_t = \sigma(w_o[h_{t-1}, x_t]+b_o) \quad (6)$$

where i_t, f_t, o_t represent input gate, forget gate and output gate, respectively. σ is sigmoid function, w_x is weight for the respective gate (x) neurons, h_{t-1} is utput of the previous LSTM block (at timestamp $t-1$), x_t is input at current timestamp, and b_x are biases for the respective gates (x).

3.6. Measurement

We use Root Mean Square Error (RMSE) and R-squared (Coefficient of determination, R^2) to evaluate the performance of the prediction models. RMSE measures the "mean error". Here, it calculates the difference between each predicted value and the observed value. The formula is given by

$$RMSE = \sqrt{MSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N} y_i - \hat{y})^2} \quad (7)$$

where y_i is the observed value, $\hat{y}$ is the predicted value of y_i, and N is the number of samples. The smaller the value of $RMSE$, the better of the model to describe the experiment data.

If $RMSE = 0$, the model can perfectly fit the data.

R^2 is the coefficient used to evaluate the fit of the values compared to the observed values, representing the percentage of change in response variable y explained by the independent variable x, given by

$$R^2 = 1 - \frac{\Sigma(y_i - \hat{y})^2}{\Sigma(y_i - \bar{y})^2} \quad (8)$$

Where y_i is the observed value, $\hat{y}$ is the predicted value of y_i, $\bar{y}$ is the mean value of y_i. R^2 ranges from 0 to 1. Higher R^2 indicates, the model fits the data well. When $R^2 = 1$, the predicted value can be explained by independent variables perfectly. When $R^2 = 0$, it shows that the predicted value does not fit the actual result.

4. Data Analysis

In this section, we conduct numerical experiments to evaluate and compare the performance of five different models: LR, XGBoost, LightGBM, RF, and LSTM. Our evaluation focuses on predicting the stock prices of Google, Tesla, and Netflix. The performance of each model is assessed using RMSE and R^2 as the primary metric.

4.1. Data Description

The data is collected from Yahoo Finance. We consider three companies: Google, Tesla, and Netflix, over ten years from January 2, 2014, to December 31, 2023 (2516 trading days). In this study, we focus on the close prices of these companies, with data in total. The data is split into training and testing sets, with 80% used for training and 20% for testing. The models are trained using the training set and the performance of models are evaluated using the test set.

Fig. 1. shows close prices of three companies, Google, Tesla and Netflix over a ten-year period. The trend across all companies is upward in the close prices over the decade. However, a notable downturn occurred in 2022, primarily attributed to rising interest rates and the global impact of the Covid-19 pandemic. This downturn affected all three companies significantly. Following this challenging period, there was a gradual recovery in the subsequent year, with prices beginning to increase once again.

Despite these fluctuations, the long-term trend highlights sustained growth in the close prices of these companies over the analyzed period.

Fig. 2. illustrates the correlation of closing prices among the stocks. Google and Tesla demonstrate a remarkably high correlation coefficient exceeding 0.90, signifying that their stock prices tend to move closely together in response to market conditions. Both companies belong to the high-tech and innovation-driven sector, which likely contributes to their synchronized price movements. In contrast, Netflix exhibits a lower correlation with Google and Tesla. This lower correlation suggests that Netflix's stock price movements are less synchronized with those of Google and Tesla. Netflix operates in the streaming and entertainment services sector, distinct from the high-tech focus of Google and Tesla, which could explain the divergent patterns in their stock prices. Overall, the correlation analysis underscores how sector dynamics can influence the synchronized movements of stock prices across different companies.

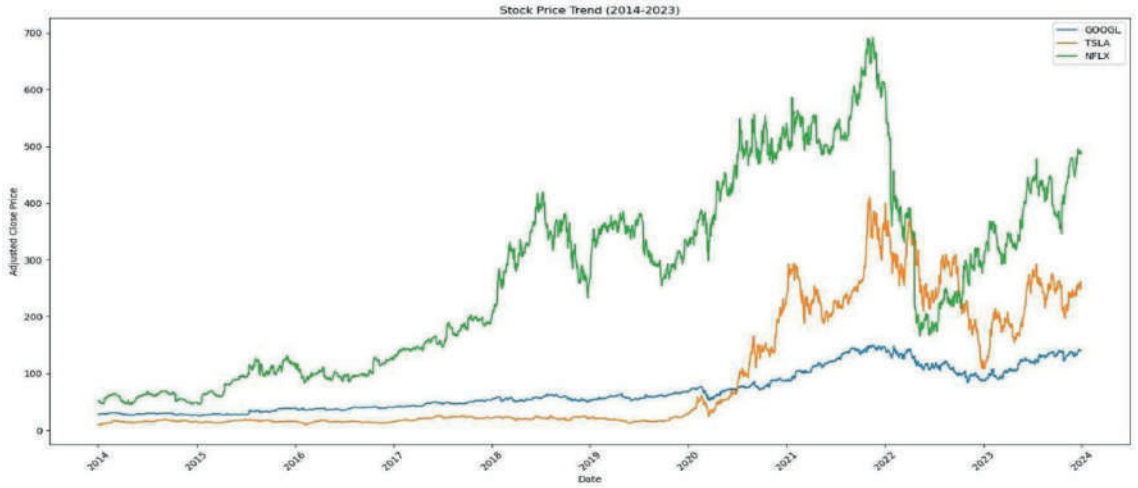


Fig. 1. Close price of Google, Tesla, and Netflix, from January 2, 2014, to December 31, 2023.

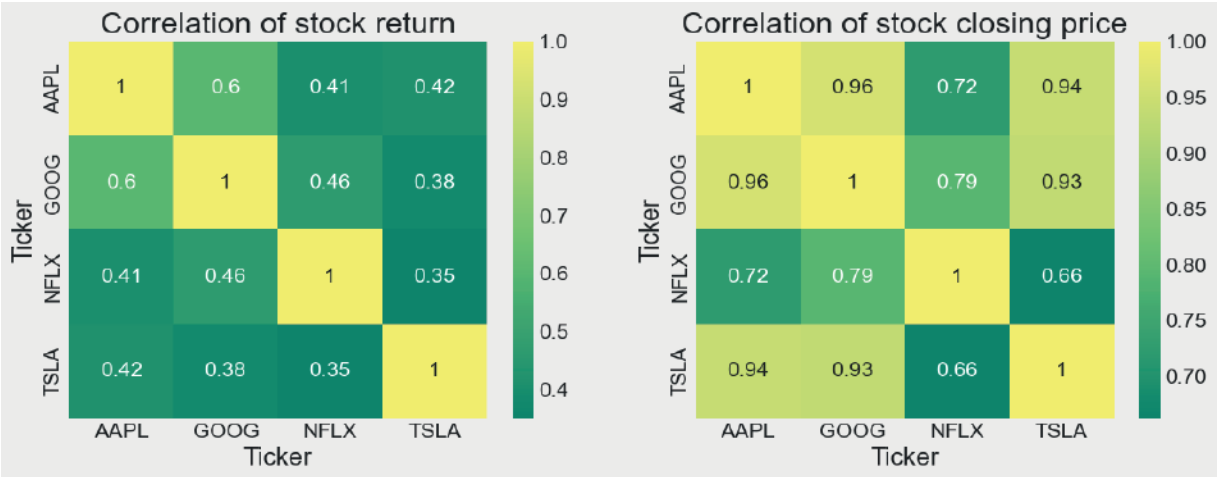


Fig. 2. Correlation of Stock Closing Price

4.2. Experiments

In the section, we conduct numerical experiments and compare the performance of five different models LR, RF, XGBoost, LightGBM and LSTM. To assess the accuracy of each model, we use RMSE and R^2 as measurements.

Fig. 3. presents the performance comparison of five models—LR, XGBoost, LightGBM, RF, and LSTM—predicting Google's stock prices. Predicted values are depicted in yellow, while actual values from the training set are in blue and from the test set in red, enabling a direct visual assessment across models and datasets. The LR model stands out for its high accuracy, closely aligning its predicted values with actual data throughout both training and test sets. In contrast, the LSTM model exhibits notable discrepancies, particularly evident in June 2023, where its predictions notably underestimate actual values. This figure provides a comprehensive visual analysis of each model's predictive strengths and weaknesses, aiding in understanding their performance in forecasting Google's stock prices.

Fig. 4. provides a similar analysis but focuses on Tesla's stock prices. It presents the predictions made by LR, XGBoost, LightGBM, RF, and LSTM models alongside actual values, enabling a comprehensive assessment of their performance in capturing the trends and fluctuations in Tesla's stock prices over time.

Fig. 5. examines the predictive capabilities of the five models for Netflix's stock prices. Similar to the previous figures, it showcases the predicted values (yellow) against the actual values from the training set (blue) and test set (red). This figure highlights how each model fares in forecasting the unique market dynamics and movements specific to Netflix's stock over the evaluated period.

Table 1. shows the RMSE and R^2 results for predicting stock prices of three company stocks using five different models. From this table, we can see that LR outperforms the other models in accuracy. For all three companies, LR achieves the lowest RMSE values and highest R^2, indicating superior predictive performance. Specifically, for Google, LR has an RMSE of 2.5265 and an R^2 of 0.9759, compared to XGBoost, which has the lowest prediction accuracy with an RMSE of 3.5892 and an R^2 of 0.9515. For Tesla, LR achieves an RMSE of 9.4394 and an R^2 of 0.9712, while LSTM shows the poorest performance with an RMSE of 36.76 and an R^2 of 0.56. Similarly, for Netflix, LR attains an RMSE of 12.1108 and an R^2 of 0.9837, whereas LSTM again shows the lowest accuracy with an RMSE of 49.06 and an R^2 of 0.73.

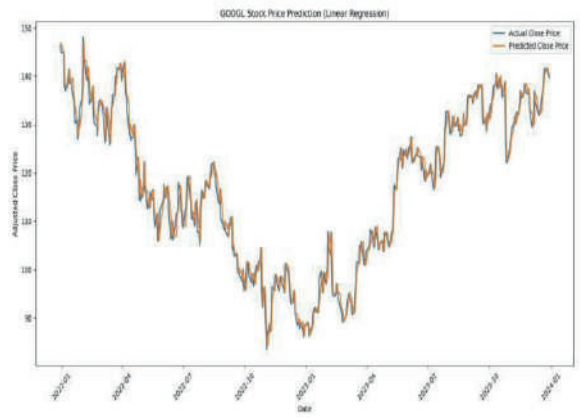
4.3. Discussion

The experimental outcomes consistently favor Linear Regression (LR) across all evaluated companies, demonstrating its ability to minimize RMSE and maximize R^2 scores. This indicates LR's reliability in capturing stock price variations accurately. In contrast, LSTM exhibits higher RMSE and lower R^2 scores, particularly noticeable for Tesla and Netflix, suggesting challenges in capturing the complex dynamics of their stock prices. The suboptimal performance of XGBoost in predicting Google's stock prices suggests the necessity for further model refinement and feature engineering. These findings emphasize the importance of selecting appropriate models tailored to the specific characteristics of stock market data for effective prediction.

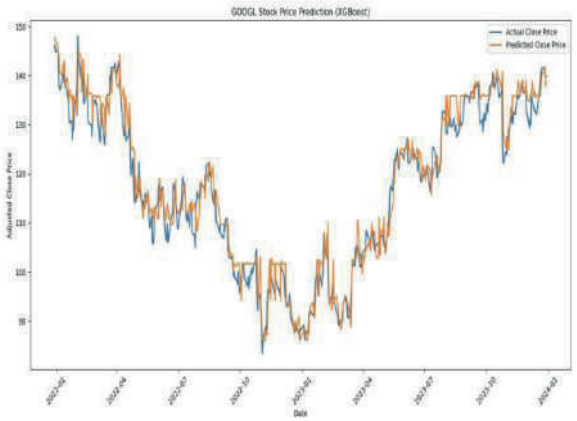
5. Conclusion

This study evaluated the performance of five machine learning models in predicting stock prices of Google, Netflix, and Tesla over a ten-year period. Linear Regression emerged as the most reliable model, while LSTM and XGBoost showed varying degrees of performance. Future research could explore hybrid models and incorporate additional financial indicators to enhance prediction accuracy.

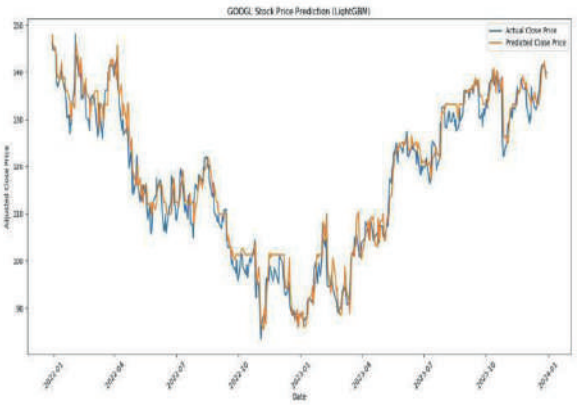
The experiment has several limitations, including the number of companies and the time period being studied. The lack of variety can lead to unitary correlation between samples, resulting in an inability to fully showcase the advantages of various models on different occasions and companies. Future research would include more sample companies over a longer period to provide a more comprehensive analysis. Additionally, studying different countries' stock markets or applying the models to other areas beyond stock market forecasting could offer further insights and improve the robustness of the models.



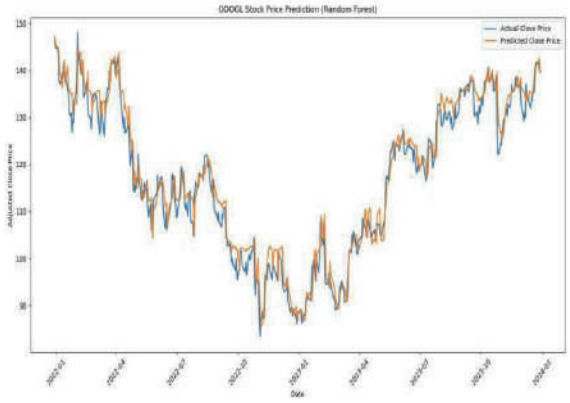
LR



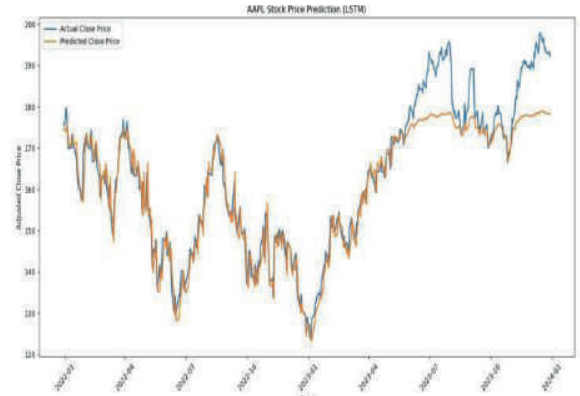
XGBoost



LightGBM



RF



LSTM

Fig. 3. Predictions and actual values of Google generated by five models, LR in (a), RF in (b), LSTM in (c), XGBoost in (d) and LightGBM in (e). with predicted values shown in yellow, actual values from the training set in blue, and actual values from the test set in red.

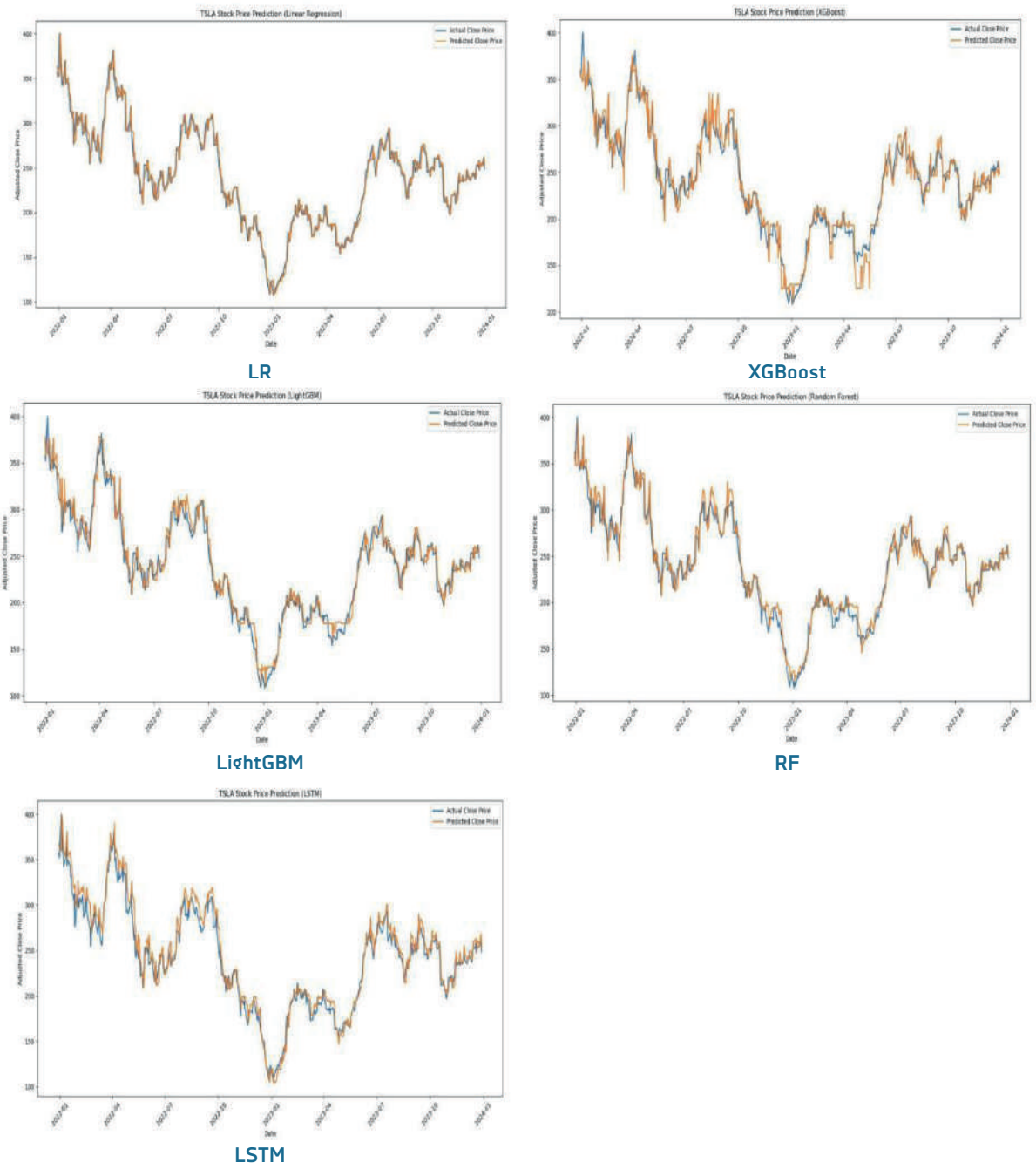


Fig. 4. Predictions and actual values of Tesla using five models, LR in (a), RF in (b), LSTM in (c), XGBoost in (d) and LightGBM in (e). The predicted values are in orange, actual values in the training set and test set are in blue.

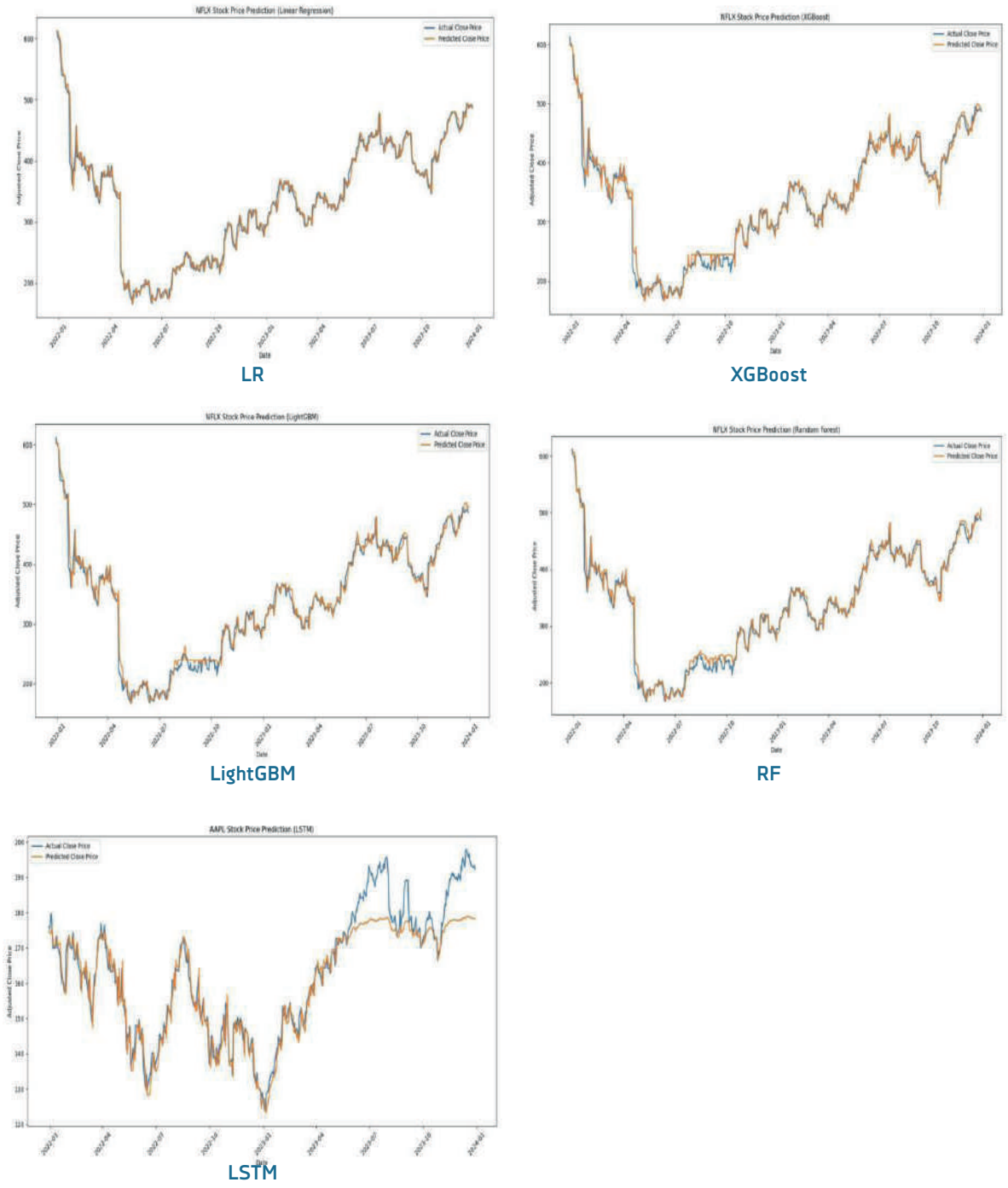


Fig. 5. Predictions and actual values of Netflix using five models, LR in (a), RF in (b), LSTM in (c), XGBoost in (d) and LightGBM in (e). The predicted values are in orange, actual values in the training set and test set are in blue.

Table 1. Results of RMSE and R^2 of three company stocks using different models

Model	RMSE (Google)	R^2 (Google)	RMSE (Netflix)	R^2 (Netflix)	RMSE (Tesla)	R^2 (Tesla)
Linear Regression	2.5265	0.9759	12.1108	0.9837	9.4394	0.9712
XGBoost	3.5892	0.9515	14.6640	0.9761	14.1418	0.9355
LightGBM	3.3039	0.9589	13.4071	0.9800	11.6077	0.9565
Random Forest	3.2275	0.9607	13.2967	0.9803	11.7175	0.9557
LSTM	2.7597	0.9713	12.1108	0.9837	12.2623	0.9515

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

References

1. Lu, Z., Gozgor, G., Huang, M., Chi Keung Lau, M.: The impact of geopolitical risks on financial development: Evidence from emerging markets. Journal of Competitiveness 1, (2020)
2. Bhandari, H. N., Rimal, B., Pokhrel, N. R., Rimal, R., Dahal, K. R., Khatri, R. K.: Predicting stock market index using LSTM. Machine Learning with Applications 9, 100320 (2022)
3. Hoseinzade, E., Haratizadeh, S.: CNNpred: CNN-based stock market prediction using a diverse set of variables. Expert Systems with Applications 129, 273–285 (2019)
4. Hochreiter, S., Schmidhuber, J.: Long short-term memory. Neural Computation 9(8), 1735–1780 (1997)
5. Van Houdt, G., Mosquera, C., Nápoles, G.: A review on the long short-term memory model. Artificial Intelligence Review 53(8), 5929–5955 (2020)
6. Eck, D., Schmidhuber, J.: A first look at music composition using LSTM recurrent neural networks. Istituto Dalle Molle Di Studi Sull Intelligenza Artificiale 103(4), 48–56 (2002)
7. Fischer, T., Krauss, C.: Deep learning with long short-term memory networks for financial market predictions. European Journal of Operational Research 270(2), 654–669 (2018)
8. Nalluri, M., Pentela, M., Eluri, N. R.: A Scalable Tree Boosting System: XG Boost. Int. J. Res. Stud. Sci. Eng. Technol 7(12), 36–51 (2020)
9. Chen, T., Guestrin, C.: Xgboost: A scalable tree boosting system. In: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, pp. 785–794 (2016)
10. Ma, M., Zhao, G., He, B., Li, Q., Dong, H., Wang, S., Wang, Z.: XGBoost-based method for flash flood risk assessment. Journal of Hydrology 598, 126382 (2021)
11. González, S., García, S., Del Ser, J., Rokach, L., Herrera, F.: A practical tutorial on bagging and boosting based ensembles for machine learning: Algorithms, software tools, performance study, practical perspectives and opportunities. Information Fusion 64, 205–237 (2020)
12. Bennett, J., Lanning, S.: The netflix prize. In: Proceedings of the KDD Cup Workshop 2007, pp. 3–6 (2007)
13. Dhaliwal, S. S., Nahid, A. A., Abbas, R.: Effective intrusion detection system using XGBoost. Information 9(7), 149 (2018)
14. Rahman, M., Asadujjaman, M.: Implementation of artificial neural network on regression analysis. In: 2021 5th Annual Systems Modelling Conference (SMC), pp. 1–7. IEEE (2021)
15. Smith, P. F., Ganesh, S., Liu, P.: A comparison of random forest regression and multiple linear regression for prediction in neuroscience. Journal of Neuroscience Methods 220(1), 85–91 (2013)
16. Chowdhury, S., Lin, Y., Liaw, B., Kerby, L.: Evaluation of tree-based regression over multiple linear regression for non-normally distributed data in battery performance. In: 2022 International Conference on Intelligent Data Science Technologies and Applications (IDSTA), pp. 17–25. IEEE (2022)
17. Priyanka, Kumar, D.: Decision tree classifier: a detailed survey. International Journal of Information and Decision Sciences 12(3), 246–269 (2020)
18. Breiman, L.: Random forests. Machine Learning 45, 5–32 (2001)
19. Seni, G., Elder, J.: Ensemble methods in data mining: improving accuracy through combining predictions. Morgan & Claypool Publishers (2010)
20. Ponsam, J. G., Gracia, S. J. B., Geetha, G., Karpaselvi, S., Nimala, K.: Credit Risk Analysis using LightGBM and a comparative study of popular algorithms. In: 2021 4th International Conference on Computing and Communications Technologies (ICCCT), pp. 634–641. IEEE (2021)
21. Wang, Y., Chen, J., Chen, X., Zeng, X., Kong, Y., Sun, S., Liu, Y.: Short-term load forecasting for industrial customers based on TCN-LightGBM. IEEE Transactions on Power Systems 36(3), 1984–1997 (2020)

22. Guennioui, O., Chiadmi, D., Amghar, M.: Global stock price forecasting during a period of market stress using LightGBM. International Journal of Computing and Digital Systems 15(1), 19–27 (2024)
23. Li, J.: The comparison of LSTM, and CNN in stock volatility prediction. In: 2022 7th International Conference on Financial Innovation and Economic Development (ICFIED 2022), pp. 905–909. Atlantis Press (2022)
24. Liu, M., Huo, J., Wu, Y., Wu, J.: Stock market trend analysis using hidden Markov model and long short-term memory. arXiv preprint arXiv:2104.09700 (2021)
25. Aziz, R. M., Baluch, M. F., Patel, S., Ganie, A. H.: A machine learning approach for Ethereum fraud detection. International Journal of Information Technology 14(7), 3321–3331 (2022)

Spillover shocks between digital payment currencies and uncertainty indices: evidence from a frequency quantile-on-quantile perspective

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Abstract

We examine the spillover effects of uncertainty indexes on the digital payment currency index at various quantiles and frequencies and vice versa from May 2018 to July 2024. We use the S&P Kensho Global Future Payments Index (GFP) as a proxy for digital payment currency, and the CBOE Gold Volatility Index (GVZ), Merrill Lynch Option Volatility Index (MOVE), Oil Volatility Index (OVX), CBOE Options Exchange Volatility Index (VIX), and CBOE S&P 500 Spot Volatility Index (SVOL) as uncertainty indices. For this reason, we propose a unique technique, called the frequency quantile-on-quantile connectedness, which allows us to evaluate bivariate interconnection across not only the same quantile pairs but also between separate quantiles in both the short and long term. Our findings show that the reversely related market risks are, on average, greater than the directly related connectedness for all cases and time horizons, implying that spillover shocks are primarily driven by different extreme quantile combinations rather than similar ones, as well as a negative co-movement in the short- and long-run. The net connectedness investigation emphasizes the complex associations between digital payment currencies and uncertainty indices, demonstrating that the magnitude and direction of spillover shocks is not constant but time-varying not only across quantile pairs but also over time horizons. Uncertainty indices act as the net receivers of shocks from GFP in the entire period and short run but switch to be transmitters in the long run. These findings highlight our method's suitability/capabilities for uncovering the real dynamics of bivariate interlinkages spanning quantiles and frequencies, which other techniques cannot provide.

1. Introduction

The COVID-19 pandemic has provided an incentive to increase the use of digital payment services, perhaps fostering deeper financial inclusion (Cull et al., 2023). In this context, the rapid growth of private and public digital currencies has raised many interesting and fundamental economic questions, emphasising that digital payments can be a gateway to broader financial inclusion (Chiu and Keister, 2022). Moreover, advances in digital networks and information technology, together with the growing

share of internet-based retailing, have created demand and technological space for peer-to-peer digital transactions with the potential to radically change payment and financial intermediation systems (Agur et al., 2019).

In particular, innovations in the Financial Technology (Fintech) sector have revolutionised the financial services market in recent years (Naysary and Shrestha, 2024; Shrestha et al., 2023). For example, activities in the field of FinTech have expanded from mobile payments, money transfers, peer-to-peer loans and crowdfunding to new areas such as blockchain, cryptocurrencies and robo-investment (Goldstein et al., 2019). Such major technological developments in the FinTech (financial technology) sector have led to significant changes in the financial services sector, and global investments in this sector are estimated to reach $238.9 billion by 2021 (Liu, 2024). In a recent study by the United Nations Development Programme, it is noted that although the COVID-19 pandemic has slowed down in developing countries, there are significant challenges in accessing financial services, and it is motivating many countries to take measures to use FinTech applications during/after the pandemic (Shaik et al., 2023). Therefore, the remarkable growth of Fintech during the COVID-19 pandemic, its sensitivity to changes in the economy and its contribution to the transition to digital financial services has become a critical area to examine the response of the broader financial market to global disruptions (Oh, 2024).

Traditionally, the largest players in the payment markets were commercial banks and digital payment companies such as VISA, Mastercard and American Express. However, the rise of digital currencies and the increasing adoption of digital payment platforms are providing more opportunities for financial inclusion (Yousaf and Goodell, 2023). Other popular payment technologies include mobile payments, for example mobile e-wallets such as Apple Pay, PayPal, Samsung Pay and Google Pay. These are virtual wallets that provide consumers with great convenience and more secure financial services (Khando et al., 2023). On the other hand, payment systems and financial services economies are being profoundly affected by the introduction of new cryptocurrencies and blockchain technologies with functions such as providing faster and more secure payment services (Ghaemi Asl et al., 2021). However, as these payment systems become more mainstream, it becomes important to understand the relationship between digital payment systems and uncertainty indices, especially in times of economic volatility. Indeed, the dynamics of financial markets are increasingly influenced by uncertainty, requiring a comprehensive understanding of how these uncertainties interact with various financial assets (Asiri et al., 2023). Doostkouei et al. (2024) stated that although the financial technology (fintech) sector plays a critical role in driving innovation and efficiency in global financial markets, it experiences unique vulnerabilities due to its sensitivity to increasing geopolitical risks.

A large body of literature using various uncertainty indicators has investigated the impact of uncertainty on digital payments such as cryptocurrency (Aharon et al., 2022; Cheng and Yen, 2020; Colon et al., 2021), fintech stocks (Abakah et al., 2023) and traditional assets (Elsayed et al., 2022). Cheng and Yen (2020) examine the predictive power of the Economic Policy Uncertainty (EPU) index constructed by Baker et al. (2016) on cryptocurrency returns and find that the Chinese Economic Policy Uncertainty index is a significant predictor of Bitcoin monthly returns. Colon et al. (2021) investigate the impact of uncertainty on the cryptocurrency market, expanding the focus beyond Bitcoin to include the top 25 cryptocurrencies, and find that the cryptocurrency market in general acts as a strong hedge against geopolitical risks. Aharon et al. (2022) investigate the relationship between two Twitter-based measures of economic and market uncertainty and the performance of four major cryptocurrencies (Bitcoin, Ethereum, Bitcoin Cash, and Ripple) and find a strong causal link between uncertainty expressed on social media and cryptocurrency returns. Abakah et al. (2023) introduce the Russia-Ukraine War and Economic Sanctions Sentiment Index (RUWESsent) derived from various sentiment sources and evaluate its impact on FinTech and blockchain stock returns and find that RUWESsent positively affects returns in bull markets and negatively in bear markets. Elsayed et al. (2022) analyse the dynamic linkage of return and volatility spillovers between the cryptocurrency index (CRIX), Gold, and various uncertainty measures and find that cryptocurrency policy uncertainty significantly affects

return spillovers to other financial assets. However, there are a limited number of studies examining the interaction between digital payment indices and uncertainty indices. For instance, Shaik et al. (2023) explore the dynamic volatility connectivity between FinTech, innovative technology communication, and cryptocurrency indices over the period from June 2018 to June 2022, and reveals that volatility spillovers increased during the COVID-19 pandemic and the Russia-Ukraine war, highlights the shifts between net transmitters and net receivers of volatility. Doostkouei et al. (2024) investigates the impact of geopolitical risk on volatility within the fintech sector by analyzing three key fintech indices and reveals that the S&P Kensho Alternative Finance and Future Payments indices respond more strongly to negative news compared to positive news, indicating an asymmetric effect.

We offer significant contributions. The major contribution lies in the applied approach. We extend the quantile-on-quantile approach of Gabauer and Stenfors (2024) by incorporating the frequency connectedness of Baruník and Krehlík (2018), allowing us to measure the spillover effects across both similar and different quantiles and over timeframes. In addition, to the best of our knowledge, no previous studies have explored the return connectedness between several uncertainty factors, including gold, sovereign bonds, oil, equity, and option market-related uncertainty, and the global future payments.

This study investigates the connectivity between global future payments and various uncertainty indices from 2018-2024 using a quantile-on-quantile frequency connectivity model. The model reveals that uncertainty indices are connected to global future payments at mostly reversely related quantiles in the entire and subperiods. The spillover shocks are primarily driven by low levels of uncertainty in the short run, but the heightened uncertainty dominates the minimal levels of global future payments in the long run. VIX and the SP500 spot market volatility are the most effective uncertainty factors on the global future payments, while oil implied volatility is the least influential. The strength of interactions decreases from high frequency to low frequency, with short-run dynamics being more prominent. All five uncertainty indicators function as the net receivers of shocks from the global future payments in the entire period. All but the gold market-related uncertainties appear to be solely the net receivers in the short run, but these four factors shift to being primary transmitters of global future payments in the long run.

This paper proceeds as follows: In the next section, we introduce the quantile-on-quantile frequency connectedness methodology and describe the dataset. Section 3 includes the empirical findings, while Section 4 concludes the study with policy implications.

2. Methodology

The more recently connectedness method proposed by Gabauer and Stenfors (2024), the quantile-on-quantile connectedness approach, allows us to quantify the transmission mechanism across both the same and different quantile combinations ($\tau_1, \tau_2, \ldots, \tau_N$), which distinguishes it from the traditional quantile connectedness approach of Ando et al. (2022). Rather than using the quantile regression of Koenker and Bassett (1978) to build measures of connectedness across the various quantiles (Ando et al., 2022), this considers the quantile-on-quantile regression of Sim and Zhou (2015) while building quantile-based connectedness measures. It calculates the size and direction of spillover shocks at both directly and indirectly related quantile combinations, providing greater insight into bivariate connectedness when a complete picture of the conditional distribution of market returns across the bivariate quantile spectrum is required.

The quantile vector autoregression, QVAR(p), is defined as follows:

$$x_t = \mu(\tau) + \sum_{j=1}^{p} \Pi_j(\tau) x_{t-j} + \dot{o}_t(\tau) \tag{1}$$

where x_t and x_{t-j} are $\ddot{E}\times 1$ dimensional endogenous variable vectors, τ is a vector of quantiles, ranging from 0 to 1, $\mu(\tau)$ signifies $\ddot{E}\times 1$ dimensional conditional mean vector, p is the lag length determined under BIC, $Ð_j(\tau)$ denotes a $\ddot{E}\times\ddot{E}$ dimensional QVAR coefficient matrix, and $\dot{o}_t(\tau)$ represent a $\ddot{E}\times 1$ dimensional error vector with a $\ddot{E}\times\ddot{E}$ dimensional variance–covariance matrix, $H(\tau)$.

To transform the QVAR(p) into its QVMA(∞) representation, we use Wold's theorem as given:

$$x_t=\mu(\tau)+\sum_{j=1}^{p}\Pi_j(\tau)x_{t-j}+\dot{o}_t(\tau)=\mu(\tau)+\sum_{i=0}^{\infty}\Theta_i(\tau)\dot{o}_{t-i} \tag{2}$$

The F -step ahead generalized forecast error variance decomposition (GFEVD) captures the influence of a shock in variable j on variable i, given by

$$\Psi^{gen}_{i\leftarrow j,\tau}(F)=\frac{\sum_{f=0}^{F-1}\left(e_i'A_f(\tau)H(\tau)e_j\right)^2}{H_{ii}(\tau)\sum_{f=0}^{F-1}\left(e_i'A_f(\tau)H(\tau)A_f(\tau)'e_i\right)} \tag{3}$$

$$gSOT_{i\leftarrow j,\tau}(F)=\frac{\Psi^{g}_{i\leftarrow j,\tau}(F)}{\sum_{j=1}^{\lambda}\Psi^{g}_{i\leftarrow j,\tau}(F)} \tag{4}$$

where e_i represents a $\ddot{E}\times 1$ dimensional zero vector with unity in its i th position and the equation (4) estimates the scales GFEVD. Diebold and Yılmaz (2012, 2014) suggest normalizing $Ø^{gen}_{ðx\leftarrow j,}(F)$ by dividing it by the row sum to obtain $gSOT_{i\leftarrow j,\tau}(F)$, as the row sum of $Ø^{gen}_{ðx\leftarrow j,}$ is not equal to unity. We estimate the total directional connectedness TO and FROM others, respectively:

$$C^{gen,\ to}_{i\rightarrow \blacklozenge,\tau}=\sum_{\lambda=1,i\neq j}^{\Lambda}gSOT_{\lambda\leftarrow i,\tau} \tag{5}$$

$$C^{gen,\ from}_{i\leftarrow \blacklozenge,\tau}=\sum_{\lambda=1,i\neq j}^{\Lambda}gSOT_{i\leftarrow \lambda,\tau^{\blacklozenge}} \tag{6}$$

where the TO total directional connectedness (5) indicates how series i affects all other series, whereas the FROM total directional connectedness (6) expresses how all series affect i. Based on these determinations, we estimate the net total directional connectedness measure (NET), which measures the effect of the variable i on the examined network, reflecting the difference between the TO and FROM total directional connectedness, as stated by

$$C^{gen,\ net}_{i,\tau}=C^{gen,\ to}_{\lambda\rightarrow \blacklozenge,\tau}-C^{gen,\ from}_{\lambda\leftarrow \blacklozenge,\tau} \tag{7}$$

where $C^{gen,\ net}_{i,\tau}>0$ implies that series i has greater impact on all other series than it has on them, making it a net shock transmitter. If $C^{gen,\ net}_{i,\tau}<0$, we identify it as a net shock receiver.

The adjusted total connectedness index (TCI) of Chatziantoniou et al. (2021), is calculated by

$$TCI_{\tau}(F)=\frac{\Lambda}{\Lambda-1}\sum_{\lambda=1}^{\Lambda}C^{gen,\ from}_{\lambda\leftarrow \blacklozenge,\tau}\equiv\frac{\Lambda}{\Lambda-1}\sum_{\lambda=1}^{\Lambda}C^{gen,\ to}_{\lambda\leftarrow \blacklozenge,\tau^{\blacklozenge}} \tag{8}$$

It shows the magnitude of market risks within a network. The greater TCI value indicates heightened spillover shocks between variables under investigation, and vice versa.

Following Baruník and Křehlík (2018), we consider the spectral representation of variance decomposition framework to describe the dynamics of the quantile-on-quantile connectedness in the

frequency domain. We describe the spectral density of x_t at frequency ω as a Fourier transform of $MA(\infty)$ filtered series, as provided

$$S_x(\omega) = \sum_{h=-\infty}^{\infty} E\left(x_t x_{t-h}^{'}\right) e^{-i\omega h} = \Psi\left(e^{-i\omega h}\right) \Sigma_t \Psi'\left(e^{+i\omega h}\right) \tag{9}$$

where $\Ø\left(e^{-i\omega}\right) = \sum_{h=0}^{\infty} e^{-i\omega h} \Ø_h$ is the frequency response function with $i = \sqrt{-1}$ and $\mathfrak{S}_x(\ )$ shows how the variance of the x_t spread over the frequency components ω. We normalize the frequency GFEVD as formulated below

$$\Theta_{ij}(\omega) = \frac{\left(\Sigma(\tau)\right)_{jj}^{-1} \left| \Sigma_{h=0}^{\infty} \left(\Psi(\tau)\left(e^{-i\omega h}\right)\Sigma(\tau)\right)_{ij} \right|^2}{\sum_{h=0}^{\infty} \left(\Psi\left(e^{-i\omega h}\right)\Sigma(\tau)\Psi(\tau)\left(e^{i\omega h}\right)\right)_{ii}} \tag{10}$$

$$\overset{i}{\Theta}_{ij}(\omega) = \frac{\Theta_{ij}(\omega)}{\sum_{k=1}^{N} \Theta_{ij}(\omega)} \tag{11}$$

where the within-frequency indicator, $\overset{i}{\Theta}_{ij}(\omega)$, describes the part of the spectrum of the i th series at a given frequency ω that may be caused by a shock in the j th series.

For our objectives, rather than examining the interconnection of variables from a broad perspective or at a single frequency, which would ignore varied frequency responses to shocks, we will focus on the interaction across short and long periods. To do this, we aggregate all frequencies within a particular range, $d = (a,b) : a,b \in (-\pi,\pi), b > a$, and define the generalized variance decompositions on frequency band d

$$\overset{i}{\Theta}_{ij}(d) = \int_a^b \overset{i}{\Theta}_{ij}(\omega)\, d\omega \tag{12}$$

Here, we use the same approach as before to estimate frequency connectedness measures, which offer information on return spillover in our case, in a certain frequency range, as given

$$NET_i(d) = TO_i(d) - FROM_i(d) = \sum_{i=1, i\neq j}^{N} \overset{i}{\Theta}_{ji}(d) - \sum_{i=1, i\neq j}^{N} \overset{i}{\Theta}_{ij}(d) \tag{13}$$

$$TCI(d) = \frac{1}{N}\sum_{i=1}^{N} TO_i(d) = \frac{1}{N}\sum_{i=1}^{N} FROM_i(d) \tag{14}$$

In our case, given that the impacts of spreads diminish with time, we consider that a 5-day timeframe will suffice to analyze short-term return spreads, with longer periods of time being adequate for long-term return propagation analysis. Thus, we define two frequency bands as $d_1 = (\pi/5, \pi)$ and $d_2 = (0, \pi/5)$. Notably, the overall connectedness measures across the same/different quantile combinations are equal to the sum of the corresponding frequency connectedness measures.

2.1. Data

The dataset covers daily observations of S&P Kensho Global Future Payments Index (GFP), CBOE Gold Volatility Index (GVZ), ICE BofAML MOVE Index (MOVE), CBOE Crude Oil Volatility Index (OVX), CBOE Volatility Index (VIX), and CBOE S&P500 Spot Volatility Index (SVOL). The sample period is May 31, 2018, through August 01, 2024, resulting in 1536 observations where we are restrained by data availability given the launch date of the GFP index. GFP is available at www.spglobal.com and the uncertainty indices are compiled from Yahoo Finance. All price indices are quoted in US dollars. To ensure stationarity, we calculate the logarithmic difference between two

consecutive observations, illustrate the return series along with the raw series in Figure 1, and provide summary statistics in Table 1.

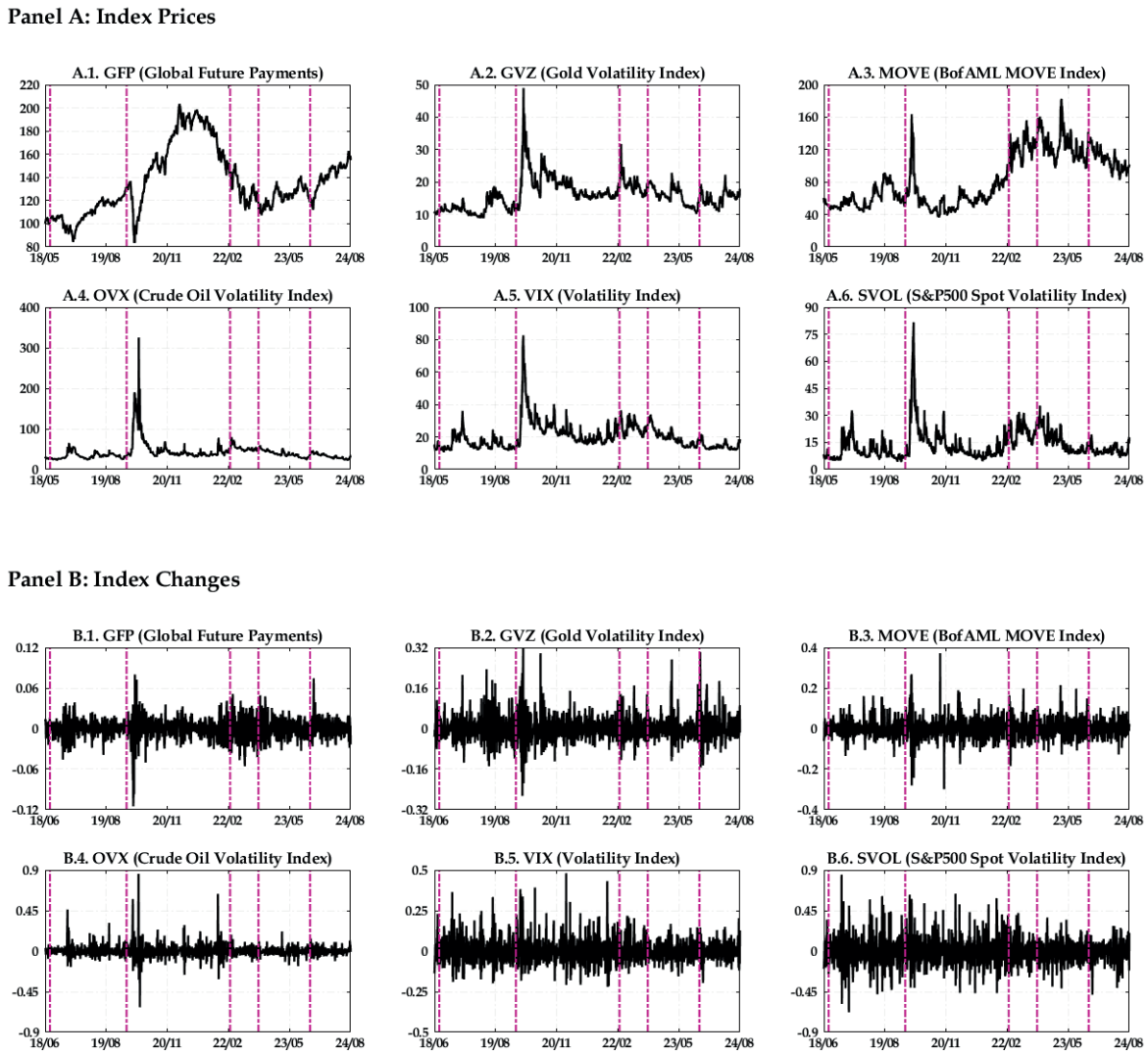


Figure 1: Time evolutions of the price and return series

Table 1 illustrates that all variables exhibit average growth rates, with SVOL and VIX posting the highest and lowest values, respectively. SVOL is the most volatile, followed by VIX index, whereas the GFP index displays the lowest volatility. GFP is significantly and negatively skewed, whereas the uncertainty indices have significantly positive skewness coefficients. Significantly positive excess kurtosis coefficients imply high peaks and extreme return observations for all variables, with OVX having a higher chance of positive returns. All variables strongly deviate from the normality assumption, are stationary, and exhibit strong evidence for autocorrelation and conditional heteroscedasticity up to the 20th lag. GFP significantly negative correlated with all uncertainty index changes throughout the sample period.

Table 1. Descriptive statistics and correlation estimations between sample returns

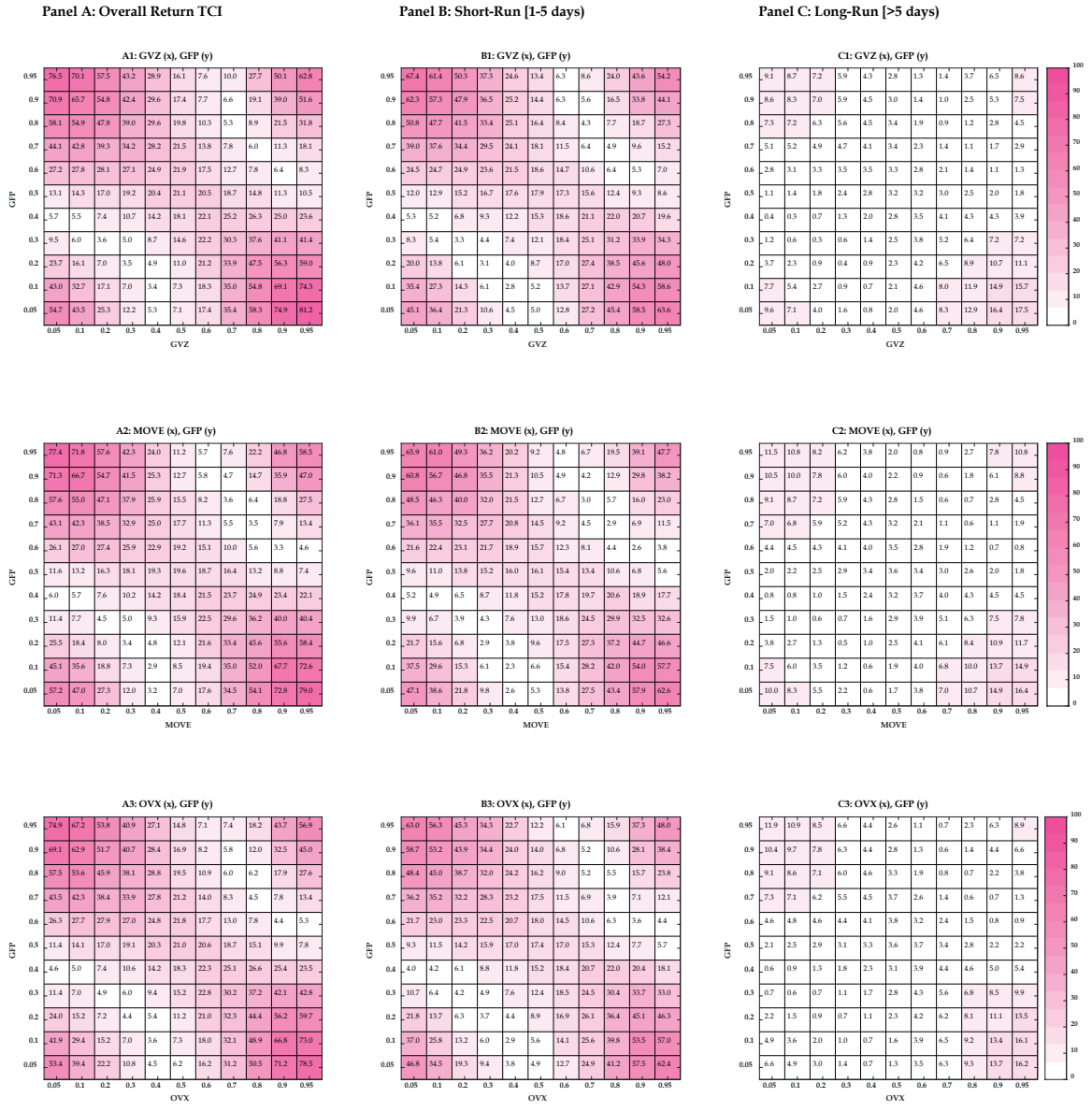
	GFP	GVZ	MOVE	OVX	VIX	SVOL
Panel A: Descriptive Statistics						
Mean	0.0285	0.0311	0.0339	0.0124	0.0121	0.0481
Variance	2.299	26.068	25.031	47.963	55.829	225.977
Skewness	-0.462***	0.941***	0.402***	2.105***	1.086***	0.433***
Kurtosis	5.183***	4.827***	5.638***	29.773***	4.127***	2.562***
JB	1772.846***	1716.441***	2074.079***	57827.974***	1391.151***	467.866***
ERS	-9.621***	-9.394***	-5.402***	-10.811***	-3.757***	-5.166***
Q(20)	31.095***	29.681***	72.902***	23.51***	15.256	41.691***
Q2(20)	828.454***	518.243***	233.101***	154.459***	108.392***	124.277***
Panel B: Kendall's Correlation Estimates						
GFP						
GVZ	-0.174***					
MOVE	-0.17***					
OVX	-0.214***					
VIX	-0.446***					
SVOL	-0.376***					

3. Empirical Findings

We illustrate the averaged quantile-on-quantile frequency return connectedness (QQC) findings, adopting a 200-day time-varying QVAR(τ_1, τ_2) model with a lag length of order 1, and a 20-step ahead forecast horizon, in Figure 1. In each panels, the magnitude of connectivity is represented by the color scheme; the darker (lighter) the shade, the stronger (weaker) the average total connectedness (TCI) is. Panel A depicts the QQC findings for GFP and five uncertainty indices over the bivariate spectrum on a grid of 11 quantiles [0.05; 0.95] for the entire period. We find noteworthy findings. First, the more intense shades in the corners demonstrate the dominance of return spillover shocks at extreme quantile combinations over normal quantiles. It implies that uncertainty index shocks impact GFP more during extreme market circumstances, such as downturns and upturns, than during moderate fluctuations. Second, the average return connectedness at reversely related quantiles $\left([\tau_1 = 0.05, \tau_2 = 0.95],\ldots,[\tau_1 = 0.95, \tau_2 = 0.05]\right)$ is more pronounced than that of directly related quantiles $\left([\tau_1 = 0.05, \tau_2 = 0.05],\ldots,[\tau_1 = 0.95, \tau_2 = 0.95]\right)$. Such a result elucidates the importance of employing a more capable approach to unraveling the complexity of global payments and uncertainty index connectivity when the negative correlation is more substantial. Third, the most prominent TCIs are observed at the intersection of the highest quantile of uncertainty indices (95%) and the lowest quantile of GFP (5%). This indicates that when the uncertainty in financial markets is at the highest level, a strong connectedness to the GFP's lowest performance quantile is evident. Global future payments are most vulnerable to VIX, followed by SVOL, whereas OVX influences it the least at the intersections of extreme positive and negative shocks.

Panels B and C further demonstrate the QQC findings over distinct frequencies, considering the heterogeneity in financial markets. Concerning the direction of co-movement, on the one hand, the short- and long-term results establish similar patterns to the entire period for five cases, emphasizing the presence of a negative correlation in both time frames. The effects of spillovers are notably more pronounced than the connectedness within directly related quantiles, where both quantiles of uncertainty indices and global future payments are either low or high, depending on the duration of the time frame. More particularly, inversely related quantiles demonstrate a greater degree of interconnectedness than directly related ones in the short and long run. On the other hand, the frequency-based connectivity

results clarify whether the overall connectivity is driven by high or low uncertainty levels. In the short run, the impacts of the lowest quantile of the uncertainty indices are more pronounced, whereas large positive shocks tend to substantially drive the long-term return network. In addition, the performance of uncertainty indices remains the same in the short run, with VIX ranking first and SVOL appearing to be second strongest, whereas SVOL–GFP constitutes the weakest return connectivity in the long run. The strongest connectivity appears when the degree of fear market participants is low (high), indicating minimal (maximum) volatility expectation for the prices of SPX index options with near-term expiration dates, there is a strongest interdependence to the GFP's highest (lowest) performance quantile in the short (long) run. Regarding the impacts of uncertainty in gold, U.S. Treasury, and oil markets on global future payments, we observe relatively weaker interconnections over frequencies. To illustrate, the least prominent TCIs within the reversely related quantiles is observed at the intersection of the highest quantile of OVX (95%) and the lowest quantile of GFP (5%), denoted by TCI values of 62.35 and 16.2, in the short and long run. Overall, the findings underline the importance of a frequency-based quantile-on-quantile quantile approach in complementing the dynamics of the nuanced and varied nature of the interconnectedness between global future payments and uncertainty indices, as traditional QQC and frequency connectedness approaches would fail to detect spillover effects under various market circumstances.



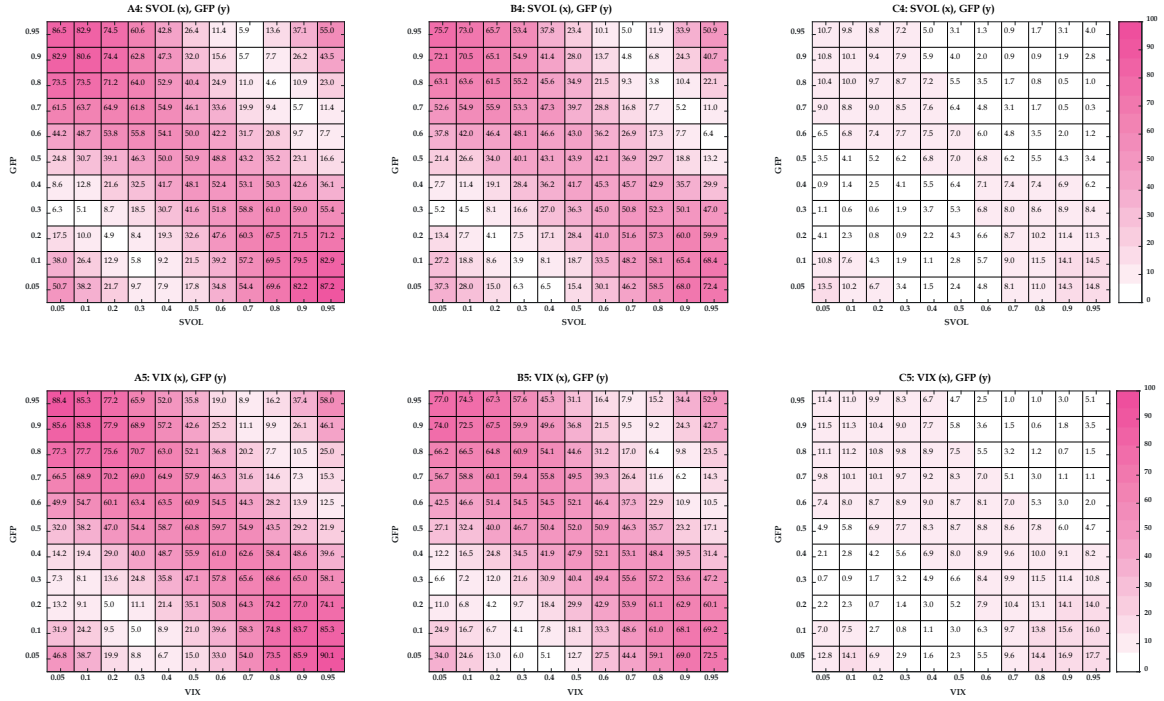


Figure 2: Overall quantile-on-quantile frequency-time connectedness

Note: This figure shows the total and net directional quantile-on-quantile frequency-time connectedness across different quantiles and over frequencies. The intensity of the violet-red color shows the strength of averaged total connectedness index at a specified quantile combination.

To enlighten the direction and magnitude of risk propagation over the bivariate spectrum and frequencies, Figure 3 illustrates the net FQQC results. Green (pink) cells with positive (negative) values demonstrate the role of shock transmitting (receivers) for the uncertainty index, with the shade of color representing the degree of spillovers, the deeper the color, the higher the shock propagation or reception. Panels A, B, and C underscore heterogenous risk propagation mechanisms for all cases and over timeframes. All uncertainty indices act as the net receivers of spillover shocks against the global future payment index, with OVX being the most vulnerable factor given a relatively higher percentage of negative values (91/30) across quantiles in the entire period. The impact of GFP on OVX is stronger at extreme lower and upper quantiles, indicating that GFP predominantly transmits shock to OVX during bearish and bullish circumstances. During both low and high levels of uncertainty in financial markets, five uncertainty indices evidently transmit shocks to GFP index, indicating heightened susceptibility of global future payments to shocks during extreme conditions. Regarding the magnitude of spillovers, VIX emerges as the most influential/sensitive index to the conditional distributions of global future payments. VIX receives (transmits) the strongest shocks of –4.5 (6.6) at the intersection of its 0.80 (0.95) and GFP's quantile of 0.95 (0.50). Panels B and C establish that all but GVZ factors assume the same role in the short run, being vulnerable to spillover shocks from GFP across quantiles, while an opposite picture emerges in the long run. As in the entire period, the oil market uncertainty, followed by VIX, appears to be most sensitive to global future payments in the short run, while the uncertainty in the SP500 index arises as the most influential factor in transmitting shocks to global future payment index in the long run. The intensified shades at the lower quantiles of uncertainty and upper quantiles of GFP index show that, particularly, SVOL and VIX have stronger net connectivity when the level of uncertainty is low. Overall findings underscore the need for a multidimensional method for identifying net return associations that vary drastically across quantiles and timeframes, given that focusing solely on one frequency would result in erroneous conclusions.

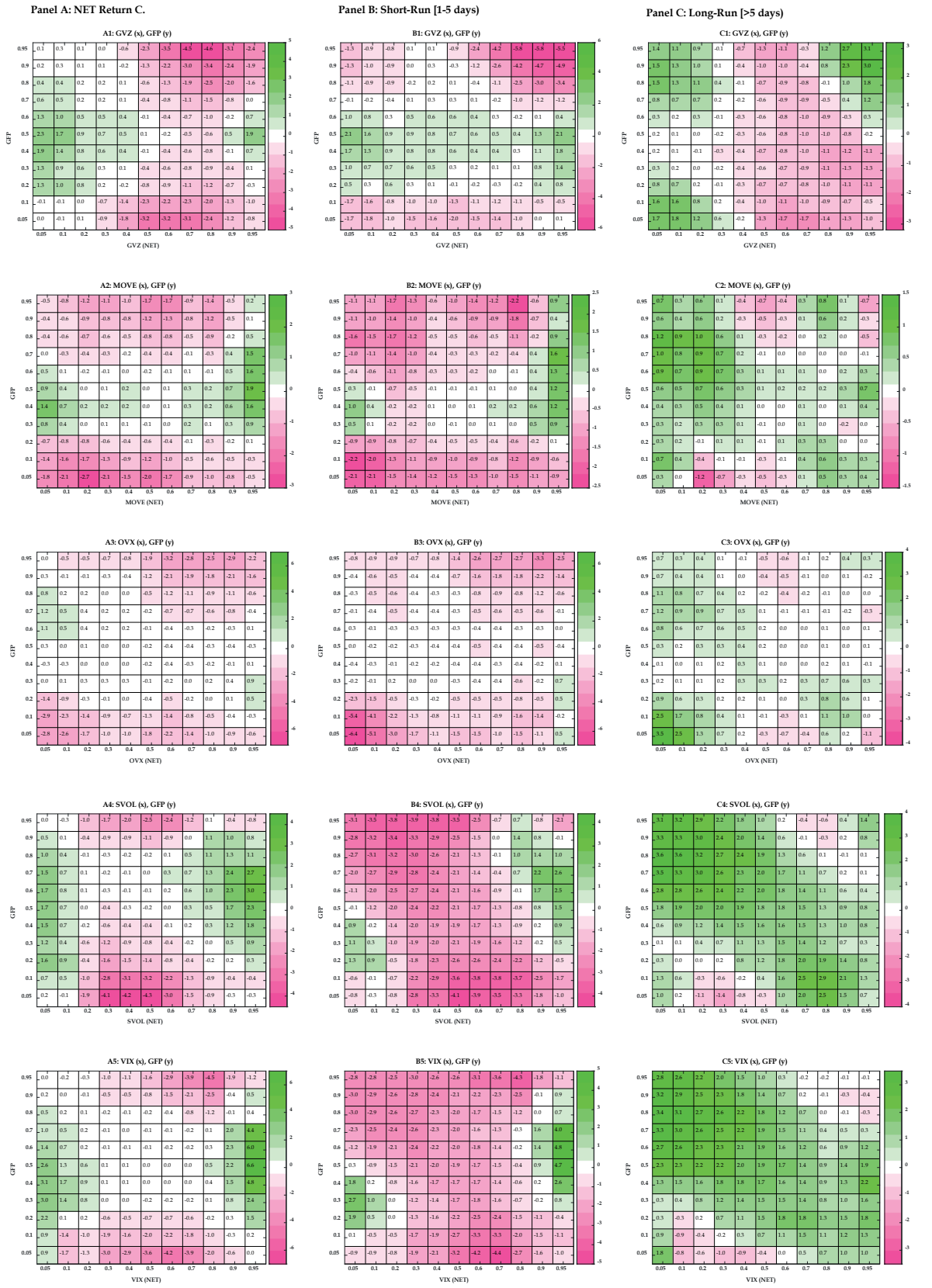


Figure 3: Net quantile-on-quantile frequency-time connectedness

Note: This figure shows the net directional quantile-on-quantile frequency connectedness across different quantiles and over frequencies. The green and violet-red colors represent a transmission and reception mechanism within a network. The positive (negative) value indicates that the uncertainty index (x-axis) acts as a net transmitter (receiver) of return shocks at a specified quantile combination and frequency.

4. Conclusions

In this paper, we investigate the return connectedness between global future payments and several uncertainty indices for the sample period 2018–2024 adopting our proposed quantile-on-quantile frequency connectivity model. This model enables researchers to determine the magnitude and intensity of spillovers across different and the same quantiles and over frequency, considering the heterogeneity in the behavior of financial market participants. The results establish that the reversely related quantiles have more prominent connectivity than directly related quantiles for all cases. The spillover shocks are driven by the heightened uncertainty and the lower level of global future payments for the entire period. The fear index and spot market volatility emerge as the most effective uncertainties triggering the fluctuations in global future payments, while the oil implied volatility is the least influential. The strength of interactions diminishes from high frequency to low frequency, i.e., the contribution of the short run dynamics is higher. In the short run, the low level of uncertainties exacerbated the spillovers shocks with the high level of future payments, while we observe a similar pattern to the entire period pattern in the long run. Global future payments predominantly transmit shocks to five uncertainty indicators in the entire period. In the short (long) run, only gold market volatility serve as the net transmitter (receiver) of shocks to (from) the global future payments.

Our results provide important ramifications for investors and policymakers. Regarding the policy-making perspective, on the one hand, policymakers must consider the heterogeneity in financial markets before taking the most appropriate policy actions for minimizing the spread of shocks on global future payments. Furthermore, they must recognize not just interactions between identical conditional distributions of growth rates, but also intersections of distinct quantiles. Actions should be taken to offset these impacts to ensure the stability and health of global future payment systems, embarking on with the most influencing uncertainty factors and progressing to the least. Conversely, investors should focus on the source of shock propagations from uncertainty factors on global payments and must weigh more the short-term dynamics given that spillover effects are temporary, not permanent. The absence of examination of the impacts of third factors necessitates more research.

References

Abakah, E. J. A., Adeabah, D., Tiwari, A. K., & Abdullah, M. (2023). Effect of Russia–Ukraine war sentiment on blockchain and FinTech stocks. *International Review of Financial Analysis*, *90*, 102948. https://doi.org/10.1016/j.irfa.2023.102948

Agur, I., Ari, A., & Dell'Ariccia, G. (2022). Designing central bank digital currencies. *Journal of Monetary Economics*, *125*, 62–79. https://doi.org/10.1016/j.jmoneco.2021.05.002

Aharon, D. Y., Demir, E., Lau, C. K. M., & Zaremba, A. (2022). Twitter-Based uncertainty and cryptocurrency returns. *Research in International Business and Finance*, *59*, 101546. https://doi.org/10.1016/j.ribaf.2021.101546

Asiri, A., Alnemer, M., & Bhatti, M. I. (2023). Interconnectedness of Cryptocurrency Uncertainty Indices with Returns and Volatility in Financial Assets during COVID-19. *Journal of Risk and Financial Management*, *16*(10), Article 10. https://doi.org/10.3390/jrfm16100428

Baruník, J., & Křehlík, T. (2018). Measuring the frequency dynamics of financial connectedness and systemic risk. Journal of Financial Econometrics, 16(2), 271-296. Doi: 10.1093/jjfinec/nby001.

Cheng, H.-P., & Yen, K.-C. (2020). The relationship between the economic policy uncertainty and the cryptocurrency market. *Finance Research Letters*, *35*, 101308. https://doi.org/10.1016/j.frl.2019.101308

Chiu, J., & Keister, T. (2022). The economics of digital currencies: Progress and open questions. *Journal of Economic Dynamics and Control*, *142*, 104496. https://doi.org/10.1016/j.jedc.2022.104496

Colon, F., Kim, C., Kim, H., & Kim, W. (2021). The effect of political and economic uncertainty on the cryptocurrency market. *Finance Research Letters*, *39*, 101621. https://doi.org/10.1016/j.frl.2020.101621

Cull, R., Foster, V., Jolliffe, D., Lederman, D., Mare, D. S., & Veerappan, M. (2023). *Digital Payments and the COVID-19 Shock*. https://documents.worldbank.org/curated/en/099454311132327828/pdf/IDU08c76166f0dda20435909e82051f6aa962419.pdf

Elsayed, A. H., Gozgor, G., & Yarovaya, L. (2022). Volatility and return connectedness of cryptocurrency, gold, and uncertainty: Evidence from the cryptocurrency uncertainty indices. *Finance Research Letters*, *47*, 102732. https://doi.org/10.1016/j.frl.2022.102732

Doostkouei, S., Naysary, B., Karimi, M. S., & Iesvand Heidari, A. (2024). Geopolitical Risk and Volatility Dynamics in Fintech Market. Babak and Karimi, Mohammad Sharif and Iesvand Heidari, Abdolreza, Geopolitical Risk and Volatility Dynamics in Fintech Market.

Gabauer, D., & Stenfors, A. (2024). Quantile-on-quantile connectedness measures: Evidence from the US treasury yield curve. Finance Research Letters, 60, 104852. doi: 10.1016/j.frl.2023.104852.

Ghaemi Asl, M., Rashidi, M. M., & Hosseini Ebrahim Abad, S. A. (2021). Emerging digital economy companies and leading cryptocurrencies: insights from blockchain-based technology companies. Journal of Enterprise Information Management, 34(5), 1506-1550.

Goldstein, I., Jiang, W., & Karolyi, G. A. (2019). To FinTech and Beyond. *The Review of Financial Studies*, *32*(5), 1647–1661. https://doi.org/10.1093/rfs/hhz025

Khando, K., Islam, M. S., & Gao, S. (2023). The Emerging Technologies of Digital Payments and Associated Challenges: A Systematic Literature Review. *Future Internet*, *15*(1), Article 1. https://doi.org/10.3390/fi15010021

Liu, J. (2024). Analyzing the Co-movement of FinTech market efficiency and oil Resource efficiency: An Input-Output study. *Resources Policy*, *90*, 104668. https://doi.org/10.1016/j.resourpol.2024.104668

Naysary, B., & Shrestha, K. (2024). Financial technology and ESG market: A wavelet-DCC GARCH approach. *Research in International Business and Finance*, *71*, 102466. https://doi.org/10.1016/j.ribaf.2024.102466

Oh, G. (2024). Multifractal analysis of Fintech market. *Journal of the Korean Physical Society*, *84*(11), 898–906. https://doi.org/10.1007/s40042-024-01066-y

Shaik, M., Rabbani, M. R., Nasef, Y. T., Kayani, U. N., & Bashar, A. (2023). The dynamic volatility nexus of FinTech, innovative technology communication, and cryptocurrency indices during the crises period. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(3), 100129. https://doi.org/10.1016/j.joitmc.2023.100129

Yousaf, I., & Goodell, J. W. (2023). Linkages between CBDC and cryptocurrency uncertainties, and digital payment stocks. *Finance Research Letters*, *54*, 103765. https://doi.org/10.1016/j.frl.2023.103765

Benford's Law in Auditing: Analysis of Sales Item in Bist Retail Sector

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Abstract

Sales are a critical indicator for companies operating in the retail sector, reflecting the primary source of revenue and the company's overall performance. A deviation from the expected Benford distribution in sales figures could potentially signal important issues that require further investigation. Such anomalies play a significant role in managers' and auditors' efforts to assess the company's financial health and shape management decisions.

Benford's Law is commonly utilized to detect potential irregularities in financial statements. As a statistical rule, Benford's Law states that the leading digits of naturally occurring numbers follow a specific distribution. When a deviation from this expected distribution in the leading digits is observed, it is often considered a sign that warrants a more detailed examination. Therefore, the application of Benford's Law in accounting audits plays a crucial role in maintaining financial integrity and reliability.

The aim of this study is to investigate whether the sales revenues of companies in the retail sector listed on Borsa Istanbul (BIST) conform to Benford's Law. The analysis examined 20 quarters of sales revenue data for ten retail companies from 2019 to 2023. The Chi-Square test was used to determine the conformity of the numerical distribution of sales revenues to Benford's Law.

The results indicate that the sales revenues of retail companies exhibit a distribution consistent with Benford's Law. This finding suggests that the sales revenues reported in the financial statements of BIST retail companies follow a natural distribution, with no signs of irregularities, errors, or manipulation. In this context, the findings support the financial transparency and reliability of retail sector companies as an important indicator.

Keywords: Audit, Benford's Law, Numerical Analysis, Borsa Istanbul, Retail Sector

1.INTRODUCTION

Financial statements provide critical information by accurately and reliably reflecting a company's financial performance. The transparency and accuracy of this information are essential for enabling various stakeholders, such as investors, creditors, and managers, to make sound decisions. However, financial statements may sometimes contain errors or deliberate manipulations. Detecting such issues is a matter of utmost importance for both company management and external auditors. At this point,

Benford's Law offers an effective method for analyzing the natural distributions of financial data. Benford's Law suggests that in naturally occurring sets of numbers, the leading digits follow a specific probability distribution. In large data sets, such as financial statements, deviations from this law can indicate potential fraud or errors. Analyzing whether financial statement items conform to Benford's Law can facilitate the early detection of anomalies, particularly in accounting and auditing processes (Nigrini, 2012; Gorenc, 2019).

The retail sector, being sales-oriented, relies heavily on sales figures as one of the most critical indicators of a company's financial success. This study examines the conformity of sales revenues reported in the financial statements of retail companies listed on Borsa Istanbul (BIST) to Benford's Law. The analysis covers the data of ten retail companies over 20 quarters between 2019 and 2023. To assess the conformity of the numerical distribution of sales revenues to Benford's Law, the Chi-Square test was applied.

While the use of Benford's Law to detect financial irregularities across various sectors is well-documented in the literature, studies focusing specifically on the retail trade sector remain limited. In this context, our study aims to identify potential anomalies in the financial statement items of companies in the sector and explore the impact of such anomalies on business management and auditing processes. The findings of this study may offer a new perspective for evaluating the accuracy of financial reporting in the retail sector and provide significant contributions to the literature in this area.

Within the scope of the research, the upcoming sections begin with a theoretical explanation of Benford's Law. In the literature review, studies examining the conformity of financial statement items to Benford's Law are summarized. Under the section titled "Data Set and Method," the details of the data set used in the analysis and the methodology applied are explained. In the following section, the findings obtained from the analysis are presented, and in the final part, the conclusions of the study are discussed.

2.BENFORD'S LAW

Benford's Law asserts that the leading digits of numbers follow a specific pattern of distribution and defines the expected frequency of these digits (Hill, 1995). Initially observed by Newcomb (1881) and later formalized by Benford (1938), their work provided the first statistical observations regarding the frequency of digits in number sequences. In Newcomb's study, he analyzed the usage rates of numbers in logarithmic tables and observed that the earlier pages of these tables, particularly those beginning with the digit "1," were more frequently used and thus more worn. This indicated that numbers starting with smaller digits appeared more often than those starting with larger digits. Similarly, in Benford's study, he examined the frequency of digits across different datasets and focused on the usage of logarithmic tables. By calculating the frequency distributions and averages of 20,229 samples, he analyzed the occurrence of digits in number sequences. This research laid the foundation for what is now known as Benford's Law.

Benford's Law is based on the probability of digits appearing in the leading positions of numbers. In base-10 systems, the probability of any digit from 1 to 9, denoted as "d_1," being the first digit of a number is given by the formula shown in equation (1) (Benford, 1938):

$$P(d_1) = \log\left(1+\frac{1}{d_1}\right); d_1 = (1,2,3,4\ldots9) \quad (1)$$

The "first digit" referred to here is the significant leading digit, which is the first non-zero digit of a number. According to the formula mentioned above, the frequency of occurrence of each digit as the first digit can be calculated using Benford's Law:

The probability of the first digit being 1 is:; $\log\left(1+\frac{1}{1}\right)=0,30103$ (2)

The probability of the first digit being 2 is:; $\log\left(1+\frac{1}{2}\right)=0,17609$ (3)

The probability of the first digit being 3 is:; $\log\left(1+\frac{1}{3}\right)=0,12493$ (4)

The probability of the first digit being 4 is:; $\log\left(1+\frac{1}{4}\right)=0,09691$ (5)

The probability of the first digit being 5 is: $\log\left(1+\frac{1}{5}\right)=0,07989$ (6)

The probability of the first digit being 6 is: $\log\left(1+\frac{1}{6}\right)=0,06695$ (7)

The probability of the first digit being 7 is: $\log\left(1+\frac{1}{7}\right)=0,05799$ (8)

The probability of the first digit being 8 is: $\log\left(1+\frac{1}{8}\right)=0,05115$ (9)

The probability of the first digit being 9 is:; $\log\left(1+\frac{1}{9}\right)=0,04576$ (10)

The probability distribution for the second digit of a number can be calculated using the following formula, as given in Equation (11):

$$P\left(d_2\right)=\log\left(1+\left(d_1 d_2\right)-\log\left(\left(d_1 d_2\right);d_2=\left(1,2,3,4\ldots 9\right)\right.\right. \quad (11)$$

Benford's Law not only assesses the distribution of the first digit but also allows for the analysis of the distribution of digits at each position separately. According to this law, as we move from left to right through the digits of a number, the probabilities of encountering each digit gradually converge. In other words, the probabilities of each digit appearing in the second, third, and fourth positions, as we move further to the right, increase slightly in comparison to the previous positions, though the differences become less pronounced.

Benford's Law relies on comparing observed numerical distributions with expected distributions to assess the accuracy of a dataset. This theory helps detect anomalies by examining the frequency of digits and is particularly useful in identifying potential errors or fraud. It is especially applicable in large datasets, such as those used for auditing purposes. However, Benford's analysis may not be suitable for all datasets. A dataset must meet certain characteristics to be appropriate for this type of analysis (Nigrini, 2012).

- The events should define similar magnitudes. For example, in financial data, there should be data on similar scales, such as market shares or revenues of businesses.
- The data should be expressed in the same unit. The analysis should be conducted using a common unit of measurement.
- It is important that the maximum and minimum values are not excessively different from each other.

- General data should be preferred over specific numbers. For instance, general revenue or market share data should be used, rather than specific numbers like identification numbers or bank account numbers.
- The dataset should consist of smaller items containing more data rather than large items with less data.

3.LITERATURE REVIEW

In the literature review on this topic, studies focusing on the gross sales account of companies listed on stock exchanges have been examined. It has been observed that studies focusing on the compliance of retail companies' financial statement items with Benford's Law are limited in number. In this section, some studies where companies' sales revenues were analyzed using Benford's Law are summarized, which could serve as a basis for comparing the findings of this study.

One of the pioneering studies in this area is Carslaw's (1988) work, which examines the numerical distributions of the sales account of 220 companies listed on the New Zealand Stock Exchange between 1981 and 1985. The results of this study revealed that the sales amounts contained an unexpectedly high number of zeros, and that the second digit contained fewer instances of the number nine than expected, indicating a deviation from Benford's Law in the sales figures. In the study by Aybars and Ataünal (2016), which applies Benford's Law to the financial statements of Borsa Istanbul (BIST) companies, the numerical distributions of net sales for 148 companies from 2005 to 2015 were examined. The results indicated that the sales figures were in compliance with Benford's Law. Jianu and Jianu (2021) focused on companies listed on the Bucharest Stock Exchange in Romania and analyzed the numerical distributions of sales revenue items for 72 companies between 1996 and 2017. The study found that these sales figures did not comply with Benford's Law. In the study by Can and Özarı (2023), which focused on companies in the BIST-30 index (excluding banks) for the period 2016-2022, it was found that gross sales, sales revenues, and the cost of goods sold all complied with Benford's Law.

This literature review shows that no studies have specifically examined the compliance of the sales revenue account of retail companies in Turkey with Benford's Law. However, similar studies in the international literature have garnered attention. This research examines the compliance of the gross sales account in the financial statements of retail companies listed on Borsa Istanbul with Benford's Law, and it is believed that this study will contribute to the literature in this regard..

4.DATA SET AND METHOD

In this study, the compliance of the sales revenue items in the financial statements of companies listed on the BIST Retail Trade Index between 2019 and 2023 with Benford's Law is evaluated. The data set for this study consists of the sales revenue of ten retail companies (BIM, BIZIM, CRFSA, CASA, MAVI, MEPET, MGROS, SOKM, TKNSA, and VAKKO) across 20 quarterly periods. For Benford's Law to provide a valid comparison, it is recommended that data sets contain at least 100 observations (Singleton, 2011). In this context, the number of observations used in this study is 200, ensuring that an appropriate data size is used for the Benford analysis.

To statistically evaluate the compliance of the financial statement data with Benford's Law, the Chi-Square test is commonly employed (Özevin et al., 2019). The Chi-Square test is used to assess how well random numerical distributions fit a specific theoretical distribution (Pearson, 1900). Therefore, in this analysis, the Chi-Square test has been chosen. The formula used to calculate the difference between the expected and observed values in the Chi-Square test is provided below.

$$x^2 = \sum_{i=1}^{9} \frac{\left(Pg,i - Pb,i\right)^2}{Pb,i} \qquad (12)$$

In this formula:

P g,i: Observed frequency for digit

P b,i: i Expected frequency for digit

To investigate whether the numerical distribution of sales revenue in the financial statements follows Benford's Law, the following hypotheses have been established for the Chi-Square goodness-of-fit test:

- H_0: There is no difference between the observed numerical distribution and the expected values according to Benford's Law.
- H_1: There is a difference between the observed numerical distribution and the expected values according to Benford's Law.

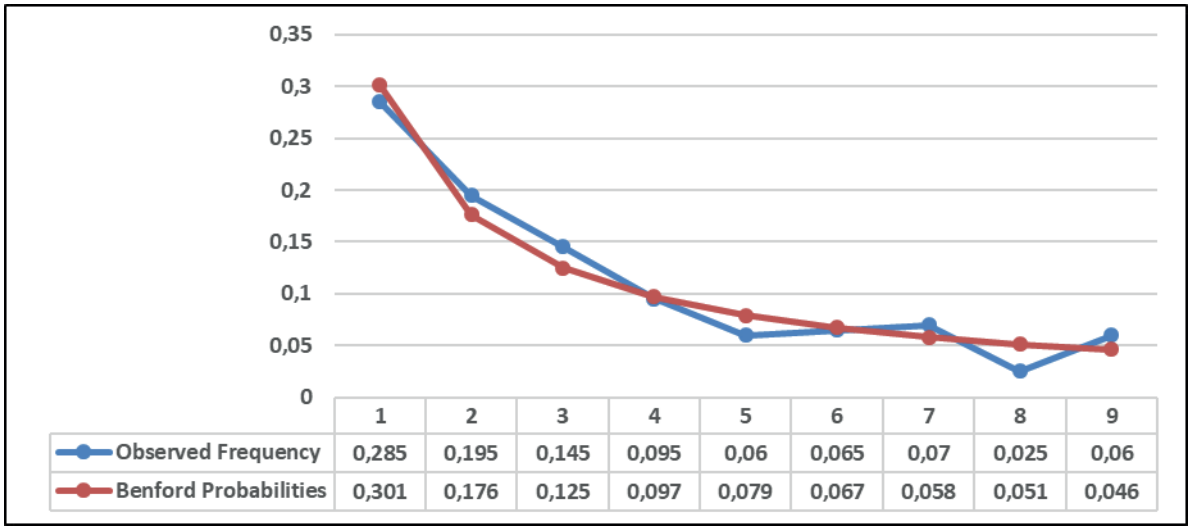
For the Chi-Square test, the degrees of freedom for the first digit are calculated as

$, v = r - 1 = 9 - 1 = 8$. With a significance level of 0.05, the critical value for the Chi-Square test in the first digit analysis is calculated as 15.507. If the Chi-Square test statistic exceeds this value, the null hypothesis (H_0) will be rejected.

Through Benford's Law, deviations from the expected distribution can be detected by defining the expected distributions of a given financial data set. If the frequency distribution of digits in the sales revenue item of the financial statement does not align with Benford's Law, it suggests that there is a discrepancy in the numerical data, indicating a deviation from the natural distribution.

5.DATA ANALYSIS AND FINDINGS

In the analysis process, the compliance of the sales revenue distributions of companies in the BIST retail sector from 2019 to 2023 with Benford's Law was examined using the Chi-Square test. Before delving into the Chi-Square analysis, the observed frequency rates for the sales revenue items of retail companies and the first-digit reference distribution rates according to Benford's Law can be examined in Figure 1.



	1	2	3	4	5	6	7	8	9
Observed Frequency	0,285	0,195	0,145	0,095	0,06	0,065	0,07	0,025	0,06
Benford Probabilities	0,301	0,176	0,125	0,097	0,079	0,067	0,058	0,051	0,046

Figure 1: Observed Frequency Rates and Benford's Law First-Digit Probabilities

When examining Figure 1, which shows the observed frequency rates for the financial statement items, it can be seen that the observed data for the sales revenues of the retail companies closely align with the first-digit probabilities of Benford's Law. However, whether the deviations in the observed values are statistically acceptable can be determined based on the results of the Chi-Square test.

The results of the Chi-Square test, which was conducted to test the conformity of the numerical distributions of sales revenues for BIST retail companies during the 2019-2023 period with Benford's Law, can be found in Table 2.

Table 2: Chi-Square Test Results

Digits	Observed Values	Frequency Ratio	Expected Values	Benford Probabilities	Proportional Absolute Difference	Absolute Difference	Chi-Square
1	57	0.285	60.2	0.301	0.016	3.2	0.170
2	39	0.195	35.2	0.176	0.019	3.8	0.410
3	29	0.145	25.0	0.125	0.020	4.0	0.640
4	19	0.095	19.4	0.097	0.002	0.4	0.008
5	12	0.060	15.8	0.079	0.019	3.8	0.914
6	13	0.065	13.4	0.067	0.002	0.4	0.012
7	14	0.070	11.6	0.058	0.012	2.4	0.497
8	5	0.025	10.2	0.051	0.026	5.2	2.651
9	12	0.060	9.2	0.046	0.014	2.8	0.852
Total	200	1	200	1	0.13	26	6.154

When examining the Chi-Square test results in Table 2, it is observed that the Chi-Square statistic values for the sales revenue item are smaller than the first-digit critical value of 15.507. In this context, it has been determined that the numerical distributions of sales revenues for the retail companies fall below the conformity threshold of Benford's Law. This indicates that the figures in the sales revenue item of the financial statements of the retail companies follow a natural distribution. Therefore, the null hypothesis (H0), which assumes that the sales revenue data conform to Benford's Law, is statistically accepted.

6.CONCLUSION

In this study, the conformity of the sales revenue item of retail companies listed on Borsa Istanbul during the 2014-2023 period to the first-digit probabilities of Benford's Law was examined. As a result of the analysis, it was found that the sales revenue accounts of retail companies showed a distribution consistent with Benford's Law. This finding indicates that the sales revenue figures in the financial statements of BIST retail sector companies exhibit a natural distribution, thus showing no signs of irregularities, errors, or manipulation. Conformity with Benford's Law can be regarded as an indicator supporting the financial transparency and reliability of retail companies.

The results obtained are in line with the findings of the studies by Aybars and Ataünal (2016) and Can and Özarı (2023) in the Turkish literature. In these studies, the conformity of the sales revenue item of retail companies to Benford's Law was also verified. However, in the study by Jianu and Jianu (2021) on the Bucharest Stock Exchange in Romania, a different result was obtained, and it was found that sales revenues did not conform to Benford's Law. Such differences suggest that market structures and economic conditions, which vary across countries, may have an impact on conformity with Benford's Law.

In conclusion, this analysis of sales revenue shows that the conformity of retail companies listed on Borsa Istanbul to Benford's Law is an important indicator of transparency and accuracy in their financial reporting, and it is consistent with similar studies in the literature. In the future, expanding similar analyses for the retail sector to cover different periods, conducting international comparisons, and researching the conformity of other financial items to Benford's Law could contribute to the literature in this field. Additionally, broader analyses at the sectoral level, including international comparisons and Benford conformity in different sub-sectors, can be addressed. Such research could contribute to financial analysis methods in the sector and help investors make more informed decisions.

REFERENCES

Aybars, A., & Ataunal, L. (2016). An application of Benford's law to fundamental accounting figures reported by Borsa Istanbul (BIST) companies. Journal of Economics, Finance, and Accounting, 3(3), 234-243. https://doi.org/10.17261/Pressacademia.2016321991

Benford, F. (1938). The law of anomalous numbers. American Philosophical Society, 78(4), 551-572.

Can, E., & Özarı, Ç. (2023). Conformity of some financial statement elements of BIST30 companies with the Benford law. Mali Çözüm Dergisi, 33(177), 773-806.

Carslaw, C. (1988). Anomalies in income numbers: Evidence of goal-oriented behavior. The Accounting Review, 63(2), 321-327.

Gorenc, M. (2019). Benford's law as a useful tool to determine fraud in financial statements. Management, 14, 19-31. http://dx.doi.org/10.26493/1854-4231.14.19-31

Hill, T. P. (1995). A statistical derivation of the significant-digit law. Statistical Science, 10, 354-363. https://doi.org/10.1214/ss/1177009869

Jianu, I., & Jianu, I. (2021). Reliability of financial information from the perspective of Benford's law. Entropy, 23(5), 557. https://doi.org/10.3390/e23050557

Newcomb, S. (1881). Note on the frequency of use of different digits in natural numbers. American Journal of Mathematics, 4, 39-40. https://doi.org/10.2307/2369148

Nigrini, M. (2012). Benford's law: Applications for forensic accounting, auditing, and fraud detection. Hoboken, NJ: Wiley.

Özevin, O., Yücel, R., & Öncü, M. A. (2020). Fraud detecting with Benford's law: An alternative approach with BDS and critic values. Muhasebe Bilim Dünyası Dergisi, 22(1), 107-126. https://doi.org/10.31460/mbdd.609957

Pearson, K. (1900). On a criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. Philosophical Magazine, 5(50), 157–175. https://doi.org/10.1080/14786440009463897

Singleton, T. W. (2011). IT audit basics: Understanding and applying Benford's law. ISACA Journal, 3(6). Retrieved from https://www.isaca.org/ Accessed on 24.08.2024.

Understanding Factors Influencing Teacher Turnover in Indian Schools

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Abstract

Teacher turnover is a critical issue affecting educational institutions worldwide, including schools in India. High turnover rates can have detrimental effects on student learning outcomes, school effectiveness, and organizational stability. This article explores the factors contributing to teacher turnover in Indian schools, drawing insights from empirical research, policy analysis, and practitioner perspectives. By examining the multifaceted dimensions of teacher turnover, including job satisfaction, compensation, professional development, working conditions, and administrative support, this study seeks to provide a comprehensive understanding of the challenges and opportunities for retaining talented educators in the Indian context. Additionally, the article discusses implications for educational policy, leadership, and practice aimed at mitigating turnover and promoting a stable and thriving teaching workforce.

Key Words; Faculty Turn over Ratio, Challenges and Ways to Solve problems

Introduction:

Teacher turnover is a pervasive issue in the Indian education system, with significant implications for student learning and school performance. High rates of turnover disrupt continuity, undermine instructional quality, and contribute to the erosion of institutional knowledge and culture. Despite the growing recognition of the importance of teacher retention, many schools in India struggle to retain skilled and experienced educators. This article aims to explore the factors driving teacher turnover in Indian schools, shedding light on the complex interplay of individual, organizational, and systemic factors influencing educators' decisions to leave the profession.

Factors Influencing Teacher Turnover:

Job Satisfaction: Research suggests that job satisfaction is a critical determinant of teacher turnover. Teachers who are dissatisfied with their workload, compensation, professional development opportunities, and working conditions are more likely to leave their positions.

Compensation and Benefits: Inadequate salary scales, limited benefits, and disparities in compensation across schools contribute to dissatisfaction among educators. Many teachers in India face financial challenges that impact their decision to stay in the profession.

Professional Development: Opportunities for professional growth and advancement are essential for retaining skilled teachers. Lack of access to high-quality professional development programs and limited career advancement prospects can lead to stagnation and disillusionment among educators.

Working Conditions: Poor working conditions, including overcrowded classrooms, inadequate facilities, and administrative burdens, contribute to teacher stress and burnout. Schools with challenging working environments often experience higher turnover rates.

Administrative Support: Effective leadership and administrative support are crucial for teacher retention. Schools that provide clear communication, supportive supervision, and opportunities for collaboration are more likely to retain their staff.

Work-Life Balance: Maintaining a healthy work-life balance is essential for teacher well-being and job satisfaction. Excessive work demands, long hours, and lack of flexibility can strain educators' personal lives and contribute to turnover.

Career Opportunities: Teachers seek opportunities for career advancement and professional growth. Schools that offer pathways for leadership roles, specialized training, and recognition of expertise are better positioned to retain talented educators.

Implications for Policy and Practice:

Addressing teacher turnover requires a multifaceted approach that addresses systemic inequities, enhances working conditions, and prioritizes teacher support and professional development. Educational policymakers, school leaders, and stakeholders must collaborate to implement strategies aimed at improving teacher retention, including:

- Investing in competitive compensation packages and benefits for educators.
- Providing comprehensive professional development opportunities aligned with teachers' needs and aspirations.
- Creating supportive work environments that prioritize teacher well-being and collaboration.
- Strengthening leadership capacity and administrative support structures within schools.
- Implementing policies to promote work-life balance and mitigate teacher stress and burnout.
- Fostering a culture of appreciation and recognition for teachers' contributions to student learning and school improvement.

Ways to Resolve the Problem of Faculty Turn over Ratio

Addressing faculty turnover in schools requires a comprehensive approach that considers various factors contributing to turnover and implements targeted strategies to mitigate its effects. Here are several ways to solve problems related to faculty turnover ratio in schools:

Competitive Compensation and Benefits:

Ensure that teachers receive competitive salaries and benefits packages that align with industry standards and reflect their qualifications and experience. Offer additional incentives such as performance bonuses, professional development stipends, and opportunities for career advancement.

Supportive Working Conditions:

Create a positive and supportive work environment that values collaboration, innovation, and professional growth.

Provide teachers with adequate resources, including instructional materials, technology tools, and classroom supplies, to facilitate effective teaching and learning.

Address issues related to workload, class sizes, and administrative burdens to reduce stress and burnout among faculty members.

Professional Development Opportunities:

Offer ongoing professional development programs that address the evolving needs of teachers and align with school goals and priorities.

Provide opportunities for teachers to participate in workshops, conferences, seminars, and online courses to enhance their skills, knowledge, and instructional practices.

Support teachers in pursuing advanced degrees, certifications, and specialized training relevant to their subject areas and professional interests.

Leadership and Management Support:

Cultivate strong leadership at all levels of the school, including administrators, department heads, and team leaders, who are committed to supporting and empowering faculty members.

Foster open communication, transparency, and trust between school leadership and faculty to address concerns, solicit feedback, and collaboratively solve problems.

Provide mentorship and coaching programs to help new teachers acclimate to the school culture and navigate the challenges of the profession.

Recognition and Appreciation:

Recognize and celebrate the contributions and achievements of teachers through awards, commendations, and public acknowledgments.

Create opportunities for peer recognition and appreciation within the school community to foster a culture of gratitude and mutual respect.

Solicit input from faculty members on ways to improve recognition and appreciation initiatives to ensure they are meaningful and impactful.

Work-Life Balance and Wellness Programs:

Promote work-life balance by offering flexible scheduling options, telecommuting opportunities, and family-friendly policies that accommodate the diverse needs of faculty members.

Implement wellness programs and initiatives that prioritize the physical, emotional, and mental well-being of teachers, including mindfulness practices, stress management workshops, and access to counseling services.

Encourage healthy lifestyle habits, such as regular exercise, nutrition education, and mindfulness activities, to support teachers in maintaining optimal health and vitality.

Exit Interviews and Feedback Mechanisms:

Conduct exit interviews with departing faculty members to gather insights into their reasons for leaving and identify areas for improvement.

Use feedback mechanisms, such as surveys, focus groups, and suggestion boxes, to solicit input from current faculty members on ways to enhance job satisfaction, morale, and retention.

Act on feedback and recommendations from faculty members to address systemic issues, improve organizational culture, and strengthen retention efforts over time.

By implementing these strategies, schools can create a supportive and nurturing environment that values and retains talented faculty members, ultimately enhancing educational outcomes and fostering a culture of excellence and innovation.

Conclusion:

Teacher turnover remains a significant challenge facing Indian schools, with far-reaching implications for educational quality and student outcomes. By understanding the factors influencing turnover and implementing targeted interventions to address systemic barriers, educational stakeholders can create supportive environments that attract and retain talented educators. The retention of skilled teachers is essential for advancing educational equity, promoting student achievement, and building a thriving education system in India.

References:

Chattopadhyay, S., & Tripathi, P. M. (2018). Factors influencing teachers' job satisfaction and turnover intention: A theoretical model. IIMB Management Review, 30(4), 307-320.

Nambissan, G. B. (2016). Teaching in rural India: A reality check. Prospects, 46(2), 213-230.

Pandey, R., & Nayak, B. B. (2018). Factors affecting teacher attrition: A study of government schools in India. International Journal of Educational Development, 62, 294-302.

Rajvanshi, A. (2020). A study of factors influencing job satisfaction and turnover intention among teachers in private schools of India. International Journal of Research and Analytical Reviews, 7(3), 141-149.

Singh, A., & Mehta, S. (2019). An empirical study on teacher turnover intention: An investigation of public sector schools in India. Journal of Educational Administration, 57(6), 672-690.

A Comparative Analysis of Mean Scores among Male and Female School Teachers

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Abstract

The process of education is shaped and made by the teachers who play a pivotal role in web of educational system. Teaching characteristically is a moral enterprise and its function is aimed at guiding and working desirable growth in others. The need to know more about teacher and teaching stems not only from the commonness of the phenomenon, but also from the realization that our notion of teacher and teaching guides our future endeavors. There is a dearth of empirical evidence about the attitude of teachers towards their profession. Quantitative research methodology was deployed using descriptive design. The study included 200 pre and in-service elementary school teachers for which representative were given to pre and in service teachers and both genders. The participants included 90 male and 110 female teachers. Two research instruments teachers' questionnaire regarding homework practices and home assessment analysis mean score checklist, were developed and used on the bases of four factor planning, assigning, feedback and advantages of homework. It was concluded that the female teachers were better mean score in planning, assigning and evaluation of homework than the male teacher.

Keywords:-Homework, Planning, Assigning, Feedback

INTRODUCTION

Education is a common phenomenon in all societies of the world; so common that almost everyone beyond the age of four or five has been involved in it. It is only education, which is instrumental in bringing about the desired and required changes in the social and cultural setup of any society necessary for its maintenance. The process of education is shaped and made by the teachers who play a pivotal role in web of educational system. Teaching characteristically is a moral enterprise and its function is aimed at guiding and working desirable growth in others. The need to know more about the teacher and teaching stems not only from the commonness of the phenomenon, but also from the realization that our notion of teacher and teaching guides our future endeavors.

Psychologists and educationists emphasize that positive or favorable attitude towards any profession facilitates and improves the performance, while negative attitude produces hindrance. Positive attitude means, that the individual is willing and has readiness to perform certain work. Readiness develops to develop interest, and motivates the individuals to make efforts for proper and successful performance of a particular work. Considerable opinion is expressed and many studies have been under taken to

explore a better understanding of teachers' attitude towards their profession; what they think and feel of their profession and what teaching means to them. This could include an opportunity to meet socio economic needs, a job they are drifted into, a profession freely chosen, or a committed way of life with the hope for the future generation. The response to such questions, positive or negative is of great significance. It is the moral and social significance of teaching profession that complete education its and researchers focus chiefly on the teachers and teaching. Educators share that it is vital for consider the traits, behaviors, attitudes, values, abilities, sex, weight, voice, quality and many other characteristics of the teachers. Teachers' attitudes, their nature and genesis, their cultivation and identification and their evaluation constitute the core concern for any society. Not only for the teacher training institutions and schools, but also for the society at large and it depends on teachers to a very great extent for the propagation of accumulated knowledge and cultural values.

Teachers consider the different purposes of designing and assigning of homework, however it is revealed from the research that there are two main purposes of homework e.g. instructional purpose and non-instructional purpose. Instructional purposes of assigning homework, mostly focused by teachers for practice and revision so that the students can get the mastery of learnt material. It is also assigned for introduction and preparation of lesson that would be discussed in future in the class. Another important purpose of assigning homework is that the student can get the chance to apply previously learnt skill to the new situation or to solve real life problem and making them accountable. Purpose of extension assignment is to develop higher order thinking skill in students and related to application of previously learnt knowledge.

OBJECTIVES

1. To study pre and in-service elementary school teachers towards inclusive education.
2. To study urban and rural school teachers' attitude towards inclusive education.
3. To study the difference between male and female teachers' attitude towards inclusive education working in secondary schools.
4. To study the difference between pre and in-service elementary school male and female teachers' attitude towards inclusive education working in private secondary schools.

METHODOLOGY

This was a descriptive research, which focuses on providing an accurate description of the attitude of teachers towards teaching profession. This particular approach was chosen as the study primarily sought to describe and understand the pre and in service teachers' attitude towards their profession. Additionally, to collect empirical evidence in the subject area, a descriptive research design was considered most appropriate to gather accurate information about the phenomenon; therefore, a survey type study was preferred.

Due to unavailability of appropriate instrument for assessment of homework in the context of schools, two research instruments were developed after reviewing the literature; one was questionnaire for homework practices of junior teachers and other was a checklist for was developed in English and Urdu including the factors; planning of homework, assigning of homework, type of teacher feedback about homework and benefits of homework. The questionnaire contained 29 items, 9 items were for the planning of homework, 3 items for assigning responses; items 1 to 20 based on five-point rating responses i.e. never to always while items 21 to 27 were based on Likert scale responses from strongly disagree to strongly agree. The reason for this difference is that some items were opinion based and some were behaviour based.

homework, 9 items for type of teacher's feedback about homework and 8 items for benefits of homework. Each item consisted of a stem with scale

The second tool was the Homework Assessment Analysis Checklist which contained rubrics to explain the criteria for assessment of homework assignment, checking of written work in class and quality of feedback. This checklist contained total 17 items. First three items based upon Yes/ No responses and items from 4 to 17 were based upon the most of the time (2 to 3 times in a week), sometime (2 to 3 times in 15 days) and almost none (2 to 3 times in a month). Both the instruments were validated through five educationists having PhD in Education with experience of ECE area for face and construct validity. The questionnaire was piloted on 50 teachers and 67 notebooks were observed for pilot testing. The reliability Coefficient Chronbach Alpha of questionnaire was 0.84 which was good.

DATA COLLECTION

The data were collected through personal visits to 10 selected urban and rural secondary schools. Respondents were briefed about research and conveyed that all the collected information will only be used for research purposes only.

Data collected through research tools e.g. Teachers questionnaire regarding homework practices and students' homework assessment analysis checklist were tabulated and analysed by using mean, median and SD.

Data collected through research tools e.g. Teachers' questionnaire regarding homework practices and students' homework assessment

RESULT AND DISCUSSION

Analysis of Teachers' Questionnaire

The data obtained from questionnaire of teachers regarding homework practices were treated statistically by calculating the means of all variables.

Table 1: Descriptive Statistics of Teachers' Questionnaire

Questions	Min	Max	Mean	SD
Planning of Homework	**Weighted Mean = 3.6**			
Students revise material covered in class	1	6	4.32	.648
Students may practice the skill learnt in school	1	6	4.03	.721
Students memorize and retain information	2	6	4.23	.887
Students prepare for future lesson.	1	6	3.12	.895
Students learn to collaborate with one another.	1	6	3.22	.918
You explain the purpose of homework to students	1	6	3.47	1.02
Plan homework according to individual needs	1	6	2.9	1.07
Plan homework according to learning styles of students	1	6	2.51	1.17
Questions	**Min**	**Max**	**Mean**	**SD**
Assigning Homework	**Weighted Mean = 3.78**			
You assign homework to punish students.	1	6	3.90	.892
You assign homework because it is the part of school policy.	1	6	4.02	.903
You assign verbal homework.	1	6	4.33	.712
Questions	**Min**	**Max**	**Mean**	**SD**
Feedback about homework	**Weighted Mean = 3.92**			
You mark the homework in the same day.	1	6	4.07	.921
You provide feedback to students.	1	6	3.89	.934
You provide students written comment on their homework.	2	6	3.87	.843
You provide students verbal comment on their homework.	2	6	3.12	.792
You discuss assigned homework to all students.	1	6	2.95	1.02
You count assigned homework in final grade of the students.	1	6	3.21	1.08
You focus on correction in your feedback.	1	6	3.96	.921

Table 2: Comparison of mean score of male and female teachers regarding homework practices

Gender	N	Mean	SD
Male	63	115.94	13.46
Female	87	129.46	11.89

DISUSSION

On analysing the data it is clear that two groups i.e. the teachers of urban and rural secondary schools differ significantly on their homework practices towards inclusive education. A significant difference of the mean scores of attitude of teachers towards inclusive education was found between the urban and rural secondary school teachers. The mean score of homework of teachers towards inclusive education, working in secondary schools situated in urban area was found to be greater than the mean score of attitude of teachers towards inclusive education, working in secondary schools located in rural area. Thus from the conformation of the result from the above table, it is clear that the urban school teachers were found having a little more favourable attitude towards inclusive education. The reason behind that the urban school teachers may be more considerate towards inclusive education than the rural school teachers.

RECOMMENDATIONS

Following recommendations were drawn from the findings and conclusions of the study:

1. The research found that the teachers assigned homework that is not well planned and designed, and mostly for the sake of revision and memorization. It is recommended that teachers should assign well-planned and well-designed homework assignment at elementary level so that the students can get maximum benefits of it.
2. The teachers should incorporate constructive and affective feedback strategies while assessing the homework.
3. The curriculum developers and content writers may incorporate the innovative and creativity based homework assignment to apply learnt skill in real life situation in the textbooks and provide hint and clues to the teachers how to assess and evaluate such type of assignment.
4. In-service and pre-service teachers training may be provided regarding homework assignment and assessment to enhance potential use homework in teaching learning practices.
5. Future studies may be conducted on culturally diverse and large sample for more comprehensive and generalized results.
6. A study may be conducted to know the effectiveness of pre-service and in-service teacher education in order to develop positive attitudes towards inclusive education.
7. Attitude plays a significant role in selecting a job of teaching. A similar study may be conducted to know the pros and cons of different attitude of teachers towards inclusive education.

CONCLUSION

Following conclusion was drawn on the bases of findings about homework assignment and assessment practices from 100 teachers from 10 public primary school and 300 notebooks of grade 1I students through teachers' questionnaire and observation of notebooks.

Planning of homework refers to the different teachers' purposes of assigning homework. Teachers perceive that they are doing their best in planning of homework. Contrary to these findings is it was revealed from homework and that is not creativity based and did not focus on other higher level purposes of homework.

Teachers perceive that they are doing their best regarding the feedback about homework such that marking or evaluating on same day, give written and verbal comments, follow the corrections mentioned and focusing of quality.

REFERENCES

1. Harrison, P. D., & Douglas, D. K. (2004). The Relative Merits of Different Types of Overall Evaluations of Teaching Effectiveness. Research in Higher Education, 45(3), 311-323.
2. Ibrahim, M. (2012). A Psychometric Evaluation of Two Teaching Effectiveness Scales. Journal of Sustainable Development, Vol. 5, No. 7, 91-103.
3. Kothawade, P. L. (2014). Correlative Study of Teaching Effectiveness & Job Satisfaction of Higher Secondary School Teachers. Indian Journal of Applied Research, Vol. 4, Issue. 7, 116-118. 9- Kumar, R. R., & Khadir, F. (2013). A Study on Teaching Effectiveness of Self-Financing Engineering College Teachers in Kerala. International Journal of Asian Social Science, 3(1), 1-9.
4. Trautwein, U., & Koller, O. (2003). The relationship between homework and achievement Still Much of a mystery. Educational Psychology Review, 15, 115–145. https://www.jstor.org/stable/23361516
5. ulhenbruck, L., Cooper, H., Nye, B., & Lindsay, J. J. (1999). Homework and achievement: Explaining the different strengths of relation at the elementary and secondary school levels. Social Psychology of Education, 3, 295–317. https://doi.org/10.1023/A:1009680513901
6. Natriello, G., & McDill, E. L. (1986). Performance standards, student effort on homework, and academic achievement. Sociology of Education, 59, 18–22. https://doi.org/10.2307/2112483
7. Hattie, J., and H. Timperley. (2007). The power of feedback. Review of Educational Research, 77 (1), 81–112.
8. Hassan, F. N. (2012). School teachers' perspectives on homework: A comparative study. Graduate Dissertation, the American University, Cairo. https://fount.aucegypt.edu/etds/1428
9. Epstein, M. H., Polloway, E. A., Foley, R. M., & Patton, J. R. (1993). problems experienced by students identified as having behavioral disorders, learning disabilities, or no disabilities. Remedial and Special Education, 14(5), 40–50. https://doi.org/10.1177/ 074193259301400507
10. Darling-Hammond, L. (2000). How teacher education matters, Journal of Teacher Education, 166-173.
11. Devi, Usha, V. K. (2005). A study of role conflict, job satisfaction and select presage variables discriminating between successful and less successful Review 118 secondary school women teachers of Kerala. Unpublished PhD, University of Calicut
12. Gnanaguru, S. A., Kumar, S. (2007) Attitude of under normal and overachievers towards teaching profession and their home environment. Journal of All India Association for Educational Research. 19(3-4), 36-37.
13. Suja, K. (2007). Interaction effect of attitude towards teaching, interest in teaching and teaching experience of job commitment of primary school teachers. M.Ed Thesis. University of Calicut.
14. Schibeci RA, Riley JP (1986). Influence of students' background and perceptions on science attitudes and achievement. Journal of Research in Science & Technological Education, 23(3), 177-187.
15. Osunde, A. U., & Izevbigie, T. I. (2006). An assessment of teachers' attitude towards teaching profession in Midwestern Nigeria, Education, 126(3), 462-467.
16. Homework: A comparison of teachers' and parents' perception

Dimensions of Teacher Competency: A Review of Research

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Abstract:

Teacher competency is a multifaceted construct that encompasses various dimensions essential for effective teaching and student learning outcomes. This review synthesizes existing research on teacher competency dimensions, aiming to provide insights into the diverse aspects that contribute to effective teaching practice. Drawing upon empirical studies, theoretical frameworks, and professional standards, this article identifies and examines key dimensions of teacher competency, including pedagogical knowledge, instructional strategies, classroom management, assessment practices, interpersonal skills, cultural competence, and professional development. The review highlights the interplay between these dimensions and their significance in fostering student engagement, achievement, and overall academic success. Furthermore, it discusses implications for teacher preparation programs, professional development initiatives, and policy frameworks aimed at enhancing teacher effectiveness and promoting positive learning outcomes for all students.

Keywords: teacher competency, pedagogical knowledge, instructional strategies, classroom management, assessment practices, interpersonal skills, cultural competence, professional development

Introduction:

Teachers are the cornerstone of educational systems worldwide, wielding considerable influence over students' academic achievements and overall learning experiences. Effective teaching is a multifaceted endeavor that demands a broad spectrum of competencies, ranging from profound pedagogical insights to adept interpersonal skills. In response to this complexity, researchers, policymakers, and educational stakeholders have delved into the diverse dimensions of teacher competency, striving to unravel the intricacies of effective pedagogy and to devise strategies for bolstering teacher effectiveness.

This review endeavors to distill the wealth of existing literature on teacher competency dimensions, providing a comprehensive synthesis of the essential elements underpinning successful teaching practice. Central to this exploration are core competencies such as pedagogical knowledge, instructional prowess, adept classroom management techniques, and finely tuned interpersonal acumen. Each dimension interlaces with the others, forming a cohesive framework that undergirds effective teaching and student learning outcomes.

By synthesizing research findings, this review aims to shed light on the nuanced interplay between these dimensions of teacher competency, offering valuable insights for educators, policymakers, and those involved in teacher training and professional development. Through a deeper understanding of

the multifaceted nature of teacher competency, stakeholders can glean actionable strategies for fostering teacher growth, refining instructional practices, and ultimately enhancing the educational experiences and outcomes of all students.

This review synthesizes existing literature on teacher competency dimensions, offering a comprehensive overview of the key factors that contribute to successful teaching practice.

Pedagogical knowledge refers to teachers' understanding of subject matter content, as well as the principles and strategies for facilitating student learning. Research suggests that teachers with strong pedagogical knowledge are better equipped to design engaging lessons, provide effective scaffolding, and address diverse learning needs within their classrooms (Shulman, 1987). Furthermore, studies have emphasized the importance of pedagogical content knowledge (PCK), which involves knowledge of how to teach specific content areas, as a critical component of teacher effectiveness (Magnusson et al., 1999).

Instructional Strategies: Effective teachers employ a variety of instructional strategies to engage students, promote deeper learning, and facilitate skill development. Research has identified numerous approaches to instruction, including direct instruction, cooperative learning, inquiry-based learning, and differentiated instruction (Tomlinson, 2001). Moreover, meta-analyses have highlighted the effectiveness of certain instructional practices, such as formative assessment, feedback, and the use of cognitive strategies, in enhancing student achievement (Hattie, 2009).

Classroom Management: Classroom management encompasses the strategies and techniques teachers use to create a positive and orderly learning environment. Effective classroom management involves establishing clear expectations, implementing consistent routines, and addressing disruptive behavior promptly and constructively (Emmer & Stough, 2001). Research indicates that strong classroom management skills are associated with increased instructional time, improved student behavior, and higher levels of academic engagement (Brophy, 2006).

Assessment Practices: Assessment plays a crucial role in monitoring student progress, identifying learning needs, and informing instructional decision-making. Effective teachers utilize a variety of assessment methods, including formative assessment, summative assessment, and performance-based assessment, to evaluate student learning and provide meaningful feedback (Black & Wiliam, 1998). Additionally, research emphasizes the importance of aligning assessments with instructional goals and standards to ensure their validity and reliability (Stiggins, 2002).

Interpersonal Skills: Interpersonal skills are essential for building positive relationships with students, fostering a supportive learning environment, and promoting social-emotional development. Effective teachers demonstrate empathy, respect, and cultural sensitivity in their interactions with students, parents, and colleagues (Wentzel, 2002). Furthermore, research suggests that strong interpersonal skills are associated with higher levels of student engagement, motivation, and academic achievement (Hamre & Pianta, 2006).

Cultural Competence: Cultural competence involves understanding and valuing the cultural backgrounds, experiences, and perspectives of students and families from diverse ethnic, linguistic, and socioeconomic backgrounds. Culturally competent teachers recognize the impact of culture on teaching and learning, and they strive to create inclusive and equitable classrooms that honor students' identities and promote cultural responsiveness (Gay, 2002). Research indicates that culturally competent teaching practices contribute to improved student outcomes and reduced achievement gaps (Banks, 2008).

Professional Development: Professional development plays a critical role in supporting teacher growth, enhancing instructional practice, and promoting continuous improvement. Effective professional development initiatives provide opportunities for teachers to acquire new knowledge and skills, collaborate with colleagues, and reflect on their teaching practice (Desimone, 2009). Research suggests that ongoing, job-embedded professional development programs that focus on specific content areas or

instructional strategies are most effective in positively impacting teacher practice and student learning outcomes (Garet et al., 2001).

Conclusion:

Teacher competency is a multidimensional construct that encompasses various knowledge, skills, and dispositions essential for effective teaching and student learning. By exploring dimensions such as pedagogical knowledge, instructional strategies, classroom management, assessment practices, interpersonal skills, cultural competence, and professional development, educators can gain valuable insights into the complexities of teaching and identify areas for growth and improvement. Moving forward, efforts to enhance teacher effectiveness should prioritize comprehensive teacher preparation programs, ongoing professional development opportunities, and supportive policy frameworks that empower educators to meet the diverse needs of students and communities.

References:

1. Banks, J. A. (2008). Diversity, group identity, and citizenship education in a global age. Educational researcher, 37(3), 129-139.
2. Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in education, 5(1), 7-74.
3. Brophy, J. (2006). History of research on classroom management. In C. M. Evertson & C. S. Weinstein (Eds.), Handbook of classroom management: Research, practice, and contemporary issues (pp. 17-43). Lawrence Erlbaum Associates.
4. Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. Educational researcher, 38(3), 181-199.
5. Emmer, E. T., & Stough, L. M. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. Educational psychologist, 36(2), 103-112.
6. Gay, G. (2002). Culturally responsive teaching: Theory, research, and practice. Teachers College Press.
7. Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. American educational research journal, 38(4), 915-945.
8. Hamre, B. K., & Pianta, R. C. (2006). Student-teacher relationships. In G. G. Bear & K. M. Minke (Eds.), Children's needs III: Development, prevention, and intervention (pp. 59-71). National Association of School Psychologists.
9. Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.
10. Magnusson, S., Krajcik, J., & Borko,

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