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The Impact of Monetary Policy on the Transformation to Circular Economy: Does Foreign Direct Investment Speak?

Nguyen-Quynh-Nhu Ngo[1], Ngoc-Tien Hoang[2], Tran Minh Tung[3*]

Abstract

Our paper examines the relationship between State Bank of Vietnam's implementation of monetary policies, Foreign direct investment inflows, and the country's move toward a circular economy. By using the PLS-SEM method with 330 observations, the study demonstrated that the positive impacts of the State Bank of Vietnam's monetary policies will aid in promoting Vietnam's transition to the circular economy, either when the State Bank offers a contractionary or expansionary or sustainable monetary policy. Moreover, when a country receives foreign direct investment, it tends to encourage companies' ability to create green, environmentally friendly products. Foreign direct investment inflows also stimulate a country to the transition to circular economy. Our research highlights the regulatory factor of Foreign Direct Investment capital that will increase 0.204 and 0.07 levels of impact between stable and expansionary monetary policy on the shift to circular economy. The results of this study contribute new factors in the theory of circular economy as well as policy implications for the State Bank of Vietnam, thereby aiding in the State Bank's development of an appropriate monetary policy to encourage foreign direct investment and the transition to the circular economy.

Keywords: *circular economy, monetary policy, foreign direct investment, transformation, Vietnam.*

1. INTRODUCTION

Everything in the universe always works in a certain cycle. Earth revolves around a 365-day, six-hour axis, equivalent to a one-year cycle. Humans also go through birth, maturity, marriage, and death stages, which form their life cycle. Plants have cycles of growth, blooming, and withering. The fruit, in turn, produces seeds, and the plant begins its cycle of growth again. So, is it possible for the economy to abide by such a cycle? As the economy is gradually depleting resources, recycling and reusing economic products is essential, utilizing the output component to create the input won't result in excess production and aid in maximizing resource utilization. With the Make-Use-Recycle cycle, circular economics makes resource extraction and leveraging as long - term and sustainable as studied (Gunawan et al., 2020) and (Holzer et al., 2021). Previous studies have underlined the significance of the circular economy as well as the role that technology (Tang et al., 2022; Chauhan et al., 2022), government (Gong et al., 2020,

[1] Lecturer, Faculty of Finance and Banking, Ton Duc Thang University, 19 Nguyen Huu Tho Street, Tan Phong Ward, District 7, Vietnam, ngonguyenquynhnhu@tdtu.edu.vn, https://orcid.org/0000-0002-0719-0797

[2] Lecturer, School of Business and Economics, Duy Tan University, Danang, Vietnam, tienvjc@gmail.com, https://orcid.org/0009-0002-4154-578X

[3] Lecturer, Academic Department, Swinburne Vietnam, FPT University, Danang, Vietnam, tungtm6@fe.edu.vn, https://orcid.org/0000-0002-4238-882X

Gunawan et al., 2020) and knowledge (Holzer et al., 2021, Mura et al., 2020) play in the development of the circular economy. With 404 observations coming from commercial enterprises, research of (Tang et al., 2022) pointed to a relationship between CE and Industry 4.0 in China and Pakistan in the period of 2019. Using the method Partial Least Squares Structural Equation Modeling (PLS-SEM), a research paper indicating the role of BCT technology in the circular economy. This role is expressed by removing corruption from the procurement and bidding process through greater transparency and smart contracts. Additionally, the study work of (Chauhan et al., 2022) presents the significance of digitizing for CE by Systematic Literature Review method. With AI technology, Blockchain and the Internet of Things (IoT), digitizing eliminates waste and promotes environmental benefits through product reform and sustainability. Furthermore, Government-sponsored initiatives for CE are also essential. (Gunawan et al., 2020)'s study from Bangladesh in 2017-2018 has shown that government support makes sense for CE through expanding the financial base for CE activities, investing in technology, building legislation for CE and expanding knowledge of CE. However, several nations still lack the infrastructure required for the shift to a circular economy. Demand for waste disposal is not fast enough, initiatives on recycling or reuse are costly as indicated by (Gong et al., 2020).

However, the concept of circular economics is still novel in many countries. Raising awareness and acquiring professional knowledge will help the CE model become more and more widely applied. With the Importance-Performance Analysis and Cluster analysis methodologies, research by (Holzer et al., 2021) about circular economics in SMEs has pointed to key factors in the CE model at Austrian enterprises as "Sustainability", "Resource efficiency" and "Difference". The knowledge of cooperation between stakeholders, independence in the provision of resources, knowledge of business life cycle and other factors such as size, field, company position also helps to develop financial health in enterprises. Besides, (Mura et al., 2020) for SMEs in Italy demonstrate the use of the CE model in their operations by classifying trash, reusing packaging and implementing energy-saving initiatives. As a result, CE also significantly contributes to increasing corporate efficiency, particularly business innovation. For a stable national economy to develop, the government must be able to manage it flexibly, utilizing tools to regulate the macroeconomy. One of the most important tools for achieving this is monetary policy, which, along with the banking system, is essential to the economy, functioning as the vascular system of living organisms. This is especially true for a market economy that is deeply integrated into the global economy. The Central Bank manages monetary policy to achieve economic stability and growth by curbing inflation, maintaining exchange rate stability, gaining full employment, and promoting economic growth (Bean et al., 2002); (A. Zhang et al., 2020). Several monetary policies have different impacts on the investment performance of enterprises (Yang et al., 2021). For promoting sustainable economic growth, monetary policy is essential. It is worth noting that certain countries, including the US and China, have implemented effective monetary policies, such as expansion, contractionary, or stability, that have contributed to the positive development of their respective economies such as developed countries (C. Zhang & Zheng, 2020, Döttling & Ratnovski, 2023) and developing countries (Nain & Kamaiah, 2020). Following (Döttling & Ratnovski, 2023), monetary policy in a developed country typically the US between 1991 and 2016 will lead to investment in businesses with less intangible capital. The paper obtained data on 318,305 observations, including tangible firms and intangible firms. The findings indicate that intangible assets use less collateral, thus showing a weaker correlation with the credit channel of monetary policy. On the other hand, tangible assets have a higher depreciation rate, making interest rate changes have a lesser impact on the relative cost of capital. Using the Ordinary least squares (OLS) methodology, (Yang et al., 2021) has shown that Contractionary monetary policy will negatively impact investment performance. Improving the comparability of accounting information can effectively mitigate the negative impact of Contractionary

monetary policy on inefficient investment, thereby improving the investment efficiency of enterprises. During periods of Contractionary monetary policy, representation costs and financial constraints can play a role in moderating the ability to compare accounting information, reducing inefficient investment from 5,751 observations from companies in the Chinese cities of Shanghai and Shenzhen between 2005 and 2019. Economic policy's uncertainty (EPU) plays an important role in the nation's economic development. Research by (Nain & Kamaiah, 2020) from April 1991 to December 2016 in India shows that Contractionary monetary policies from rate hikes will lead to a 0.5 time decline in output growth when EPU is higher than when EPU is low. To measure the impact of monetary policy, the authors used the Markov Switching Vector Autoregression (MS-VAR) method. In China, the team of authors (C. Zhang & Zheng, 2020) used data from companies for the period from 2006 to 2016 showed that relative risks in fixed investments and expansionary monetary policy led to increasing financial investment by non-financial companies in China in the post-financial crisis period 2008. Systemic risks are those that are beyond our control. (Kabundi & De Simone, 2020) collected data from quarter 4 of 2002 to quarter 2 of 2017 from the 30 largest banks in the eurozone, using structural factor-augmented vector autoregressive (FAVAR) methods and validating the sustainability of their findings. This highlights how the bank's acceptance of changes can be impacted by monetary policy in times of systemic risks.

How about economic policies, particularly monetary policies, and do they affect the circular economy or not? According to research by (Hussein & Abdulzahra, 2020) in Iraq, monetary policy should be taken care of as a tool for the policy of the entire economy. This policy is in place to entice investors to fund circular initiatives. The role of the government in establishing the project in circulatory activity is highlighted in the paper. The first impact was to diversify the Iraqi economy, change the economic cycle to promote economic expansion. The second impact is to give citizens a quality of life in places with high levels of pollution: providing desalinated drinking water, medical treatment for diseases, separating their accommodation from the garbage area. In addition, the Iraqi government should stimulate and aid the transition of the circular economy through monetary policy instruments, which form the basis for creating an economic sector that attracts private capital to invest in.

On the other hand, when the Circular Economy (CE) is tied to sustainability, it will form two key pillars of Public Policy (Arauzo-Carod et al., 2022). Their study, which is based on 48 research papers related to the environment, pollution, and circulation, states that public policy plays a crucial role in guiding consumers, businesses, and organizations to adopt policies and strategies in the territory. Government, consumer, and producer behavior are key factors on the path to success towards a circular and sustainable world.

(Yin et al., 2022) give another aspect of how monetary policy impacts Circular Economy through the concept of Green Innovation. With data sources from 1960-2018, the research range is up to 133 countries and reaches about 5124 observed variables. Using the OLS method, the paper highlights how stringent environmental regulations may promote green innovation through monetary policy. This emphasizes the role of environmental regulation in amplifying the positive impact of Monetary Policy on Green Innovation as part of the Circular Economy. Moreover, effective governance is necessary for positive regulatory impact, including the prevention of corruption, an extensive legal framework, and high levels of government efficiency.

As resources in already exploited countries seem to be running out, environmental concerns are heating up in many countries, especially wealthy ones. For the long-term, they are seeking to use resources that are sustainable and kind to the environment. Regarding the function of Circular Economy, Monetary Policy, and the correlation between both in different countries., the research studies have drawn several assumptions and conclusions. Since then, there has been a research gap in Vietnam, the study of environmental issues through economic policies is still limited and the term circular

economy is quite new. This serves as motivation for our research and to fulfil the gap, we propose two research questions.

Research Question 1: How different situation of Monetary Policy and FDI affect the transformation to Circular Economy?

Research Question 2: Does FDI serves as a mediating role in the connection?

Why “transformation to CE” but not “CE”? Because Vietnam is currently undergoing a transitional phase from a linear economy to a circular economy, it is in the stage of awareness and implementation of the Environmental Resource Law, which took effect on January 1, 2022. As a result, other policies are also being formulated and implemented in the early stage, but there are no concrete practical results to evaluate the circular economy in Vietnam yet.

We classify MP into three categories: Expansionary Monetary Policy (EMP), Contractionary Monetary Policy (CMP), and Stable Monetary Policy (SMP). We measure the FDI through three channels: FDI Inflow by cash, FDI inflow by machinery, equipment, and technology, FDI inflow by patents, copyrights, and other intellectual property. We measure the transformation to Circular economy through the awareness and engagement in CE activities of business, individuals, administrative entities and social organizations.

The paper expects positive results between MP and CE relations. Firstly, the study expects a positive relationship between EMP and CE. During this period, the central bank injects money into the market to support business expansion and provide capital for enterprises. This leads to an increase in financial investments from both domestic and foreign firms, which expands the CE model and creates a higher demand for equipment and machinery. Additionally, the decrease in interest rates stimulates personal spending and job creation, ultimately balancing the supply and demand of goods. This encourages manufacturers to improve their CE systems and processes, leading to cost savings. Secondly, the study results are expected with a negative correlation between CMP and CE. When the central bank tightens its policies, it reduces the money supply outside the market, which leads to higher interest rates and decreased spending needs. This, in turn, results in a significant reduction in household waste generation and the costs of using electricity and living. Contractionary policies also enable the government and local mass agencies to enforce strict environmental regulations, such as emission limits and waste management, to reduce the damaging effects of economic activities on the surroundings. Thirdly, the authors are optimistic about the positive impact of SMP on CE. A stable monetary policy will enable enterprises to plan market calculations, calculate prices, costs, and interest rates more effectively. This stability also encourages businesses to adopt environmentally friendly green products. Policy stability is also an essential feature of a stable forecasting and investment environment. Companies require price and exchange rate stability to make long-term investment decisions, and stability helps create a conducive environment for firms to invest in green technology research and development. Technological innovation plays a vital role in developing green products and minimizing negative impacts on the environment. Furthermore, stable monetary policy fosters confidence in the people and creates stability in the country's financial system. Finally, the paper anticipates that FDI outcomes will act as a mediator supporting MP's impact on CE. FDI's primary goal is to attract investment capital from foreign enterprises, creating conditions for cash flows. This will provide businesses, investors, individuals, and government agencies with orientation in plans to develop and expand the CE system. FDI often involves establishing factories and enterprises in the country of investment, and some investment countries apply strict environmental standards, helping to promote the improvement of domestic environmental standards and contribute to environmental protection. Additionally, FDI from technologically and managerially advanced countries can transfer green technologies and environmentally friendly

management methods, providing advanced knowledge and techniques to domestic enterprises, improving resource use efficiency, and reducing environmental pollution. Furthermore, FDI has a favorable effect on the advancement of renewable energy sources including electricity produced from biomethane, wind energy, and solar energy. This lowers carbon emissions and contamination of the environment and produces a clean, sustainable source of power for the economy. Moreover, FDI can play a crucial role in the growth and promotion of green finance markets, including investment in sustainable development projects and companies that operate under green business models. This can facilitate the development of green industries and aid the transition towards an environmentally friendly economy.

We aim to use Exploratory Factor Analysis (EFA) to explore the factor structure predicted by Partial Least Square - Structural Equation Modeling (PLS-SEM) model. All observed indicators in our research are formative indicators. We measure the model through convergent validity test, collinearity test, statistical significance of weights, nonlinear effect test, endogeneity and unobserved heterogeneity test to check the model robustness. Goodness-of-fit test and Q square will be used in our study.

Above all, the primary goal of this article is to add to existing research by examining the effects of various Monetary Policies and determining which monetary policies are most crucial to Vietnam's transition to a CE. This paper also aims to provide more empirical evidence on the correlation between monetary policy and the transition to a circular economy mediated by FDI. From there, policy implications for Vietnam and other countries with economic, political, and cultural characteristics like Vietnam serve as a basis for research.

There are eight sections in the article. The theoretical underpinnings of monetary policy and how they apply to the circular economy are covered in more detail in the second section. The third paragraph explores earlier research on how monetary policy affects several facets of the economy, such as green growth, economic development, sustainable development, and circular economy. The authors base their study hypothesis on this information. The fourth section details the research design, including the proposed research models and data collection methods for investigating the impact of monetary policy on the transition to a circular economy in Vietnam. The findings of the experiment and subsequent discussion are presented in the fifth and sixth sections. Finally, the seventh and eighth parts offer ideas for further study as well as policy implications.

2. THEORY BACKGROUND

2.1 Circular economy theory

Circularity was first advocated by (Pearce & Turner, 1989), who are considered as pioneers of the circular economy. They argued that extending the product life of commodities is a logical starting point for initiating a gradual transition towards a sustainable economy. Additionally, the paper "Sustainable Economic Development" also mentioned the idea of a circular economy put forth by (Pearce & Turner, 1989). The essay focused on the association between the environment and the economy, aiming for a new economic model based on the fundamental principle that "everything is an input to something else". According to (MacArthur, 2013): "By intention and design, the Circular Economy is an industrial system that is recoverable or replicable. The concept of "end-of-life" is replaced with the idea of recovery, renewable energy is utilized, harmful chemicals that limit reuse are avoided, and waste is eliminated through improved design in terms of materials, products, procedures, and possibly business structures". This theory has provided the foundation for various research papers such as those by (Ekins et al., 2020; Campbell-Johnston et al., 2020; Jarre et al., 2020; Kirchherr et al., 2017) with about 114 definitions of this concept.

The Circular Economy structure was first established with the 3R's Framework System in 1989 by (Pearce & Turner, 1989) with the order “Reduce-Reuse-Recycle". As of (Kirchherr et al., 2017) created the 4R Framework and introduced the idea of "Recover" to the system. In order to improve sustainability, (Bradley et al., 2018) developed the definition of the "6R Framework" and included the idea of "Remanufacturing, Redesign" to the system. During that period, (Vermeulen et al., 2018) has also researched and developed the system with the hierarchy 9R's Framework (starting with R0 and ending with R9). This discovery was used by (Carrasco & Ordóñez, 2023) and (Campbell-Johnston et al., 2020). Table 1 summarizes the description of value retention of the circular economy from R0 to R9.

Table 1. Description of value retention of the circular economy.

Value retention options R0 – R9	Description
R0: Refuse	Consumers buy and use less. The manufacturer refuses to use raw materials, packaging that is difficult to decompose and redesign the process to avoid waste.
R1: Reduce	Consumers use the product carefully and for a long time. Manufacturer optimizes raw materials during production or ' dematerialization’
R2: Resell, reuse	A product's second customer (the purchase of the old product) virtually every requires modification and functions just like the new product. Manufacturers "reuse in fabrication"
R3: Repair	Handling minor repair problems. Peer-to-peer, nearby residents, repair businesses, or the "repair café" are all options for doing this.
R4: Refurbish	Refers to the integrity of large components of the product when these components are replaced. Leads to the quality of the product being upgraded.
R5: Remanufacture	The structural components of the product will be disassembled for inspection, cleaning and replacement or repair as needed in an industrial process.
R6: Re-purpose	The manufacturer will reuse the discarded components for other purposes
R7: Recycling	Managing a variety of post-consumer goods or waste streams, which may involve crushing, melting, or other procedures to produce (nearly) pure raw materials.
R8: Recovery (energy)	Collecting the energy contained in the waste, attaching it to the combustion process that combines energy production.
R9: Re-mine	Following the period of landfilling, material is recovered; cannibalization; urban mining or high-tech landfill mining.

According to (MacArthur, 2013), the circular economy is characterized by renewable, enhanced natural capital, optimized reserves and resource production, and shows the potential for innovation, job creation and economic growth. The government is one of the key actors for the Circular economy. According to study conducted by (Pan et al., 2015), there is a significant association between government and policies or laws that support CE by preventing abnormal, lack of transparency through tariff policies (Di Maio et al., 2017). In addition, with an effective legal system, manufacturers can produce lines of products designed to be recyclable, bringing a higher life expectancy to consumers as

well as benefits to society and the environment. This result comes from research from (Asif et al., 2016) with the goal of providing economic efficiency and a system of circulating products through evaluation tools. From the results of the research papers, we have hinted at measuring the transformation to circular economy through the awareness and engagement in CE activities of four objects: business, individuals, administrative entities and social organizations.

2.2 Keynesian theory

In 1930, British economist John Maynard Keynes initiated economic theory, emphasizing the importance of government intervention in stabilizing the economy during risky times. The central idea is that increasing the money supply will boost demand, spending, employment, and economic growth. Furthermore, businesses may reduce spending during a recession to decrease demand and jobs. Advocates of Keynesian thought contend that economies do not rapidly stabilize independently, and that active intervention is required to stimulate short-term demand in the economy, especially in the current era of economic model transformation. According to Keynes, expanding the state's role is not only necessary to prevent the destruction of existing financial institutions but also essential for successfully implementing individual initiatives. The government can become involved in the economy through investment policies, either directly or indirectly. Additionally, the financial, credit, and monetary circulation systems can be utilized as tools for the macro-regulation of the economy. Keynesian economics has also highlighted the significance of aggregate demand for goods and services within the economy and the importance of managing aggregate demand through policies and tools, as illustrated by (Keynes John, 1936).

2.3 New Keynesian theory

Keynes's New Economics theory is built upon the fundamental principles of Keynesian Theory. This innovative concept focuses on the imperfections and potential economic conflicts that can arise due to unemployment, credit lines, and business cycles. This new theory is based on rational expectations, unlike the classical Keynesian approach. This means that economic agents are presumed to have access to enough information to form expectations regarding the future and can adjust these expectations in real-time to reflect changing economic conditions. The theory also incorporates the concept of fixed prices, which allows prices to be adjusted flexibly over the long term while minimizing short-term fluctuations. By addressing wage rigidity and intrinsic inconsistency, the new Keynesian theory successfully bridges the gap between traditional economic theory and the realities of modern markets, where changes in supply and demand can lead to inefficiencies. To solve this problem, economists explain the neo-Keynesian school of unemployment and investment, which considers factors such as the business cycle, fixed prices, and the effectiveness of government intervention in markets through fiscal and monetary policies. Fiscal policy can be used to adjust supply and demand by modifying tax rates, while monetary policy can help reduce inflation by adjusting interest rates. As well as (Tai Nguyen et al., 2022), (Tiên et al., 2019) offer suggestions for optimally combining fiscal and monetary policies in a new policy framework based on new theories of the Keynesian model.

2.4 Sustainability theory

The concept of sustainability dates back centuries, but the modern concept of sustainability was developed in the 1980s by the World Commission on Environment Development - WCED (Brundtland Commission). The United Nations founded WCED in 1983 to investigate the correlation between environmental protection and economic growth. According to (Daly, 1990), sustainability theory is a broad term referring to the study of how human activities can be maintained over time without depleting the natural environment or depleting natural resources. It is at the core of concepts such as sustainable productivity, sustainable society and sustainable development. Sustainable

development is a broad term to describe beneficial policies, projects and investments that limit the worst impact on the environment, society and human health in the future. These policies are often described as “green policies" because they focus on limiting the impact of economic development on the environment.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1. The impact of Monetary Policy on Foreign Direct Investment

To measure monetary policy, prominent economists such as Milton Friedman, John Maynard Keynes and Irving Fisher have developed various theories and models to explain why central banks use tools to influence the economy. Five instruments are used to measure: interest rates, refinancing, required reserve ratios, open markets and exchange rates. So, how will these monetary policy’s tools impact on FDI?

When central banks implement an Expansionary monetary policy (EMP), they inject more money supply into the market than usual. At that point, interest rates will be one of the first factors affected. An increase in the money supply will lead to a decrease in interest rates, so the demand for spending and finding jobs will improve to be comparable to the amount of goods in that country. The Central Bank usually applies the expansionary monetary policy when the economy is in a recession; unemployment is high. Using this policy will help promote financial investment and expand production and business. In various studies, the results show that EMP impacts FDI in both positive and negative directions. (Karahan & Bayır, 2022) demonstrated that EMP positively impacts FDI when they studied the relationship between the two during the Covid-19 pandemic. When monetary policy is expansive before or during a given period, it could lead to a rise in global stock market indices and low-interest rates, facilitating the transfer of foreign direct investment (FDI) from developed to poor nations. However, research by (Mahmood, 2018) suggests that this policy could harm FDI in the long term. Higher interest rates can increase costs, negatively impacting investor sentiment toward investment decisions and returns. (de Mello, 1997) supports this argument by explaining that investment firms tend to reduce costs to increase the return on their investments. Furthermore, research by (Suhendra et al., 2022) also indicates that lending rates can harm FDI. Foreign investors are willing to pay loans for foreign investment activities when the capital used for the expected activities generates income higher than the initial investment amount. For the required reserve ratio, the study by (Hasan et al., 2020) in Iraq has shown an inverse correlation between compulsory reserves and FDI from 2004 to 2017. The paper indicates that rediscount rates and reserve requirements are monetary policy instruments that did not significantly impact FDI during the study period. In a study report published in Bangladesh, Mahmood (2018) demonstrated how open markets are preventing FDI inflows since they are negatively impacted both immediately and over time. Trade openness hurts FDI inflows, as seen by the negative link between trade openness and FDI inflows. This outcome also demonstrates that trade openness and FDI inflows are competitive. In addition, research by (Hasan et al., 2020) also shows that market openness has no significant impact on FDI. When using the exchange rate as a measure of expansionary monetary policy, it is easy to see that the exchange rate directly impacts FDI inflows. The paper of (Suhendra et al., 2022) shows that the appreciation of foreign currencies while the local currency depreciates will reduce FDI inflows. Conversely, when the local currency becomes more substantial than the foreign currency, it will attract investment flows from outside.

The combination of monetary and fiscal policy has been shown to have a major effect on the environment. According to research by (Ullah et al., 2021), supply and demand in monetary policy can have an impact on the environment. The study shows that short-term carbon emissions can be affected both favorably and unfavorably by monetary policy measures. However, a well-planned economic policy shock can help to reduce carbon emissions in the long run. Some studies have also explored the opposite effect, where

environmental factors can impact monetary policy. (Dafermos et al., 2018) investigated the effects of climate change on companies' financial stability. The findings indicate that as climate change becomes more complex, it can worsen the financial health of businesses through equity, liquidity, profitability, bond prices, and credit activities.

When central banks implement Contractionary monetary policy (CMP), they will cut the money pumped into the home economy. This involves reducing the amount of money put into the economy, which can cause interest rates to rise. As a result, spending and consumption may be limited. Researchers (Al-Hallaq et al., 2020) have found a correlation between CMP and foreign direct investment (FDI) rates as a percentage of GDP (% of GDP). Their study shows that interest rates have a causal relationship with FDI rates, meaning that when interest rates rise, investment tends to increase. However, other studies have found an inverse relationship between CMP and FDI. With different conditions when conducting surveys in the field of electrical and electronics, research by (Inglesi-Lotz & Ajmi, 2021) has demonstrated that when interest rates are increased, it will reduce FDI inflows. Research by (Fernandez & Joseph, 2020) on the Covid-19 epidemic period also shows that CMP negatively impacts FDI inflows into Indonesia. In addition, research by (Fernandez & Joseph, 2020) in Indonesia has shown that trade openness and exchange rates are positively correlated for FDI during the Covid-19 pandemic. In addition, (Inglesi-Lotz & Ajmi, 2021) has also pointed out that increasing the exchange rate will increase FDI inflows to African countries.

When central banks implement Stable monetary policy (SMP), they maintain price stability and economic growth by controlling inflation and managing the money supply. Price stability and long-term economic growth are the objectives of a stable monetary policy. To achieve stable monetary policy, the central bank can employ measuring instruments like interest rates and money supply. For instance, the central bank may increase interest rates in order to lower the money supply and manage inflation when it is excessive. In contrast, the central bank can reduce interest rates during a recession to expand the money supply and promote investment and expenditure. In research by (Raza et al., 2021), political, and institutional quality determinants, such as the legal system, social norms, and legally recognized behaviors, all showed significant positive associations with economic growth. This is consistent with research by (Afonso & Jalles, 2016) that produced similar results. The results show that institutional stability of the economy (less corruption) and political stability tend to promote better economic growth. To complement the view that SMP positively impacts FDI inflows, research by (Huynh, 2021) has shown that political stability and FDI with positive relationships and political stability can help reduce income inequality in 36 cities in ASEAN countries. Along with improving the efficiency of governments, they can be more autonomous and independent in implementing their policies on institutional reform and governance quality because local governments have higher FDI; better governance increases economic well-being, conducive to redistributive policies to reduce income inequality (GINI). According to (Khudari et al., 2023) while conducting research with data from 1974 to 2017 in Turkey, the study's findings showed that for FDI inflows, GDP, trade openness, and political stability all exhibited a positive association.

In Vietnam, the impact of Expansionary monetary policy on financial institutions or more specifically, the Bank's performance is shown through research by (Nguyen et al., 2022). Specifically, they believe that applying expansionary monetary policy will reduce the operational efficiency of banks or credit institutions with small size, low charter capital and high credit risks in the midst of the Covid-19 epidemic. Vietnam's Monetary policy mainly uses traditional and indirect measuring tools such as cutting policy interest rates, giving instructions, and guiding commercial banks to implement support measures for enterprises. The organization was affected by the pandemic. Research by (Bhattacharya, 2014) has provided an overview of the inflation situation in Vietnam after the renovation. From there, it hints at applying Contractionary monetary policy to the economy to control

inflation growth. In addition, (Dang & Nguyen, 2021) conducted research based on data from 07 countries from the ASEAN region (including Vietnam). Research results show that political policy stabilization and population growth in developing countries are inversely related to FDI inflows. And the solution for governments is to strengthen structural reforms to control corruption and increase transparency in the system of financial controls. As a result, countries will create a healthy economy to help investors feel more secure in their FDI projects.

In summary, from the analysis of the above research papers, this research paper aims at the following hypotheses:

H1: EMP has a positive impact on FDI inflows.

H2: CMP has a negative impact on FDI inflows.

H3: SMP has a positive impact on FDI inflows.

3.2. The impact of Foreign Direct Investment on Circular Economy

In the upcoming section, we will delve into the mutual influence between FDI and CE factors. FDI can be measured using various tools, including cash flows, infrastructure, and intangible assets like patents and technology. (Marino & Pariso, 2020) employed standard purchasing power data of Gross Domestic Product to evaluate the impact of FDI on CE. The findings reveal that as the Gross Domestic Product rises, CE indicators such as the reuse rate of materials, the traded items that are recyclable raw materials, or the number of CE-related patents also increase. While the growth may be uneven across the 28 EU member states, the research paper affirms that FDI has a positive impact on CE. However, constructing waste management facilities comes at the public expense of the state. Therefore, the system's periodic cash flow, usually annual, must be balanced to zero. To achieve this, it will be necessary to levy variable fees and maintenance fees on system users, namely local residents. However, any potential cost increases are likely to encounter significant opposition and be met with reluctance from citizens. The new waste management objectives set by the EU require substantial modifications to the waste management system, which might raise costs for residents, claims a study report by Tomi & Schneider from 2020. In addition, technical aspects contribute to the promotion of the spread of CE expertise among businesses and organizations. The CEIMA Framework initiative – Circular Economy Interface Matrix Analysis from research by (Coenen et al., 2020) helps connect infrastructure stakeholders to specific applications of CE; connect stakeholders in a wide range of work sectors (incredibly energy-intensive occupations with high potential for waste reduction) with CE principles. The article demonstrates the positive impact of technology factors on CE in creating a premise for developing and expanding CE projects. Research on technology to recycle 'end-of-life' tires into fiber and turn them into secondary raw materials for other applications is clarified in the (Gigli et al., 2019). In addition, the project's advanced technology can be smoothly transferred to various factories, and once implemented, it has the potential to be replicated across Italy and other European nations. The author has proven that FDI and CE are positively correlated and closely linked. In addition, the paper of (Mignacca et al., 2020) also demonstrates a positive two-way correlation of both FDI and CE factors through intangible assets and infrastructure. The article covers modularization and modularization as well as the application of modularization in infrastructure. CE now serves as the foundation for managing the sustainable modular infrastructure “Moduler CE”. Modularization reduces negative impacts on the environment, e.g. modularization can reduce construction and demolition waste. It can also reduce lifecycle energy requirements and material consumption of energy infrastructure, thus forming an essential part in achieving energy and resource policy objectives. The modularization process can improve removability, maintainability, upgradeability, reusability, and recyclability performance. By implementing modularization in infrastructure, it becomes possible to reconfigure and extend it while adjusting its lifecycle through decoupling. In Vietnam, the

former Director of the Institute of Strategy, Natural Resources Policy and Environment also generalized the Party's policy on circular economy development as reflected in Article 142 of the Law on Environmental Protection in 2020. In addition, by April 2023, the business sector (including FDI and domestic investment) will have invested about 09 billion USD in green growth and development areas, such as exploiting renewable energy and investing in equipment for the green economy. And this figure accounts for about 2% of GDP and the average growth during the past two years has been high (10-13%). Another example in India (Bajpai, 2009), when an enterprise with FDI up to 100% will be allowed to invest in renewable energy sectors on an automated route without approval from government agencies. This will help attract investment in renewable energy projects such as solar and wind power. From the factors clearly outlined in the above research papers, the hypothesis formulated here aims at the link between both FDI and CE factors:

H4: FDI has a positive impact on CE.

3.3. The impact of Monetary Policy on Circular Economy

To begin with Stable Monetary Policy (SMP), research by (Adebayo, 2022) mentioned about renewable and environmentally sustainable energy sources. It is seen that the positivity in monetary policy comes to CE. The paper emphasizes that energy use is necessary for economic development, but it will also come with output wastes such as CO2. Renewables may contribute to ecological sustainability and sustainable development, including non-carbohydrate energy sources and sporadic emissions. The author also examines political concerns and evaluates how adopting renewable energy or reducing CO2 emissions in Canada from 1990 to 2018 affected the country's economic development and trade globalization. The study's findings indicate a link between Canadian political stability, CO2 emissions, and foreign direct investment (FDI), requiring the government to address the climate catastrophe more seriously in order to balance economic expansion. The implementation of renewable energy is primarily influenced by good governance, innovation, political stability, and financial development. In order to enhance the production of renewable energy, the article by (Awijen et al., 2022) advocates for sustainable policy decisions that improve governance quality and innovation performance. The accessibility of renewable energy sources in a nation has a direct impact on its political stability (Liang & Fiorino, 2013). For example, it has been concluded that access to funding and a general climate of political stability are prerequisites for the United States and its allies in Western Europe to carry out their plans for the development of renewable energy (Brunnschweiler, 2010). The problem of political stability and its external effects on the renewable energy sector, however, is not well addressed by existing empirical economics research. In a recent research, (Chan, 2020) looked at how the Carbon Tax Rate, Monetary Policy, and Fiscal Policy affected CO2 reduction. According to the paper, a Carbon Tax should be imposed as part of Monetary Policy rather than Fiscal Policy even if each strategy can result in lower pollution, income tax revenue, and overall price levels. Analysis of the carbon emission levels under each policy using the Dynamic Random General Equilibrium Model (E-DSGE) revealed that under the carbon tax policy, attempts to cut emissions only grow. Under fiscal and monetary policy, there is a corresponding decline in income tax revenue and general price levels. The analysis comes to the conclusion that monetary policy affects carbon tax policy the most. As a result, the economy can maintain stable momentum with the standard monetary policy on carbon emissions and the well-being of households. On the other hand, the study by (Belaïd et al., 2021) does not mention that FDI is a factor that helps MP impact CE more effectively. However, the authors mention independent variables such as FDI, CO2 and political stability (POLS) in the regression model. Through the correlation test table, the results show that FDI correlates with both POLS and CO2 variables. This adds to the hypothesis that FDI plays a role in promoting the impact between SMP and CE. For Contractionary monetary policy (CMP), rising interest rates make borrowing and investment more expensive and difficult, reducing

businesses' ability to access capital and undertake development projects. For the transition to a circular economy model, new investment and development are critical to promote diversification and enhance the sustainability of the economy (Awijen et al., 2022). For Expansionary Monetary Policy (EMP), (Wang et al., 2021) studied the impact of refinancing on CE. The study points out the role of the Government and financial institutions in offering preferential solutions and policies with the goal of green development. Financial institutions actively cooperate with the Government to introduce preferential policies to improve the industry and apply preferential lending interest rates to encourage businesses to become enthusiastic about green investment projects. At the same time, they also need to be stricter about green finance policies, limiting their ability to provide capital to businesses with highly polluting industries and high discharges. In addition, such enterprises need to supervise and control the expansion and force them to upgrade and improve production and consumption processes to optimize environmental pollution.

Currently, in Vietnam, research topics on the impact of economic policies in general and monetary policy in particular on environmental issues are pretty new and have many limitations, mainly the circular economy has only emerged in recent years, is still an entirely new concept and has little documentation in the country. However, there is still a legal foundation in Vietnamese law for strategically adopting the circular economy theory, the Law No. 72/2020/QH14 promulgated by the National Assembly on November 17, 2020, effective from January 01, 2022, accordingly, Clause 11, Article 5 of the 2020 Law on Environmental Protection requires that while developing and putting into practice socioeconomic development strategies, plans, programs, schemes, and projects, circular and green economy models be integrated and promoted. In addition, the concept of the circular economy is further spelled out in detail in Article 142 of the Law on Environmental Protection 2020, which also requires the government to establish standards, plans, and other mechanisms to promote the circular economy's adoption in accordance with the socioeconomic climate of the nation; In addition, it also stipulates responsibilities for the performance of the circular economy model for 02 essential components, namely state management agencies and the business community. According to Decree No. 08/2022/ND-CP, the Government has also outlined procedures and financial incentives for economic and social sectors to invest in research, development, and application of circular economy models in production, commercial operations, trade, and services. In addition to the Law on Environmental Protection 2020, the law on Investment also has regulations to encourage the development of the circular economy in Vietnam. Point dd, Clause 2, Article 15 of (Law No. 61/2020/QH14 Dated June 17, 2020 on Investment, n.d.) stipulates that beneficiaries of investment incentives include "Hi-tech enterprises, science and technology enterprises, scientific and technological organizations; projects involving technology transfer on the list of technologies encouraged for transfer by the law on technology transfer; technology incubators, science and technology business incubators by the law on high technology, the law on science and technology; enterprises producing and supplying technologies, equipment, products and services in service of environmental protection requirements by the law on environmental protection".

Thus, to meet as well as fill the research gap in Vietnam, the research paper aims to build the following hypotheses:

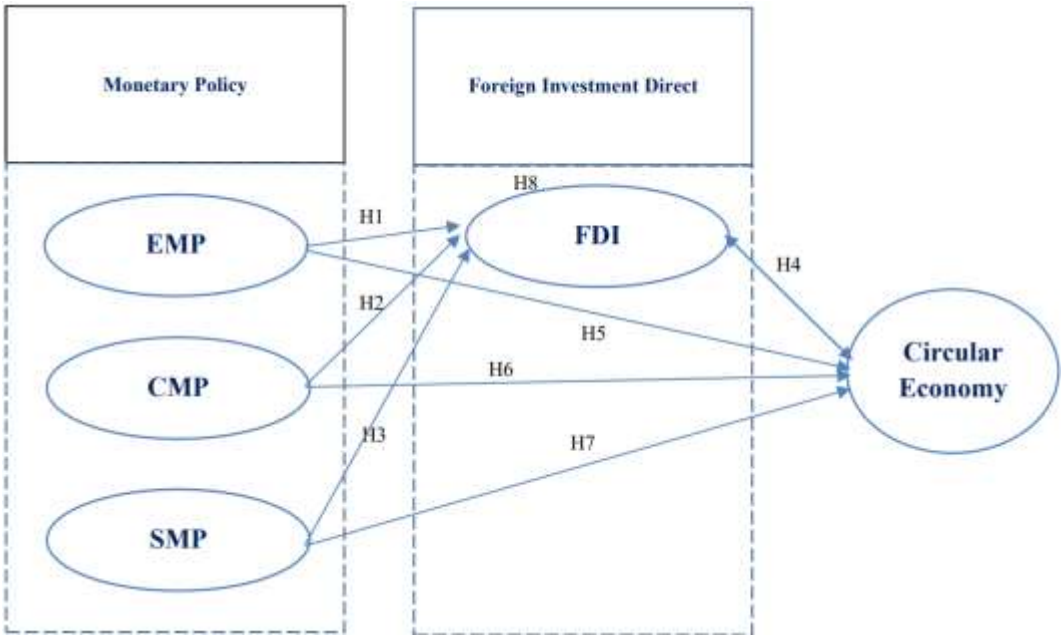
H5: EMP has a positive effect on CE.

H6: CMP has a negative effect on CE.

H7: SMP has a positive effect on CE.

H8: FDI has a mediating effect on the influence of MP to CE.

Figure 1: Proposed Research Model



4. DATA AND RESEARCH METHODOLOGY

The Partial Least Square Structural Equation Model (PLS-SEM) approach is used to model evaluation variances in the variables that have been observed, examine the causal connections between the observed variables, and search for appropriate models that permit the use a number of indicators for a given latent variable (Gadzo et al., 2019). The dataset utilized in this study contains 330 data points covering 22 variables from December 2022 to March 2023. The variable's definition is displayed in Table 2.

Table 2. Variable's description

Latent variable	Items	Description
EMP	EMP1	The SBV increased outstanding loans for refinancing and rediscounting
	EMP2	The SBV reduced lending interest rates of refinancing and rediscounting
	EMP3	The SBV announced an increase in the central exchange rate between VND/USD
	EMP4	The SBV reduced the required reserve ratio
	EMP5	The SBV buys more valuable papers than it sells
CMP	CMP1	The SBV reduced outstanding loans of refinancing and rediscounting
	CMP2	The SBV increased lending rates of refinancing and rediscounting

	CMP3	The SBV announced a reduction in the central exchange rate between VND/USD
	CMP4	The SBV increased the ratio of required reserves
	CMP5	The SBV sells valuable papers than buys
SMP	SMP1	The SBV stabilizes outstanding loans for refinancing and rediscounting
	SMP2	The SBV stabilizes outstanding loans for refinancing and rediscounting
	SMP3	The SBV announced the stabilization of the central exchange rate between VND/USD
	SMP4	The SBV stabilizes the required reserve ratio
	SMP5	The SBV buys and sells valuable papers equally
FDI	FDI1	FDI inflow by cash
	FDI2	FDI inflow by machinery, equipment, and technology
	FDI3	FDI inflow by (patents, copyrights, and other intellectual property)
CE	CE1	Businesses are aware of and actively engage in sharing, leasing, reusing, repairing, refurbishing, and recycling of pre-existing materials and products.
	CE2	Individuals engage and encourage sharing, renting, reusing, repairing, refurbishing, and recycling of pre-existing materials and products.
	CE3	The sharing, leasing, reusing, mending, refurbishing, and recycling of pre-existing materials and products is encouraged by state administrative entities, who also put it into practice.
	CE4	Social organizations are aware of and actively participate in the sharing, leasing, reusing, mending, refurbishing, and recycling of pre- materials and products.

The collection of studied data was gathered from financial and policy specialists working for the State Bank of Vietnam, Commercial institutions, and State-owned institutions in Vietnam. To measure and assess the impact of monetary policy instruments on Vietnam's transition to a circular economy, this study employed a Mixed Research Methodology. Mixed methods research is a type of research design that incorporates data that is both qualitative and quantitative. Based on the work of individuals in a variety of sectors, such as evaluation, education, management, sociology, and health sciences, mixed research methods arose early 1990s and the late 1980s. Its growth, development, and ongoing development have gone through a variety of stages. In general, mixed approaches were preferred since they were strong in both qualitative and quantitative research and minimized the drawbacks of each. Practically speaking, mixed methods offer a sophisticated technique to study that draws innovators of fresh research methodologies (Levitt et al., 2018). The factor structure of the hypothetical model was validated by the use of exploratory factor analysis (EFA). The suggested relationships were then validated using Partial Least Square - Structural Equation Modeling (PLS-SEM). This paper chooses PLS-SEM as the analysis is concerned with testing a theoretical framework from a prediction perspective; the structural model is complex and includes many constructs, indicators and model relationships; the research objective is to better understand

increasing complexity by exploring theoretical extensions of established theories (exploratory research for theory development); the path model includes one or more formatively measured constructs; and the research requires latent variable scores for follow-up analyses. According to (Hair et al., 2019), this paper should choose PLS is an appropriate SEM method for a study. Firstly, we examine the measurement model for our formative constructs through reliability for exploratory research should be a minimum of 0.60, convergent validity, variance inflation factor (VIF) should be close to 3 and lower. All observed indicators in our research are formative indicators. We measure the model through convergent validity test, collinearity test, statistical significance of weights, nonlinear effect test, endogeneity and unobserved heterogeneity test to check the model robustness. Goodness-of-fit test and Q square will be used in our study. The relevance of these robustness checks depends on the research context, such as the aim of the analysis and the availability of data.

5. RESULTS AND DISCUSSION

The total number of questionnaires sent to the survey was 400, after screening the unqualified votes, there were 330 qualified responses. According to (Barclay et al., 1995), the amount of samples used in the most intricate regression of the PLS path model (i.e., accounting for both measurement and structural models) should be approximately ten times the number of independent variables. This basic rule of thumb states that the smallest possible sample should be ten times the maximum amount of pointing devices pointing at any latent variable that is included in the PLS path model. This rule provides a general framework, but the minimal sample size need should take the statistical power of the estimations into account. Therefore, our sample size is suitable. Among 330 responses, in terms of professional qualifications, 13.7% of the respondents have a doctorate degree or higher, 36% of the respondents have a Master's degree, the rest have a university degree. In terms of experience in economics, finance and banking, 70.5% have worked over 10 years, 10.8% worked from 5 to 10 years, 7.2% worked from 1 to 5 years , the remaining 11.5% worked for less than 1 year. The PLS-SEM technique employing SmartPLS 4 software consists of the measurement (outer) and structural (inner) models. The structural model depicts links between constructs, whereas the measurement model depicts interactions between the data that is observed and the constructions. A method created by Hair et al. (2019) and Sarstedt & Cheah (2019) is used to access these models.

5.1 Measurement Model Assessment

Table 3 displays the values of VIF and outer weights of all items, along with corresponding p values, that are utilized to evaluate the measurement model's construct reliability and convergent validity. The table reveals that all item weights are statistically significant ($p \leq 0.05$) and have accounted of the variation of the examined construct (Benitez et al., 2020). Additionally, VIF results are below 3, showing that there is no collinearity in the model (Hair et al., 2019). Table 4 illustrates R square and Q square results. R2 values of CE and FDI are 0.48 and 0.35, which are considered moderate. All Q2 value are larger than zero which are meaningful, while Q2 values of CE and FDI are 0.23 and 0.45 depicting medium predictive accuracy of the PLS path model. Q2 predict values of all items are above zero, indicating that the model outperforms the most naïve benchmark.

Table 3. VIF and outer weights of the measurement model.

Construct	Items	VIF	Outer weights	P values
CE	CE1	1.655	0.502	0.000
	CE2	1.844	0.37	0.005
	CE3	1.646	0.308	0.018
CMP	CMP1	1.756	0.249	0.032

	CMP2	1.592	0.348	0.002
	CMP4	1.558	0.348	0.002
	CMP5	1.495	0.347	0.002
EMP	EMP1	1.418	0.247	0.021
	EMP3	1.249	0.284	0.007
	EMP4	1.323	0.319	0.000
	EMP5	1.458	0.49	0.000
FDI	FDI1	1.662	0.5	0.000
	FDI2	1.583	0.25	0.001
	FDI3	1.581	0.44	0.000
SMP	SMP1	1.654	0.245	0.004
	SMP2	1.876	0.27	0.001
	SMP3	1.784	0.273	0.005
	SMP5	1.699	0.439	0.000

Table 4. R square and Q square of the measurement model.

Construct	Item	Q^2predict	Q^2 (=1-SSE/SSO)	R-square
CE	CE1	0.211	0.23	0.351
	CE2	0.153		
	CE3	0.125		
FDI	FDI1	0.369	0.449	0.483
	FDI2	0.24		
	FDI3	0.309		

5.2 Path Coefficients Analysis

After completing the first stage, the study moves to the structural model assessment phase. This step analyzes the route coefficients discovered through the bootstrapping method in SmartPLS 4 program. The program produced 5,000 bootstrap samples to ensure accurate results.

Table 5. Path coefficients for the research model.

Links	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CMP -> CE	0.203	0.203	0.08	2.556	0.011
CMP -> FDI	0.085	0.098	0.079	1.083	0.279
EMP -> CE	0.069	0.077	0.087	0.792	0.429
EMP -> FDI	0.174	0.174	0.063	2.75	0.006
FDI -> CE	0.401	0.404	0.075	5.315	0.000
SMP -> CE	0.009	0.007	0.094	0.101	0.920
SMP -> FDI	0.510	0.507	0.066	7.672	0.000

Table 5 depicts the path coefficients result of the research model. To begin with, when analyzing the impact of Monetary Policy on the transformation to Circular economy, Contractionary monetary policy has positive impact with correlation coefficient of 0.203*** while Expansionary Monetary Policy and Stable monetary policy has insignificantly impact on the transformation to Circular economy with correlation coefficients of 0.069 and 0.009.

When the central bank implements a Contractionary monetary policy by reducing the money supply in circulation and raising interest rates, this can impact the transition to a circular economy model. The circular economy is an economic model that aims to minimize waste, promote sustainable practices, and maximize the efficiency of resource use. By raising interest rates, borrowing becomes more expensive for businesses and individuals. This leads to reduced spending on non-essential items and projects, which can contribute to lower levels of consumption. In a circular economy, the focus is on extending the life cycle of products and reducing waste. When people consume less and make more mindful purchasing decisions, it can lead to a reduced generation of waste, as products are used for longer periods and recycled or repurposed at the end of their life cycles. The study by (Huang et al., 2022) produced similar results when the study talked about the relationship between economic policy and CO2 emissions through Contractionary monetary policy. Conversely, rising interest rates leading to increased costs will drive the technological path of domestic businesses to seek alternative energy sources, as in the study on alternative power generation by (Inglesi-Lotz & Ajmi, 2021).

Similar to this, albeit negligible, the path coefficient indicates the effect of expansionary Monetary Policy on the transformation to Circular Economy is 0.069, but not statistically significant. This shows that even though an Expansionary Monetary Policy can increase economic growth and aid in the reduction of interest rates, which in turn encourages borrowing and investment, the switch from a linear to a circular economy model is much more difficult and necessitates the interaction of a number of different factors. However, the way that business can use correctly fundings to transform to sustainable economy might depend on other factors. Expansionary monetary policy can help create favorable conditions for economic development but should be coordinated with other policies such as fiscal policy. The outcome aligns with the findings of (Wen et al., 2019) which explored the effectiveness of increasing the money supply in mitigating the adverse effects of crude oil prices on China's economic progress. However, it differs from (Helm, 2020) study on monetary policy's role in reducing the coronavirus pandemic's environmental repercussions.

Similarly, the positive path coefficient of Stable monetary policy on the transformation to Circular economy is 0.009, but not statistically significant. A stable monetary policy helps reduce exchange rate fluctuations and creates a predictable environment in trade activity. This creates favorable conditions for enterprises to participate in international markets, boost exports and expand consumption markets. This result is similar to (Chan, 2020) when the paper proposed about twenty CE practice proposals in SMEs in favor of the stable monetary policy.

Table 5 also presents the impact of Monetary policy on Foreign Direct Investment. EMP and SMP positively influence to FDI with correlation coefficients of 0.174*** and 0.51*** while CMP impacts positively on FDI with correlation coefficients of 0.085 but insignificant.

Contractionary monetary policy is often used to control inflation, minimize financial risks, and maintain economic stability in the country. This reduces the value of exports and makes foreign goods and services more competitive in the domestic market. This can attract foreign businesses to invest to take advantage of prices and compete in the domestic market. Lower prices in the domestic market may encourage foreign businesses to invest and compete. However, the impact of contractionary monetary policy on foreign

direct investment is complex and can have several outcomes. This result supports the result of (Al-Hallaq et al., 2020).

Expansionary monetary policy involves increasing the money supply and lowering interest rates to stimulate economic growth and investment. This can encourage foreign investors to borrow locally to finance their investments, as the cost of capital is reduced. Expansionary monetary policy aims to stimulate economic activity and increase aggregate demand. Growing economies often offer more potential for profits and returns on investments, making them attractive destinations for FDI.

Similarly, Stable monetary policy, characterized by steady and predictable interest rates and inflation rates, can also have positive effects on FDI. When monetary policy is stable and well-communicated, investors can make more informed decisions about their long-term investments. They are more likely to commit capital when they have confidence that their investments will not be undermined by sudden policy changes. This stability allows investors to better assess risks and make informed decisions about their long-term projects. Attracting these institutional investors can lead to significant inflows of FDI.

Table 5 also investigates the impact of Foreign Direct Investment on the transformation to Circular Economy. A high positive path coefficient (0.401***, $p \leq 0.05$) is obtained for the impact of FDI on CE showing that FDI is often accompanied by the transfer of technology, knowledge and modern management processes from developed countries. From the research paper (Gigli et al., 2019) has also shown the role of FDI inflows in technology to help other countries expand end-of-life tire recycling technologies. This can significantly enhance production capacity and overall business performance for domestic enterprises. By adopting new technologies and management processes, businesses can drive innovation and improve their competitiveness as they transition to a circular economy. In addition, foreign direct investment can also promote competition and help strengthen the capabilities of domestic enterprises. To thrive and remain competitive, businesses that are up against foreign rivals must enhance the quality of their products, cut down on production expenses, and refine their overall business operations. This shift toward sustainable growth is key to creating a circular economy with minimal negative environmental and natural resource impacts. That has been proven by research by (Marino & Pariso, 2020). However, the research result of (Inglesi-Lotz & Ajmi, 2021) shows the difference in the relationship between FDI and CE, specifically with different conditions when surveying the power sector, when raising interest rates will reduce FDI.

5.3 Indirect Effects Analysis

Table 6 illustrates the findings of the Indirect effects for the research model, which involved examining the route coefficients obtained via the bootstrapping technique using SmartPLS 4 software. A total of 5,000 bootstrap samples were generated for this purpose.

Table 6. Indirect effects for the research model.

Links	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CMP -> FDI -> CE	0.034	0.039	0.032	1.08	0.280
SMP -> FDI -> CE	0.204	0.206	0.052	3.96	0.000
EMP -> FDI -> CE	0.07	0.07	0.029	2.38	0.017

There is a positive indirect effect of (SMP -> FDI -> CE) and (EMP -> FDI -> CE) with coefficients of 0.204*** and 0.07***. Foreign Direct Investment's mediating effect on Stable Monetary Policy's impact on the transformation to Circular Economy is statistically significant. This finding emphasizes the positive regulatory influence of FDI during stable monetary policy, will further improves the shift towards a circular economy.

By incentivizing sustainable practices, promoting innovation, fostering collaboration, and addressing environmental challenges, regulations can accelerate the transition towards a circular economy, attracting foreign investments that align with sustainability goals.

Similarly, Foreign Direct Investment's mediating effect on Expansionary Monetary Policy's influence on the transformation to Circular Economy is statistically significant. By aligning positive regulatory influence with expansionary monetary policy, countries can create a conducive environment for businesses to invest in and adopt circular economy practices. This combination of increased investment, innovation, consumer demand, and corporate responsibility can accelerate the shift towards a circular economy and promote a more sustainable and resilient economic model. However, it's essential to strike a balance and ensure that the expansionary policies do not lead to unsustainable consumption patterns or neglect environmental considerations. Effective policies should be designed to promote both economic growth and environmental sustainability in a synergistic manner.

However, we do not find a regulatory role of FDI during Contractionary monetary policy (CMP -> FDI -> CE) will promote the transition to a circular economy.

5.4 Structural Model Assessment

Next, the structural model was used to test the hypotheses. The GoF (goodness-of-fit) indices, including d_ULS = 0.202, d_G = 0.122, NFI = 0922, SRMR = 0.034, demonstrated that the structural model fit the data.

All predicted correlations were confirmed statistically ($p < 0.05$), except for hypotheses H2 and H6. The outcomes of the structural model can be found in Table 7 and Figure 2 displays the findings of the study model.

Table 7. Results of structural model testing.

Hypothesis	Relationship	Proposed effects	SRW	Results
H1	EMP -> FDI	Positive	0.174***	Supported
H2	CMP -> FDI	Negative	0.085^{ns}	Not Supported
H3	SMP -> FDI	Positive	0.510***	Supported
H4	FDI -> CE	Positive	0.401***	Supported
H5	EMP -> CE	Positive	0.069^{ns}	Supported, but not significant
H6	CMP -> CE	Negative	0.203***	Not Supported
H7	SMP -> CE	Positive	0.009^{ns}	Supported, but not significant
H8a	CMP -> FDI -> CE	Mediating	0.034^{ns}	Supported, but not significant
H8b	SMP -> FDI -> CE	Mediating	0.204***	Supported
H8c	EMP -> FDI -> CE	Mediating	0.070***	Supported

*** $p < 0.001$; ns: Not significant at $p < 0.05$

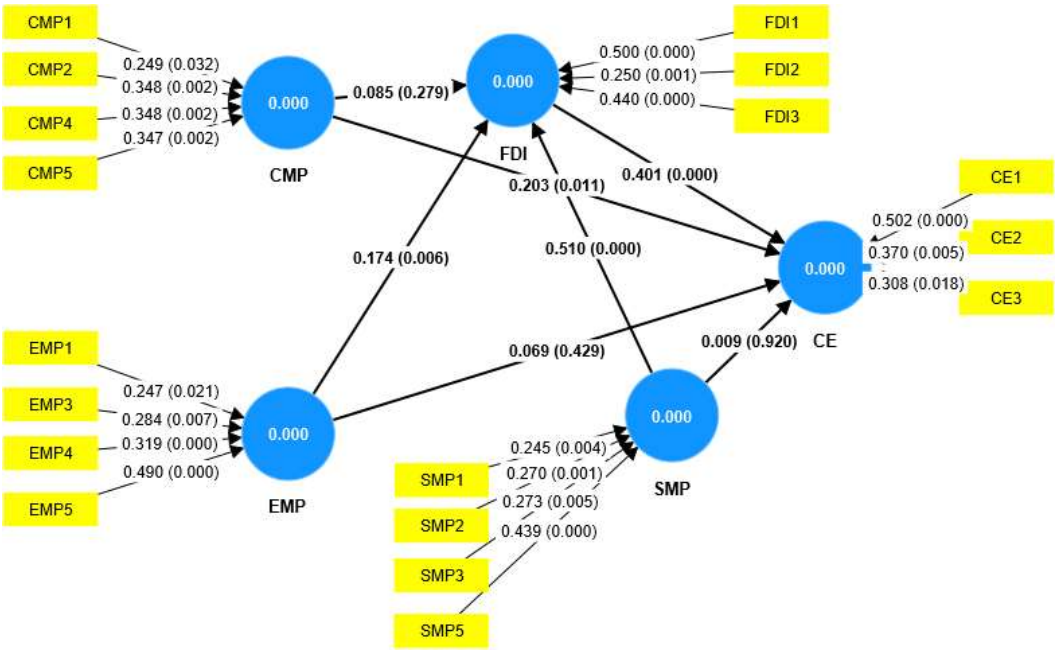


Figure 2. Research Result Model.

6. DISCUSSION AND CONCLUSIONS

Firstly, this study aims to explore how monetary policy impacts Vietnam's shift towards a circular economy, considering the regulations surrounding foreign direct investment. The paper demonstrates how contractionary monetary policy favorably statistically significantly influences the shift to a circular economy. Although not statistically significant, the stable, expansionary monetary policies favor the change to a circular economy. The research findings are in line with a study on the impact of expansionary monetary policy on green development by Wang et al. (2021). The research of (Awijen et al., 2022) also pointed out that stability in political policy is the driving force to deploy and develop projects green energy renewable project. However, the short-term impact is still insignificant. It must be left to the long-term, when policies associated with sustainable models can help increase the efficiency and quality of renewable energy production. The multifaceted influence of monetary policy on carbon emissions is demonstrated by research (Ullah et al., 2021). Positive and negative shocks from Monetary Policy tools can raise carbon emissions to the environment in the near term, but they will help regulate and lower emissions over the long run. Changing the perspective, if we consider the opposite effect of CE on MP, the study of (Dafermos et al., 2018) will show the effect of variable climate change on businesses' financial stability. The study results show the negative impact of climate on the "financial health" of corporations. Climate change increases the risk of default on loans, profitability and companies' liquidity. Damages from climate change can reallocate portfolios, driving down bond prices. Finally, credit expansion will be negatively impacted by climate-related financial instability, which will exacerbate the effects on the national economy.

Secondly, to raise awareness, expand infrastructure, and advance technology for environmentally friendly growth, this research also offers factual evidence on the beneficial effects of foreign direct investment on the transformation to a circular economy. The studies by (Mignacca et al., 2020) and (Gigli et al., 2019) support this conclusion. Both studies emphasize that investment in green development technologies will help attract FDI. Models of waste reduction in the production, construction and demolition processes or the recycling technology of 'end-of-life' tires can all be interested and replicated by foreign investors' scope of use to surrounding countries. Besides, the research paper of (Tomić & Schneider, 2020) argues that FDI will affect the environment

in EU countries, specifically requiring the government to have management objectives, more specific waste and reduce costs for the people (citizens) using the waste management system.

Thirdly, the role of FDI as a mediating component in the link between MP and CE was investigated in this study. The results indicate that SMP and EMP positively affect CE through FDI, with FDI playing a mediating role. This is consistent with (Chan, 2020)'s study which suggests that the stability of fiscal policies, monetary policies and carbon tax policies will reduce environmental pollution. Additionally, the report mentions the correlation between FDI and policy stability and CO2 emissions, providing evidence that FDI plays an intermediary role in regulating CO2 emissions of the policies mentioned in the study. In (Adebayo, 2022)'s study mentioned that stability in the economy and politics would attract more FDI from abroad, leading to stricter environmental policies and addressing the climate crisis. Furthermore, (Belaïd et al., 2021)'s study provides a regression model including 3 variables: FDI, CO2 and political stability. After analyzing the correlation test results, it can be concluded that FDI is also a key element in connecting the relationship between EMP, SMP and CE.

7. THEORETICAL CONTRIBUTIONS AND MANAGERIAL IMPLICATION

Our research offers the findings of a study on the function of FDI in supporting the theoretical features of the circular economy as well as the expansionary and stable monetary policies to promote or contractionary monetary policies to restrict the conversion process to a circular economy. Both theoretical and real-world policy implications for Vietnam may be drawn from this finding.

We contribute two main points in terms of theory. Firstly, the study offers a valuable contribution to the circular economy by shedding light on transitioning from a linear economy to a circular. It provides a deeper understanding of the mechanism behind this conversion process, offering valuable insights and knowledge. This increases knowledge of important factors and the process of economic transformation. The research results provide information on the determining factors and impact of monetary policies on the transition process. This helps to identify important factors that need attention and policy direction to achieve an effective and sustainable transition process. Secondly, this research sheds light on the crucial role of monetary policy and foreign direct investment (FDI) in transitioning from a linear to a circular economy. Policies can focus on adjusting monetary policies, attracting, and encouraging FDI, and creating a favorable environment for technology transfer and training. The results from this research provides evidence to identify the factors, processes, and impacts of monetary policies and FDI in the economic transition process, thereby expanding and developing the existing theory of circular economy.

We contribute two points from the perspective of policy implications. Firstly, Vietnamese government and central bank can utilize the results of this study to inform their policy decisions and develop effective economic strategies to facilitate this transition. The study can provide practical tools, procedures, and policies for managing money that will support the shift to a circular economy while minimizing risks and adverse effects. Furthermore, the study's findings give the Central Bank and other government agencies in Vietnam the data they need to make choices on how to modify their monetary policies to transition to a circular economy successfully and sustainably. Therefore, recommendations and proposals for changing and thinking about monetary policy can be made. Secondly, the positive impacts of FDI on increasing investment capital for Vietnam were revealed by a research study. The infusion of investment capital through FDI could provide financial resources for initiatives that promote the recycling, reusing, and preservation of resources, thereby facilitating the transition toward a circular economy.

Applying advanced technology and modern management in Vietnamese businesses can promote the transition towards a circular economy by improving labor productivity, enhancing product quality, and diversifying products. Additionally, FDI helps expand export markets for Vietnamese companies through the scale and power of foreign-invested companies, thereby contributing to developing the recycling, conservation, and reuse industries as well as creating favorable conditions for Vietnamese businesses to access international markets.

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Author contributions

Conceptualization, Nguyen-Quynh-Nhu Ngo; Methodology, Nguyen-Quynh-Nhu Ngo; Software, Nguyen-Quynh-Nhu Ngo; Validation, Ngoc-Tien Hoang; Formal analysis, Ngoc-Tien Hoang; Investigation, Ngoc-Tien Hoang and Nguyen-Quynh-Nhu Ngo; Resources, Minh-Tung Tran; Data curation, Minh-Tung Tran; Writing - original draft, All; Writing - review & editing, Ngoc-Tien Hoang and Nguyen-Quynh-Nhu Ngo. All authors have read and agreed to the published version of the manuscript.

Declaration of Competing Interest

None to declare.

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