**UNIVERSITY COLLEGE LONDON**

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# Master thesis

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# Foreign Bank and Financial Development:

# Factors Affecting Foreign Bank Effects in CEE Countries

*Master thesis*

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## Abstract

This dissertation analyses country-level data for 12 CEE countries from 2000 to 2021 using the Dynamic GMM methodology. The aim of this article is to investigate the effect of foreign bank entry on four dimensions of financial development, which are financial stability, efficiency, depth and access. Furthermore, the article will examine the factors affecting foreign bank effect, including the economic and institutional level of domestic banks and the extent and stage of foreign bank entry. The result shows that foreign bank penetration has a positive influence on financial stability and efficiency, while it has a negative effect on financial depth and access. In general, a high level of economic development and a stringent and well-developed institutional environment is favourable for foreign banks to exhibit a positive influence on financial development. And the bad influence of foreign banks on financial depth and access is diminishing over time. Results regarding the relative importance of foreign banks indicate a mixed conclusion. Overall, this dissertation supplements empirical evidence on the link between foreign banks and financial development in CEE regions and could provide more insights to policymakers.

**Keywords:** Foreign Bank, Financial Development, CEE Region, Economic Level, Institutional Environment, Cherry-Picking, Dynamic GMM

### Abstrakt

Tato disertační práce analyzuje data na úrovni zemí pro 12 zemí střední a východní Evropy v letech 2000 až 2021 pomocí metodiky dynamického GMM. Jejím cílem je zkoumat vliv vstupu zahraničních bank na čtyři dimenze finančního rozvoje, včetně finanční stability, efektivity, hloubky a dostupnosti. Dále se článek bude zabývat faktory ovlivňujícími efekt zahraničních bank, včetně ekonomické a institucionální úrovně domácích bank a rozsahu a fáze vstupu zahraničních bank. Výsledek ukazuje, že pronikání zahraničních bank má pozitivní vliv na finanční stabilitu a efektivnost, zatímco na finanční hloubku a přístup má vliv negativní. Obecně platí, že vysoká úroveň ekonomického rozvoje a přísné a dobře rozvinuté institucionální prostředí je příznivé pro to, aby zahraniční banky vykazovaly pozitivní vliv na finanční rozvoj. A špatný vliv zahraničních bank na finanční hloubku a dostupnost se postupem času snižuje. Výsledky týkající se relativního významu zahraničních bank naznačují smíšený závěr. Celkově tato disertační práce doplňuje empirické důkazy o vztahu mezi zahraničními bankami a finančním rozvojem v regionech střední a východní Evropy a mohla by poskytnout více poznatků tvůrcům politik.

**Klíčová slova:** Zahraniční banka, finanční rozvoj, region střední a východní Evropy, ekonomická úroveň, institucionální prostředí, Cherry-Picking, dynamický GMM

**Range of thesis: 85 pages**

## Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague 31 July, 2023 **Jiale Hou**

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## 1. Introduction

One of the most significant changes in the financial structure of the Central and Eastern European (CEE) countries since the 1990s has been the massive entry of foreign banks into their banking systems. The rise in the market share of foreign banks in CEE countries is a symptom of the integration of the banking systems of mature market countries and CEE countries. By the end of 2021, foreign banks have dominated in CEE nations among CEE economies. In some nations such as the Slovak Republic,  even 99 percent of all bank assets were held by foreign banks. Central and Eastern European is therefore an excellent region to study the link between foreign bank presence and financial development.

Academics have done extensive studies on the link between the presence of foreign banks and the domestic nations' financial development. There are many arguments in favour of the positive influence of removing restrictions on foreign bank entry on financial development (Cho, 1990; Berger et al., 2001; Sturm & Williams, 2004). In general, foreign banks are believed to have advanced management concepts and technologies, which help to improve the operational efficiency of the banking sector, increase the size of capital and improve the management experience of the host nation's banking system. The entry of foreign banks helped to transform the unfavourable situation of the banking system in the early stage of losses. Moreover, the liberalisation of the financial sector has a positive influence on the private sector's access to credit (Fiador, et al., 2022; Clark, et al., 2005). With offshore funding as a guarantee, foreign banks do not contract their credit size significantly, which is favourable to financial stability in CEE (Keeley, 1990, Boot and Thakor, 1993; De Haas and van Lelyveld, 2014). But the economic crisis at the end of the 20th century, the economic crisis of 2008 and the subsequent euro crisis, as well as the varying economic development of the countries of CEE in recent decades, have also triggered questioning and even opposition to financial globalization and integration in the academic community. They argue that the corresponding exchange rate movements in international markets and the risks associated with abrupt changes in other financial markets can also be more easily transmitted to foreign banks in host countries, thus reinforcing domestic financial instability. (Buch, 2000, Morgan et al, 2004, Cetorelli & Goldberg, 2012; De Haas & Van Horen, 2013; Anginer et al. 2014). Foreign banks perform less well than local banks owing to the cost of foreignness, which lowers the efficiency of the banking industry (Liu, et al., 2021). In addition, due to the cultural differences between foreign banks and the host country, the serious information asymmetry between banks and enterprises as well as the concerns of economy of scale, foreign banks may produce the 'cherry-picking' phenomenon. Foreign banks only choose large-scale customers with hard and transparent information, thus limiting small and medium enterprises' access to credit (Berger et al., 2001, Love et al., 2016).

While a significant collection of literature has analysed the influence of foreign bank presence on financial development in host nations, the relationship between foreign penetration entry and financial development may not be unidirectional. The impact of foreign banks is influenced by a variety of conditions including the economic and institutional factors of the host country, the relative importance of the foreign bank and also the stage of bank entry. In general, higher levels of national economic development and better institutional regulations usually provide a favourable environment for the penetration of foreign banks. Foreign banks tend to enter rich markets, which will increase efficiency and credit and also contribute to the creation of a stable financial market (Van, 2007; Vogel & Winkler, 2010; Gormley, 2010). Meanwhile, the detrimental effects of foreign bank entrance are often lessened by strict capital requirements, high market entry barriers, and efficient credit information sharing. Additionally, improved external governance and regulation will strengthen the consequences of international banks' spillovers (Maurer, 2008; Yin, 2021; Shabir et al., 2023). Different effects on financial development may also depend on the relative prominence of foreign banks in the host nation. Some academics think that having more foreign banks has a beneficial effect on financial growth (Allen & Gale, 2003). However, opponents argue that the proportion of foreign banks is not necessarily related to financial development, or even inversely related (Boyd et al., 2003; Marton, 2003). Finally, the basic consensus is that the negative impacts of foreign banks subside over time. As foreign banks continue to penetrate the banking markets of transition countries, the differences in behavioural preferences between foreign and domestic banks will gradually diminish, and therefore the negative behaviour of foreign banks should not be generalised (Hawkins, 2006; Chadi, 2019)

As the conclusions and findings are varied in this field and the Covid-19 has exposed many issues in the global financial markets where financial integration is gradually deepening. This article adds to the body of knowledge on foreign bank penetration and financial development in CEE countries. The article will analyse country-level data for 12 CEE countries from 2000 to 2021 using the Dynamic GMM methodology. The purpose of the article is to examine the influence of foreign bank presence on four aspects of financial development, including financial stability, efficiency, depth and access. Furthermore, the article will examine the factors affecting foreign bank entry, including the economic and institutional level of domestic banks and the extent and stage of foreign bank entry. The structure of this article is as follows. Chapter 2 will introduce the background information on foreign bank entry in the targeted CEE region, especially the history of why and how foreign banks entered and dominated the CEE market. The related literature about foreign banks' effect on four dimensions of financial development will also be analysed. Chapter 3 will make a detailed description of the research question and propose four hypotheses. Specifically, the article will put forward hypotheses with regard to whether the foreign bank effect depends on the economic level, institutional environment and relative importance of foreign banks in domestic countries and whether the effect will change over time. Chapter 4 will build a basic research structure for the article. This chapter will introduce the variables, data description and empirical model. Pre-regression tests including multicollinearity and stationary will also be carried out. Empirical results and robustness tests will be analysed and discussed in Chapter 5. The final Chapter will make a conclusion to this article.

# 2. Background Information and Literature Review

## 2.1 History of Foreign Bank Entry in CEE Countries

After the financial crisis in CEE countries in the early 1990s, the privatisation process of state-owned banks greatly accelerated the pace of foreign bank entry. In the 1990s, privatisation became the main theme of banking system reform in CEE countries. Since financial markets in CEE countries are neither perfect nor developed, the burden of commercial banking reform cannot be accomplished by relying solely on domestic financial resources and markets. Besides, the usual assumption is that foreign investment will bring advanced technology, promote competition, and favour banking reform. Meanwhile, foreign banks were willing to acquire shares in commercial banks in CEE countries in order to expand their market share in the region and improve their internationalisation. Therefore, in the transition process, CEE countries intended to take the equity reform of commercial banks as an opportunity to open up their financial sector to foreign investment, trying to establish an efficient and complete financial system in the shortest possible time. Given this, the governments of CEE countries have implemented a radical open-door policy for the banking system. First, they have lowered or even cancelled the entry thresholds for foreign banks and loosened the limitations on the opening of branches by foreign banks. Second, foreign banks were allowed to participate in state-owned banks as strategic investors or to acquire domestic banks.

Small and medium-sized banks made up the majority of the institutions sold at first, but huge state savings banks and foreign trade banks were also sold after 1999. By the end of 1999, foreign ownership of the banking sector in Hungary had reached about 60 percent, making it a pioneer in the privatisation process. Poland's privatisation process was gradual but accelerated between 1999 and 2000, with foreign control also reaching 53 percent after the sale of Pekao Bank in mid-1999. The privatisation of state-owned banks in the Czech Republic started in 1998, and by the start of 2000, three of the country's four largest state-owned banks had been sold, increasing foreign ownership to 60%. Additionally, foreign ownership of Czech surpassed 70% with the 2001 privatisation of the last surviving state-owned bank. After the privatisation and foreignisation of the financial system transformation, domestic private capital lagged behind foreign banks with respect to both management experience and capital size. The commercial banking system in CEE countries showed a clear tendency towards foreignisation and the establishment of a bank-dominated financial system. Prior to the financial crisis in 2008, most nations had achieved their maximum level of foreign bank entrance. However, following the financial crisis and the European debt crisis, several countries saw a fall in the percentage of foreign banks. For example, Poland's foreign bank presence dropped because of the crisis, but it is still above 60 percent. 11 CEE nations in our sample, except Albania, have now joined the European Union, and 10 of the nations that joined in 2004 and 2007 have completed the transition to mature market economies (Alam, 2008).

## 2.2 Effects of Foreign Banks on Financial Development

A significant amount of scholarship has investigated how foreign banks affect financial development. However, it is crucial to make clear why foreign banks and financial development should be the major emphasis of this article before beginning the literature analysis. Firstly, we learnt that the financial system in Central and Eastern Europe is dominated by banks, and bank assets occupy a dominant position in financial assets. Therefore, the influence of foreign banks on financial development is worth studying. Secondly, financial development is closely related to economic development (Levine et al., 2000; Cihaket al., 2013). The idea of financial deepening was put out by Shaw in 1973. According to this theory, a nation's financial development would have an impact on its economic growth, which is a crucial objective for any nation to pursue. In order to accomplish the coordinated development of interest rates, savings, investments, and economic growth, he contends that emerging nations should quicken the financial system's reform and distribute resources effectively via the market. Merton& Bodie (1995) put forward the theory of financial services that the financial system, whether bank-based or market-based, can provide financial services for economic development by fulfilling its unique function. Additionally, several empirical researches have shown that financial development aids in economic growth. For example, Aghion et al.(2005) analysed data from 71 countries during 1960-1995 and concluded that the lower the level of financial development, the lower the probability of a country converging with the economic growth rate of the United States. Using survey data from more than 4,000 businesses across 54 countries, Beck et al. (2005) performed regression analyses and discovered that nations with low levels of financial development also developed small- and medium-sized businesses (SMEs) at a slower pace. The significance of SMEs to a nation's economic growth makes it impossible to undervalue the contribution of financial development to economic expansion. Overall, in the context of the CEE countries, despite the fact that 11 CEE countries have joined the EU, these countries still have a large gap with the older Western European member states in terms of economy (Liebscher, 2006). Therefore, the research on foreign banks and financial development can help to reduce the economic gap between EU countries and facilitate the process of European integration.

To quantify financial development more precisely, Cihak et al.(2012) proposed four criteria for financial institutions and markets. And the four dimensions of financial development are used to construct Global Financial Development Database, which is publicly available at World Bank Database. The first one is financial stability, defined as the resilience of financial systems to stress. It is often measured by bank Z-score. The second one is financial efficiency, which measures how successful the financial institution is at turning expenses into revenue. Common metrics include Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin. The size of financial markets in relation to an indicator of economic production is what is meant by the third dimension, financial depth. Private credit as a percentage of GDP is a proxy that has drawn significant attention in the empirical literature in this respect. The final one is financial access. The measurement focuses on density metrics, including the proportion of ATMs or bank branches per person. Therefore, both the literature review and empirical analyses that follow in this article will be framed in terms of these four dimensions of financial development.

### 2.2.1 Financial Stability

As an important aspect of financial development, financial stability and its correlation with foreign banks received lots of attention. However, the conclusions are controversial and vague. Many academics agree that the efficient functioning of foreign banks enhances the host nation's banking sector and boosts the overall soundness of the financial system. According to Barth et al. (2001), ownership arrangements with more diversification are often less likely to have financial crises. After examining the local merger and acquisition (M&A) behaviour of foreign banks in seven Latin American emerging market countries, Crystal et al. (2002) draw the conclusion that foreign participation in the control of domestic banks generally has a beneficial effect on the stability and growth of these nations financial systems. The presence of foreign banks can induce regulatory bodies to step up financial oversight and harmonise domestic banks' accounting and disclosure standards with those of international practices, thus improving the quality of data and the environment for financial regulation (Bonin et al.,1998). Conversely, some studies have argued that the penetration of foreign banks could exacerbate instability in the financial markets of host countries. Empirical research on emerging countries showed that the presence of foreign banks exacerbates the instability of the host country's banking system (Yin,2019; Chen, et al., 2017; Wu, et al., 2017). It was stated by Stiglitz (1993) that foreign banks do not often behave in line with the desires of the host government. This results in a loss in the power of the host government to regulate its own economy, which may enhance the vulnerability of a country's financial system. Moreover, the introduction of foreign banks results in a reduction in the worth of bank franchises, thus diminishing the profitability of the sector. This prompts banks to engage in competitive measures, such as undertaking precarious loan operations, which will amplify instability. (Carletti & Hartmann, 2003).

One point of contention in the discourse about the impact of foreign banks on financial stability is the correlation between competitiveness and stability. It is a consensus that foreign bank penetration will increase the competition in the domestic market (Barth et al., 2001; Popov & Horen, 2019). The supporters of ‘foreign bank and stability’ believe that competition will lead to stability. Schaeck et al. (2009) conducted a study whereby they used the Panzar and Rosse H statistic as a means to assess the level of competitiveness in 45 different nations. The findings of their study indicate that banking systems that exhibit higher levels of competitiveness are less susceptible to experiencing systemic crises. The opposite perspective of ‘competition-stability’ is ‘competition-fragility’. Acharya & Kagan (2004) examine the interactions among commercial bank capital adequacy, competitiveness, and internationalisation spillovers, and argue that the penetration of foreign capital can lead to instability in the financial systems of emerging market countries, which, at least to a certain extent, stems from the financial liberalisation that brings about increased competition and higher risk incentives in the banking sector. Increasing competition will also affect financial stability through decreased bank market power. Turk-According to Ariss (2010), there is a statistically significant positive association between banks' market strength and overall stability using data on 821 banks from 60 developing countries between 1999 and 2005. Subsequently, Jiménez et al. (2013) also found a positive correlation between bank market power and stability in the Spanish banking market. These all prove that the penetration of foreign banks leads to increased competition thereby destabilising banks.

A key measurement of how foreign banks will affect financial stability is how well they function during financial crises. It is believed that foreign banks are usually well-capitalised and have strong international market financing capabilities, making it easier for branches and subsidiaries of large international banks to have access to additional funds and capital from their parent company when needed. Because the parent firm often has a more globally diversified portfolio than domestic banks, which means that its revenue streams are less connected with wholly local shocks, it is able to offer this capital (Yilmaz & Koyuncu, 2010). Meanwhile, foreign banks can mitigate the flight propensity of host country residents. De Haas & Van Lelyyeld (2005) argue that the introduction of foreign banks allows host country residents to switch their deposits from failing local banks to reputable foreign banks, thus avoiding the impact of flight on exchange rate stability and balance of payments. Peek & Rosengren (2000), Berger et al. (2001), Martinez Peria et al. (2002) and Kraft (2002) have done regression analyses to show that in emerging markets foreign banks do not have 'cut and run' behaviour, which refers to the reduction of the market supply of credit when the host economy is in recession. Moreover, it is the diversification of bank equity that ensures the scale of social credit and investment necessary to stabilise the economy, thus preventing further deterioration. Dages et al. (2000) examine the lending practises of domestic and international banks and discover that variety of ownership supports credit stability during times of financial system instability and volatility. Furthermore, Bonin & Louie (2017) demonstrate that foreign banks' responsiveness to host conditions becomes less procyclical as exposure increases.

However, some research argued that foreign bank is more likely to exacerbate the economic crisis. Peek & Rosengren (1996) and Dekle & Lee (2015) argue that foreign banks tend to contract lending on a large scale or even withdraw capital in times of difficulty in the home country, causing the financial crisis to escalate. Peric et al. (2018) used dynamic panel data and derived that foreign banks often shift international risk from parent to host nations. For example, during the Southeast Asian financial crisis of 1996-1998, not only did the crisis countries receive a significant reduction in cross-border claims, but foreign banks in these countries also significantly reduced their lending to host country firms by more than 40% (Harvie & Van Hoa, 2016). Ma (2018) argues that the penetration of foreign banks may deepen the host country's overdependence on foreign loans, thus triggering a debt crisis. Due to insufficient savings, the economic development of the host countries, especially developing nations, depends on external debt to a certain extent, and the entry of foreign banks provides a convenient intermediary for this dependence. Some countries have blindly borrowed large amounts of foreign debt in an unrealistic pursuit of high economic growth.

### 2.2.2 Financial Efficiency

Numerous empirical studies have argued that changes in bank ownership are important for the improvement of bank efficiency. The first extensive analysis of the effects of foreign bank entrance was done by Claessens et al. (2001). The introduction of foreign banks enhances the effectiveness of banks in the host countries and increases the degree of welfare in these nations, according to research that looked at data on 7900 banks in 80 developing and developed countries during the years 1988 to 1995. Levine (2004) further quantitatively examined this study and concludes that with each unit reduction in the degree of restriction on the entry of foreign banks, the level of bank's level of net interest margin decreases by roughly three percent. This implies that the host nation's banking system becomes more competitive and effective with the admission of international institutions. Bremus (2015) tested the impact of foreign bank penetration on the market structure of the banking industry in 18 OECD nations between 1995 and 2009 using the two-country general equilibrium model with heterogeneous banks developed by DeBlas & Russ (2010). Bremus found that the entry of foreign banks decreased bank concentration and increased the competition and efficiency of banks in the domestic nations. Lots of national-specific literature have come to similar conclusions. Taci & Zampieri (1998) studied the cost efficiency of Czech banks using stochastic frontier analysis (FA). The researchers conducted an analysis including many factors, including efficiency, size, and ownership structure. Their findings indicate that privately and foreign held banks exhibit a comparatively higher average level of efficiency. Nikiel & Opiel (2002) analysed Polish banking data for the years 1997-2000 and they found that foreign banks have higher cost efficiency than domestic banks. Mulyaningsih et al. (2015) used the model developed by

Bikker et al. (2012) and adopted the Panzar-Rosse method and found that the entrence of foreign banks in Indonesia helped create a contestable and efficient market.

Supporters of foreign bank entry have the following arguments. First of all, foreign banks may profit from stronger oversight by private shareholders and better incentives for management due to the high correlation between foreign and private ownership in many CEE nations (Baudino, 2004). Secondly, Foreign banks could offer their expertise in risk analysis and business organisation (Weill, 2003). According to Levine (2001), the presence of foreign financial institutions boosts the financial sector's overall operational effectiveness and helps both the public and private sectors' financial infrastructures grow. By encouraging competition via demonstrative and pull effects, as well as by significantly lowering the transmission pathways like the spreads of the banking system, the admission of foreign banks improves the efficiency of the host country's banking system. Jeon et al.(2011)'s study results revealed that foreign bank entry leads to increased competition, compelling domestic banks to improve their efficiency and service quality. Additionally, the existence of foreign banks encourages the development of new technologies and the adoption of best practises by local banks, improving the overall effectiveness of the banking sector.

Not all empirical research, nevertheless, came to the conclusion that international banks are more effective than local banks. Using a sample of 43 banks, Kraft & Tirtiroglu (1998) employed a stochastic frontier analysis technique to forecast the degree of scale efficiency and cost efficiency in the Croatian banking industry in 1994 and 1995. The results obtained indicate that foreign banks are less cost and scale efficient compared to old private or state-owned banks.  According to a research by Moguillansky et al. (2004) on Mexico, international banks did not help to foster competition to increase financial efficiency because of their rent-seeking approach when they entered the Mexican market via mergers and acquisitions.  Uiboupin (2005) studied a sample of 319 banks in CEE transition nations between 1995 and 2001 and came to the conclusion that as more foreign banks entered the market, the host country banks' pre-tax profitability, non-interest revenue, interest income, and loan loss provision ratios all notably decreased. While the general operating cost ratio increased, it is insignificantly.  According to Yeyati & Micco (2007), the 1990s entrance of international banks into Latin American nations diminished bank competition and effectiveness.

The causes of foreign banks' detrimental effects have been outlined in a variety of linked academic works. The performance advantage of state-owned banks may stem from the organisational diseconomies of foreign banks, which are subject to remote control in both operating and supervising the bank or from cultural barriers that prefer state-owned banks (Berger et al, 2000). Meanwhile, after more than a decade of financial system reforms, domestic banks in some transition countries have been asset-optimised and their competitiveness has increased substantially (Barros, 2005). The research also implies that variations in bank size or corporate structure may contribute to efficiency discrepancies between state-owned and international banks. If foreign banks are smaller than state-owned banks, the higher efficiency of foreign banks could stem from the diseconomies of scale of state-owned banks instead of the better management abilities of foreign banks (Weill, 2003). Although both size and operations are the result of managerial choices, it takes time to make adjustments to size and operations, as large adjustment costs can affect the process of capital investment.

### 2.2.3 Financial Depth and Financial Access

Numerous studies have shown that the introduction of foreign banks may hasten the development of financial access and deepening, particularly in developing nations. The large-scale penetration of foreign banks not only increases the supply of credit resources in the host country but also improves the credit structure, which is conducive to financial deepening in the host country (Giannetti & Ongena, 2005). In a pan-African study of banks, Leon & Zins (2020) discovered that the presence of foreign banks boosted the amount of bank credit in the host nation. According to Beck and Cull (2014), the presence of foreign banks is linked to a notable increase in the number of bank branches and the accessibility of financial services in distant and underdeveloped areas. Moreover, foreign banks tend to introduce new products and innovative services, contributing  to unbanked people and small and medium-sized businesses (SMEs) getting access to credit. Given the distinctiveness of COVID-19 and the effect of the embargo on economic activity, Yao et al. (2022) discover that while lending by foreign banks' subsidiaries decreased significantly, foreign banks' lending rates remained higher than those of local banks.

The explanations mentioned in the literature are summarized as follows. Firstly, foreign banks can facilitate financing, attract foreign capital from international financial markets in transition countries and alleviate the pressure of the twin shortfalls of investment funds and foreign exchange funds in transition countries. Buch & DeLong (2004)’s study finds that cross-border bank mergers can enable foreign banks to leverage their international network to facilitate financing and attract foreign capital. These mergers may also result in more competition among banks in the local banking sector, which would improve financial intermediation and loan availability for borrowers. For example, according to Zhuang (2008), the presence of foreign banks promotes competitiveness in the domestic banking sector, encouraging local banks to improve both the amount and quality of loans available. Moreover, additional credit alternatives and cutting-edge financial products are offered by international banks, which facilitates domestic consumers' access to credit and financial services. According to empirical research by Peek et al. (2000), for a significant amount of time following arrival, foreign banks in transition nations consistently contributed far more to the development of loans to local enterprises than the commercial banks of the host country. Abundant capital and well-developed trading instruments have met the growing investment and financing needs of transition countries. Meanwhile, it is also because of the increasingly strong contractual relationship with foreign banks that many domestic enterprises have been motivated to improve their governance structure and accounting standards in line with international standards.

The penetration of foreign banks can deepen financial depth and access by changing the financing system of the host country. Giannetti & Ongena (2009) argued that most developing countries have been practising a relatively closed development strategy for a long time, and their financing channels are overly dependent on internal accumulation. After the entry of foreign banks, not only can they break this closed financing status and open up new channels and new ways for domestic simple financing, but also they can have a positive significance in regulating and promoting the development of the securities market through their participation in the stock and bond markets. For example, De Haas & Van Lelyveld (2002) classify the credit resources provided by foreign banks to the host country into the loans directly provided by foreign bank branches in the parent nations and the cross-border loans provided by the head office or other branches of foreign banks outside the host country. They argue that the penetration of foreign banks increases the supply of credit and reduces the cost of loans for domestic enterprises. De Carvalho (2000) points out in his study that foreign banks will be more independent of regional governments and minimise "credit rationing" due to government pressure, thus helping to reduce distortions in the allocation of domestic credit resources. At the same time, in the case of a change in the economy, adequately funded foreign banks are capable of and willing to lend to local companies rather than limiting or even ending credit as domestic banks do. Weill's (2003) study also shows that, on average, foreign banks are more efficient in resource allocation than domestic banks in transition countries: the average efficiency value of foreign banks is 70.4 percent, compared with only 62 per cent for domestic banks.

Numerous studies, however, challenged the beneficial contribution of foreign banks to financial access and financial deepening. They believe that the penetration of foreign banks is not necessarily linked or even anti-correlated with credit in the host country. Firstly, the penetration of foreign banks exhibits a dual effect on local credit in the host country, which can lead to both credit contraction and credit expansion. Especially if the penetration of foreign banks plays more of a credit role and excessive competition, foreign banks and local banks of the host nations will be trapped in a vicious circle of "expanding loans - increased risk of default - increased non-performing loans", making the host nations' financial sector overheated. And the phenomenon of overheating in the financial sector of the host nations will lead the financial system towards vulnerability (Natsir, et al., 2019).

Another problem associated with foreign banks is the possibility of ‘cherry picking’. As a conduit for the international diversification of asset portfolios between home country banks and multinational firms, foreign banks' decision-making objectives and business behaviour are to some extent influenced by home country banks and firms and thus differ from the host country bank's domestic return-maximising decisions. Foreign banks may be more willing to lend to large domestic or foreign-owned firms, competing with domestic banks for high-quality customer resources, a phenomenon commonly referred to as 'cherry picking' (Detragiache et al, 2008). Foreign banks may be more focused on financing international trade activities and some large firms with international reputations in the host country while disregarding a large number of domestic firms in transition countries that do not comply with international accounting standards (Cull et al., 2018). Theoretically, such financing preferences can distort the operating behaviour of financial institutions in the host country and make local credit supply and demand imbalances. For example, According to Gormley's (2010) study for India, which used data on foreign bank entry in the 1990s, only a small portion of very profitable firms were financed by foreign banks at the time of entry, and the likelihood that firms would obtain a loan decreased by an average of 8 percentage points as a result of a systematic decline in domestic bank lending.

Some literature contributes to the explanation of the cherry-picking phenomenon. Due to the enormous information asymmetries in the loan market, banks often use credit restriction to protect themselves against borrower adverse selection and moral hazard. Although foreign banks have the advantage of more advanced credit scoring technology, i.e., hard information, it is difficult for foreign banks to collect soft information about SMEs, i.e., borrowing and lending relationships owned by local banks. (Boustanifar, 2014). Foreign banks that do not have an information advantage over local banks are more prone to credit rationing (Beck & Peria, 2008). Therefore, the entry of foreign banks may exacerbate the phenomenon of SMEs' difficulty in lending (Lin, 2011; Gormley, 2010). Sengupta (2007) examined how competition affects a company's ability to acquire loans by conceiving of banking rivalry as a contest between parties with asymmetric knowledge. He creates a model to explain the cognitive bias of foreign and big domestic banks in lending to large enterprises at the cost of small firms, while more knowledgeable local banks continue to pursue markets among small firms (which is stronger in emerging nations). Mian (2006) further explained the reasons behind information asymmetry, emphasising the fundamental role of distance when assessing the foreign bank's effect on the host nation's banking system. The closer the parent and host countries are geographically and culturally, the more pronounced the information advantage of the foreign bank. Detragiache et al. (2008) then proposed the cream-skimming effect, whereby the distance (both geographic and cultural) between the headquarters and the local subsidiaries may be particularly large in poorer countries, making it difficult to make judgements about the firm's information so that the foreign bank tend to serve large firms with transparent information rather than small firms with opaque information. Foreign banks generally target their operations at high-quality customers and wealthy individuals such as multinational corporations, large enterprises, government agencies and public utilities in the host country, and it is often hard for SMEs to obtain credit support from international banks.

# 3. Research Question and Hypothesis

## 3.1 Research Question

In the preceding chapter, the article reviewed the history of CEE foreign banks' entry and analyzed established literature focused on how foreign bank entry affected the four dimensions of financial development in host nations. It allows us to get an initial insight into the ambiguous relationship between foreign banks and financial development. The entry of foreign banks is a double-edged sword, which has a double influence on the economy of the host country. While foreign bank penetration extends the market's borders and has profound implications on the market structure and organisational system, it has been argued to exacerbate financial system instability and worsen the credit environment of the domestic market. Besides, we learnt the dominant role of foreign banks in the CEE region. Therefore, it is meaningful to analyze how foreign bank work and influence CEE countries. To be specific, this article is going to examine the relationship between foreign bank entrance and four aspects of financial development. Furthermore, on account of the heterogeneity of the foreign bank effect, the article also going to investigate the factors contributing to this phenomenon. The focus and extent of the financial influence of foreign banks on different nations vary based on the maturity of their financial systems, the degree of economic level, and the extent and time of openness. By answering these questions, the article will provide more insight into whether foreign banks can deepen or hinder financial development in the CEE region and how different conditions can impact this process. The recent outbreak of covid-19 has exposed many problems in the global financial markets where financial integration is gradually deepening. Therefore, having a deep investigation into the question could let the policymakers and also foreign investors whether this is a sustainable development way and how to make the most of this.

This article will propose the hypotheses in the next section to empirically investigate the factors affecting foreign banks' penetration into the financial development of host countries.

Specifically, the article will analyze how foreign bank penetration affects the return on assets, bank Z-score, private sector credit to GDP and bank branches per 100,000 adults. Furthermore, the article will investigate different subsamples to investigate whether the foreign bank effect depends on the economic level, institution environment, openness of the financial market and time factor of the domestic market.

## 3.2 Hypothesis Setting

### 3.2.1 Economic Level

The impact of foreign banks' entrance is significantly impacted by the degree of economic growth in host nations. First, the penetration effect of foreign banks is more pronounced in nations with lower levels of development, where the domestic financial system is generally less developed and sophisticated (King & Levine, 1993). For financial stability, Cull & Martinez (2010)'s research showed that foreign bank penetration in poorer countries is accompanied by more stringent regulation and better practices, which will lead to a more robust and stable financial environment. According to Lensink & Hermes' (2004) research, spillovers from foreign bank penetration play a significant role in economically less developed nations, where foreign bank entry is linked to higher costs and marginal net interest for domestic banks, and domestic banks in these countries have more room for improvement. However, a substantial amount of studies have highlighted the association between foreign bank spillovers and economic progress. Van (2007) used the gravity model of bilateral FDI in banking to evaluate 102 countries and discovered that foreign banks operating in impoverished nations are less financially efficient than foreign banks operating in high-income nations. Tan (2007) uses panel data of 105 domestic banks in 10 CEE nations from 1997 to 2004 and the results showed that, The admission of international banks has a favourable effect on the pre-tax asset margins and the percentage of non-interest income to total assets of the domestic banks in the CEE nations as the level of economic development and banking development in such countries rises. As for financial depth and access, Vogel & Winkler (2010) suggested that foreign banks may have provided stability-enhancing effects in some rich emerging economies, while the influence on credit and financial access may differ depending on the specific country's economic characteristics. Besides, foreign bank tends to cherry-pick customers and markets, as mentioned in the last section (Sengupta, 2007; Detragiache et al., 2008; Gormley, 2010). Geographic and cultural differences are especially obvious for poorer countries, which will increase the difficulty of foreign banks to collect information and allocate resources. Therefore, it will be harder to receive credit and get access to financial services for countries with low economic levels. Overall, the paper holds that there is a favourable correlation between economic growth and the impact of foreign banks.

H1: Foreign banks have more positive effects on countries with higher economic level

### 3.2.2 Institutional Environment

In general, the idea that a better institutional framework will help a foreign bank have a favourable impact on the financial system is backed by academics. Shabir et al. (2023) conducted a study of 2,073 banks in 106 countries in 2016-2021 found that while Covid-19 reduces bank instability, a better regulatory environment and quality of institutions significantly increase the strength and resilience of banks. Lensink et al. (2008) used data on 2095 commercial banks in 105 countries from 1998-2003 and concluded that the foreign banks' penetration has a detrimental influence on bank efficiency and that this effect depends on the home country bank's institutional quality. A better institutional environment could mitigate the negative effect. Using data from 148 countries from 1987-2015, Yin (2021) argued that the influence of foreign bank entry is reduced by strict capital requirements, increased market entry barriers, and efficient credit information sharing, while the relationship between the presence of foreign banks and competitiveness is strengthened by improved supervision and external governance. Maurer (2008)'s research investigated 22 transition nations and concluded that when institutional regulation protects the right of borrowers, the presence of international banks will boost access to credit and financial services.

H2: Foreign banks have more positive effects on countries with better Institutional environment

### 3.2.3 Relative Importance of Foreign Banks

Different effects on the growth of the financial system might be caused by the relative prominence of foreign banks in the host countries. Allen and Gale (2003) employ a binary logit model and maximum likelihood estimation (MLE) to empirically analyse the influence of foreign bank penetration on the stability of the banking systems of Poland, the Czech Republic and Hungary, and conclude that the likelihood of a crisis in the banking systems of the transition countries is inversely correlated with the level of foreign bank entry. This suggested that the penetration of foreign banks has a positive impact on the financial stability of the transition countries. Claessens et al. (2001), analysing 7,900 banks in 80 countries for the period 1988-1995, found that rising foreign bank participation significantly reduces the net interest income, profitability and total cost ratios of banks in host countries. This implied that the introduction of foreign banks has a major favourable effect on the enhancement of the host country's banking system's efficiency. It appears that the impact of competitive pressures occurs more at the time of entry than after they have taken a sizable market share, which supports the idea that foreign bank entry improves the efficiency of the banking system by enhancing the competitiveness of the host country's banking market. The efficiency improvement effect is significantly correlated with the number of foreign banks entering rather than their market share. However, some studies addressing the issue of market power have further pointed out that the degree of market concentration is not necessarily related or even inversely related to financial development. For example, Boyd et al. (2003) analysed that both competitive and monopolistic market structures are likely to have banking system crises by building a dynamic model. Using stochastic frontier analysis, Hasan & Marton (2003) examined banking data for Hungary from 1993 to 1998 and discovered that domestic banks there are more effective than foreign banks, and that the greater the proportion of foreign capital, the less effective the banks are. In all, this article supports the view that foreign banks' relative importance will have a positive relationship with foreign bank effects.

H3: Foreign banks have more positive effects on countries with a higher portion of foreign banks

### 3.2.4 Time

Foreign banks' effects on financial development may shift over time. From the financial efficiency side, Kunt & Huisinga (1999) showed that foreign bank penetration also negatively influences the net interest margin of domestic banks. In the long run, foreign bank entry has a favourable influence on host nation banks by decreasing their net interest margins and improving efficiency, as demonstrated by Lensink & Hermes(2004). However, in the short term, bank expenses could rise, and the bigger the growth in bank costs, the lower the degree of banking development. According to Zhuang (2008), competition will increase when international banks enter a nation with an underdeveloped financial sector and a constrained selection of financial services and clients. In the short run, domestic banks might therefore temporarily charge their clients more to cover the higher costs brought on by spillovers. Still, in the long run, the penetration of foreign banks will result in increased competition, leading to lower costs and higher efficiency for banks. On account of financial access and depth, Chadi (2019) studied the banking system in MENA countries using the GMM model and concluded that the phenomenon of 'cherry picking' by foreign banks slowly diminishes over time. A related explanation is contributed by Hawkins (2006), who finds that the difference in behavioural preferences between domestic and foreign banks in transition nations is related to the different modes of entry of foreign banks at different times. When foreign banks first made a significant foray into transition countries, the majority of them opted for the new bank model. Lacking a branch network and information on firms in transition countries, they focused their business on large corporate clients. And by the second wave of foreign bank penetration in the mid-to-late 1990s, foreign banks began to merge and acquire a large number of domestic banks in transition countries, as well as launching services for households and SMEs. Since foreign banks used to control the former huge state-owned banks that provided retail banking, it is now possible to study the competitive behaviour of foreign banks in the retail banking sector in transition nations. Therefore, the difference in behavioural preferences between foreign and domestic banks will diminish as foreign banks continue to penetrate the banking market in transition countries, and "cherry-picking" behaviour should not be generalised.

H4: Foreign banks have more positive effects on the later stage of entry

# 4. Research Framework

## 4.1 Variables and Data

The annual data is derived for the 12 CEE countries from the central and eastern European countries, including Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia. These countries share similarities in geography, politics and economics. In the 1990s, these countries transitioned from planned economy systems and opened their banking sector to foreign capital. On account of the data availability, this article chooses the period 2000 to 2021 as the research focus for financial stability, efficiency and depth. For financial access, as the earliest available data starts from 2004, the article chooses the time period 2004 to 2021 for this dimension of financial development. The following part of this section will introduce the variables, data sources and data analysis. Detailed information on variables and sources is listed in Table 1.

### 4.1.1 Dependent variables: financial development indexes

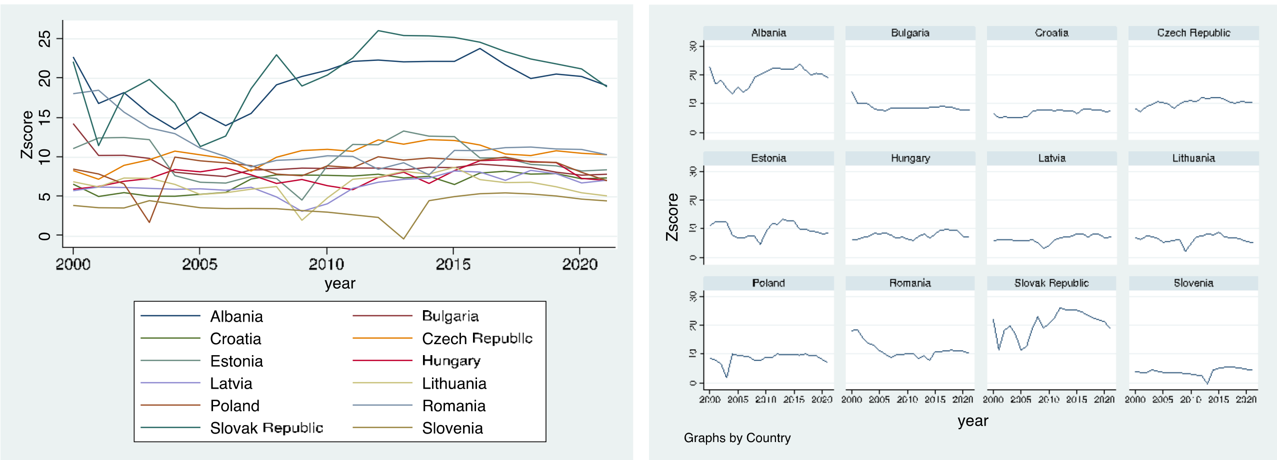
Considering the bank-dominated financial system in CEE countries and the fact that the impact of foreign banks is also mainly in the banking sector rather than in other financial sectors, the dependent variables selected in this article to represent financial development are all bank-related indicators (Enger & Schrooten, 2004). The article chooses four financial development indexes that are in line with the four financial development dimensions in the literature review section. All the financial development variables are derived from the Global Financial Development Database of the World Bank.

a) Financial stability: Z-score (*ZSCORE*)

Lots of proxies are used to measure the financial stability in the existing literature, but the most widely used proxy is the bank Z-score (Laeven & Levine, 2009; Morgan & Pontines, 2014; Fauzi and Saluy, 2021) The Z-score captures the probability of default of a country's commercial banking system and is used to measure the extent to which a bank is on the verge of failure (Roy, 1952). The Z-score combines margin, leverage and return volatility to measure risk and stability from the perspective of individual banks. Specifically, a larger Z-score indicates a more stable bank. The improvement of profit margin and capitalization level, and the decline of unstable income will lead to the improvement of Z-score, which means the decline of bank failure risk and the improvement of financial stability (Kohler, 2015; Shabir et al., 2021).

***Figure 1 Line Plots of Bank Z-score***

*(a) Line Plots for all countries* *(b) Line Plots by country*




*Source: Global Financial Development Database*

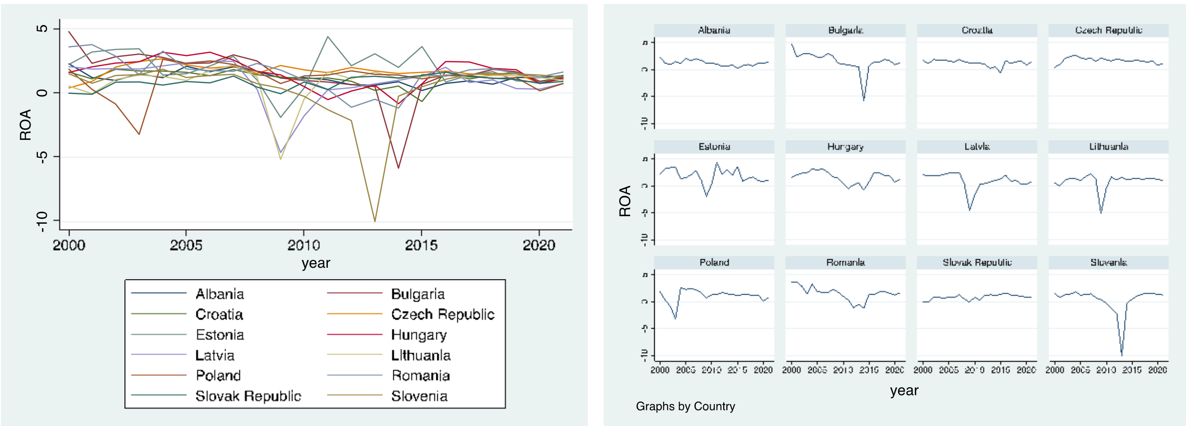
Figure 1 a) depicts the trends of bank Z-score for 12 countries from 2000 to 2021. Figure 1 b) shows the trend of each country more clearly. It can be seen from the figure that countries including Albania, Poland Romania and Slovak experienced large fluctuation before 2008. Z-score of Poland dropped from 6 to 2 in 2003 and rose to 10 in 2004. Romania’s Z-score dropped from 18 to 8 from 2000 to 2007. Although fluctuates largely before 2008, Albania and Slovak have a much higher Z-score than other countries in the sample and reached 19 in 2021, indicating the relatively stable financial environment of these two countries. Slovenia has remained the lowest Z- score of almost all time, with a large drop in 2013 because of the economic recession caused by the low loan demand, and tightening credit standards. Other countries have relatively stable and similar Z-score values at around 10 compared to the average value.

b) Financial efficiency: return on asset (*ROA*).

Return on assets is commonly used to measure how efficiently banks use their assets to generate profits (Widiarti et al.; Setiawan & Putri, 2021). The banking industry is a highly leveraged industry that earns profits on total assets that are predominantly liabilities. Therefore the most important measure of asset profitability in the banking sector is the ROA. A high ROA indicates that the company is highly efficient in using its assets to generate profits and that the company has achieved good results in terms of increasing revenue and economising on the use of capital.

***Figure 2 Line Plots of ROA***

*(a) Line Plots for all countries* *(b) Line Plots by country*




*Source: Global Financial Development Database*

Figure 2 a) and b) display the ROA trend. Poland had the first dramatic drop in 2003 from -1% to -3%. Almost all countries experienced a significant drop in ROA from 2008 to 2010 because of the global economic crisis, with the average ROA below 0 in 2009, which means that banks are incurring losses and not generating profit. Among them, Latvia and Lithuania fell to -5% and Estonia fell to close to -2% in 2009. But Estonia rose in 2011 and experienced a higher ROA than other countries between 2011 and 2015. The European sovereign debt crisis around 2012 also led to a decline in ROA in some countries. Slovenia dropped from -2% to -10% in 2013 and Hungary dropped from 0.5% to near -1%. Other than these large fluctuations, countries have demonstrated quite stable trends, ranging approximately from 0% to 3%.

c) Financial depth: private sector credit to GDP (*CREDIT*).

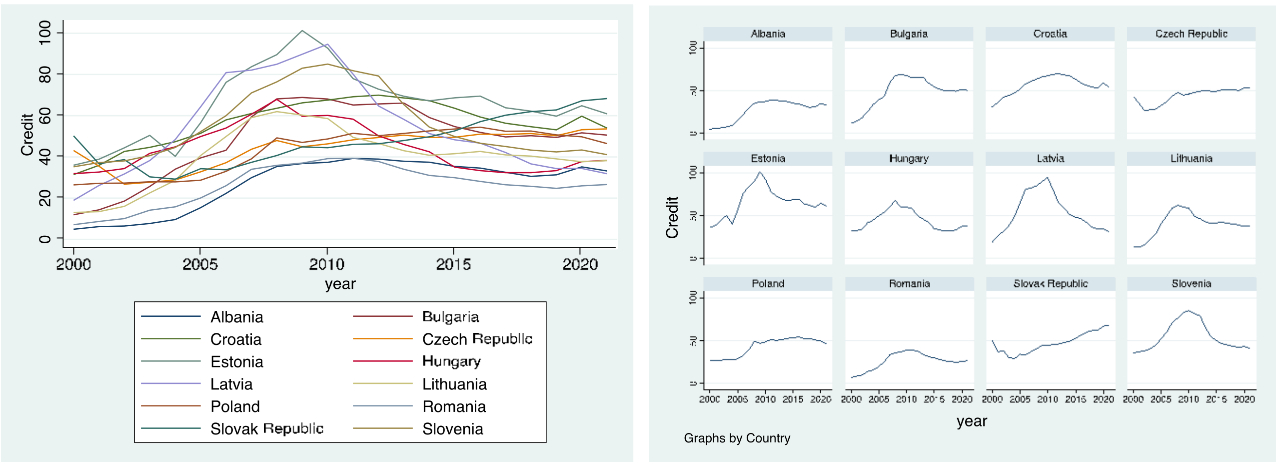
This ratio captures the extent to which credit provided to the private sector contributes to the overall size of the economy. Empirical evidence from various studies supports the use of the private sector credit to GDP ratio as a reliable measure of financial depth (Rajan & Zingales,1996 and Levine, 2005). As financial institutions extend credit to the private sector, it facilitates investment, consumption, and economic growth. Thus, a higher ratio indicates a deeper and more active financial system, supporting economic development. A high private sector credit to GDP ratio is not necessarily beneficial, though. Actually, a few of the nations with the greatest credit-to-GDP ratios, including Australia and South Korea, suffered large losses when world financial crisis happened. The excessive expansion of credit in these countries contributed to the buildup of financial imbalances, including a housing bubble and unsustainable levels of debt. When the financial crisis hit, these imbalances led to severe disruptions in their financial systems and caused economic downturns. One thing that should be noticed is that private sector credit to GDP could not represent the credit provided to the private sector itself but it is related to GDP. The increase or decrease of this ratio is probably related that GDP and credit have not changed proportionately.

Figures 3 a) and b) present the development of private sector credit to GDP. The gap in this ratio among countries is obvious. For example, in 2009, while Estonia reached the highest value of over 100%, Albania and Romania only have a value of around 37%. And the credit to GDP gap among countries remains wide until 2021, with 68% in Slovak and 26% in Romania. Because of the economic crisis, many countries' credits dropped to varying degrees from 2009. As of 2021, Latvia experienced the most dramatic drop from 94% to

32% and Estonia also decreased from 101% to 60%. However, private sector credit to GDP in countries including Czech, Poland and Slovak Credit in has been relatively stable and has not contracted because of the economic crisis. Private sector credit to the GDP of these countries shows a slow upward trend, meaning the financial depth has been continuously developed. In all, the credit to GDP did not rise a lot since the economic crises, indicating the slow development of the financial depth of the CEE region.

***Figure 3 Line Plots of private sector credit to GDP***

*(a) Line Plots for all countries* *(b) Line Plots by country*



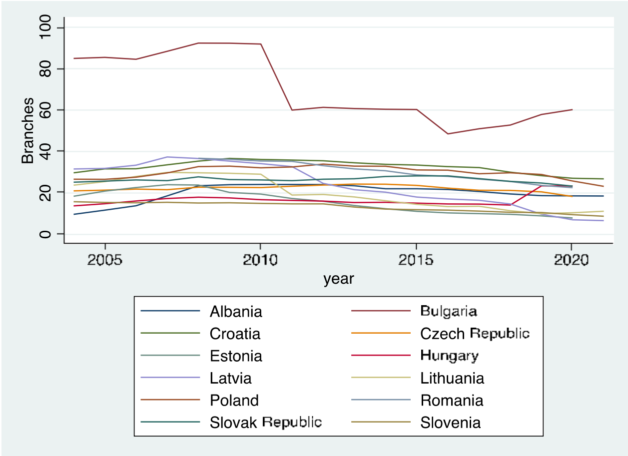

*Source: Global Financial Development Database*

d) Financial access: bank branches per 100,000 adults (*BRANCHES*).

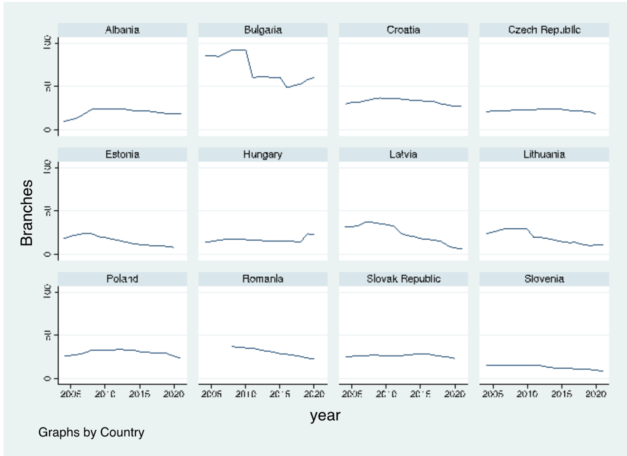
It is a common proxy variable to measure financial access in the literature (Beck et al., 2007; Allen et al., 2016). The bank branches per 100,000 adults provide a quantitative measure of the availability and physical presence of banking services within a country. This measure captures the extent to which financial services are geographically accessible to the population, allowing individuals and businesses to participate in the formal financial system. A higher number of bank branches per 100,000 adults suggests that more individuals have direct access to banking services, which can include deposit accounts, loans, and other financial products.

***Figure 4 Line Plots of* bank branches per 100,000 adults**

*(a) Line Plots for all countries*




*(b) Line Plots by country*




*Source: Global Financial Development Database*

Figures 4 a) and b) depict the trend of bank branches per 100,00 adults from 2004 to 2021. The value of this index fluctuates in the range between 5 and 40 for each country except for Bulgaria. Although there is a large decrease from 92 in 2010 to 60 in 2021, Bulgaria has kept the highest value of all time. Countries like Estonia, Latvia and Lithuania all have seen their branches per 100,00 adults drop by a factor of two or more from 2004 to 2021. While branches in Albania increased from 9 to 18 and in Hungary increased from 13 to 23, other countries in the sample remained stable value from 2004 to 2021. This implies the development of financial access in the CEE region is stable and slow.

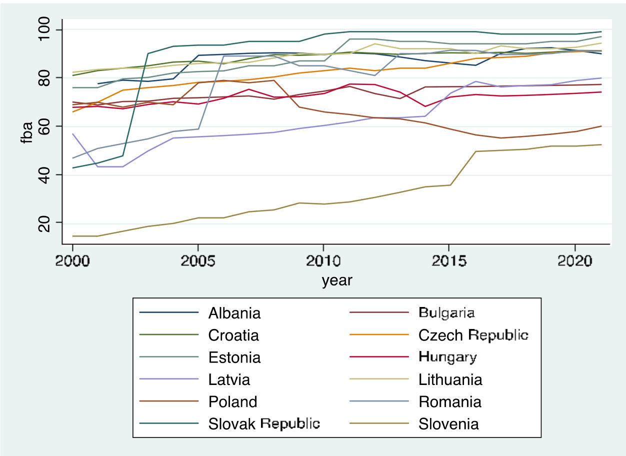
### 4.1.2 Independent Variable: foreign bank entry indexes

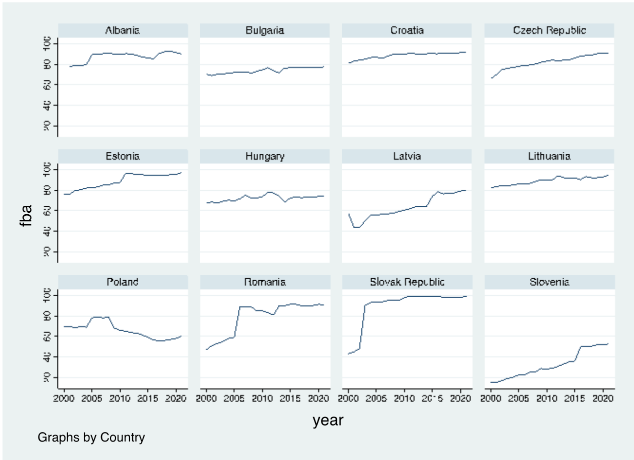
The article adopts the definition of foreign banks proposed by the World Bank (2017) as a reference. According to their definition, A bank is considered foreign if it is owned by foreign individuals, businesses, financial institutions, or governments and their ownership exceeds fifty percent. To represent the foreign bank entry, the article chooses foreign bank assets among total bank assets (*FBA*) as the independent variable. The data is derived from Global Financial Development Database. Because of missing data in specific years, we supplemented the dataset with European Bank for Reconstruction and Development

(EBRD) and National Bank. An alternative measure of foreign bank penetration is foreign banks among total banks (*FBN*). While foreign bank assets represent the foreign bank penetration based on shares, foreign banks among total banks signal the foreign bank presence according to the number. But due to the missing data for this variable, the article uses it for robustness tests rather than in the main specification.

***Figure 5 Foreign bank assets among total assets (%)***

*(a) Line Plots for all countries* | *(b) Line Plots by country*

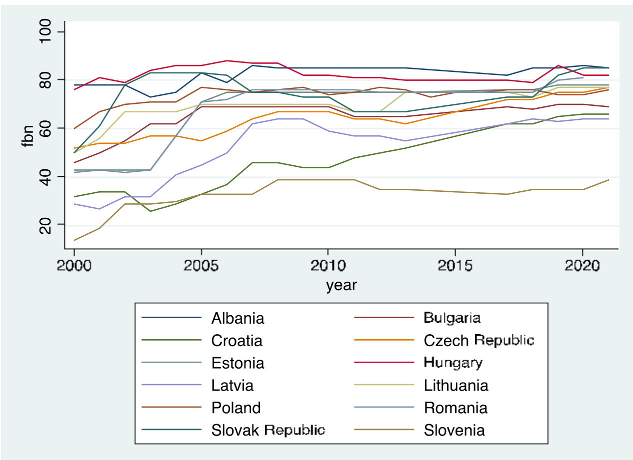


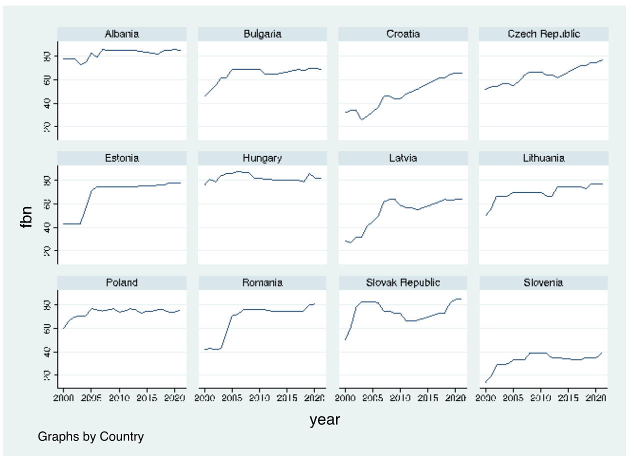




*Sources: Global Financial Development Database, EBRD and National Bank*

***Figure 6 Foreign banks among total banks (%)***

*(a) Line Plots for all countries* | *(b) Line Plots by country*




*Sources: Global Financial Development Database, EBRD and National Bank*

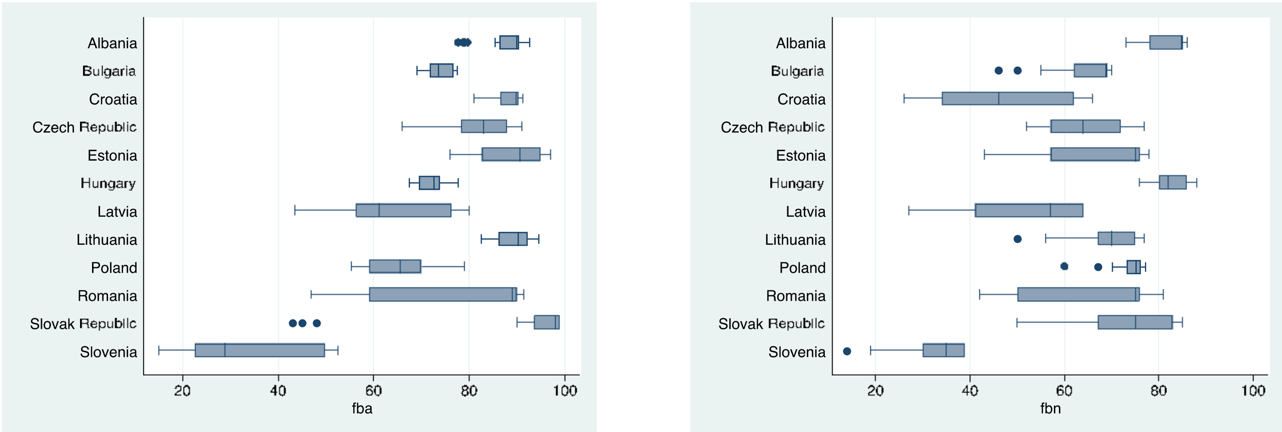
Figure 5 a) and b) display foreign bank assets among total assets and Figure 6 a) and b) depict foreign banks among total banks. It could be seen directly from the figures that both foreign bank assets and numbers increased steadily since the banking sector reformation in the 90s. One exception is Poland, where the foreign bank asset dropped after the 2008 economic crisis and hasn't returned to its original maximum value of 79% in 2008. Both the Figures 5 and 6 show that foreign banks have reached a dominant position in CEE regions. By the end of 2021, all countries' foreign asset percentages and foreign bank percentages in the sample have exceeded 60%, except for Slovenia. Countries such as Estonia and Slovak even have a foreign bank asset percentage near 100%.

By comparing the two figures and also two measurements of foreign bank presence, we could get a  preliminary judgement as to the extent to which foreign bank assets align with their respective proportions inside a given country. For most countries, the percentage of foreign bank assets in bank assets is larger than the percentage of foreign banks number. To clarify, it can be observed that foreign banks not only constitute over 60% of the total number of banks in the nations under consideration, but they also possess a significantly higher proportion of bank assets in comparison to their numerical representation. In Croatia in 2021, it is seen that foreign bank assets constituted a significant proportion of the overall assets, amounting to 91%. However, in terms of the total number of banks, foreign banks represented a comparatively smaller share, standing at 66%. However, there are two contradictions, Hungary and Poland, in this finding. Both countries have a larger percentage of foreign bank numbers compared to foreign bank assets. Therefore, we will do the empirical analysis based on the two measurements respectively to see whether the measurement of foreign bank presence will influence the result of the foreign bank effect.

Figure 7 further shows the relative presence of foreign banks in terms of assets (a) and number (b) from 2000 to 2021 for 12 countries. While some countries, such as Albania and Hungary dominant over 90% of bank numbers, countries like Latvia and Slovenia have an average bank number percentage below 60%. Furthermore, by comparing the two figures, one thing that should be noticed is that asset shares declined more sharply below the middle range compared to the number for Latvia and Slovenia. This indicates that foreign banks are either large both in number and size or small both in number and size in the two countries. The difference in foreign bank assets among countries is also obvious. While Albania's foreign asset percentage range from 70% to 90%, the maximum foreign bank asset percentage for Slovenia is below 60%.

***Figure 7 Boxplot of foreign banks presence***

*(a)* Foreign bank assets among total banks assets  *(b)* Foreign banks among total banks




*Sources: Global Financial Development Database, EBRD and National Bank*

### 4.1.3 Control Variables

To address potential omitted variables, the article includes control variables that have been proven to have a relationship with financial development. The first one is GDP per capita, which represents the economic development of the domestic country. Higher GDP per capita is often linked to greater financial development, including increased access to financial services, improved financial stability, and enhanced financial efficiency (Claessen & Horen, 2014; Shabir, 2023). The second one is inflation, which has been proven to have a negative effect on financial development (Rousseau & Wachtel, 2002; Boyd et al., 2001). On account of the institutional environment, the article includes the rule of law, which reflects the degree of trust in, and adherence to, the rules of society, in particular contract enforcement, property rights, and the quality of the police and courts. Better institutional quality is considered to be conducive to financial development (Kunt & Levine, 2004; Chadi, 2019). This article utilizes linear interpolation to estimate the missing data for the rule of law in 2001. Lastly, the article includes the degree of bank concentration, which is represented by the three largest commercial banks' assets. The higher degree of bank concentration will negatively affect financial development (Berger, 2004; Mody & Peria, 2004).

***Table 1 Variable Descriptions and Data Sources***

| Variables | Abbreviation | Measurement | Definition | Sources |
|---|---|---|---|---|
| Financial Stability | Zscore | Bank Z-score | The likelihood of a country's commercial banking sector experiencing default. | Global Financial Development Database |
| Financial Efficiency | ROA | Bank return on assets (%, before tax) | Pre-tax revenue of commercial banks in relation to annualised total assets. | Global Financial Development Database |
| Financial Depth | Credit | Private sector credit to GDP (%) | The financial resources provided to the private sector by domestic money banks as a share of GDP. | Global Financial Development Database |
| Financial Access | Branches | Number of bank accounts per 1,000 adults | Number of commercial bank branches per 100,000 adults. | Global Financial Development Database |
| Foreign Bank Presence | FBA | Foreign bank assets among total banks assets (%) | Percent of the banking system's assets was in banks that were foreign-controlled. | Global Financial Development Database, EBRD and National Bank |
| | FBN | Foreign banks among total banks (%) | Percentage of the number of foreign owned banks to the number of the total banks in an Economy. | |
| Economic Development | GDP | GDP per capita (current US$) | GDP per capita (current US$) | IMF Database |
| Inflation Rate | Inf | Inflation, consumer prices (annual %) | The annual percentage change in the cost of a basket of goods and services. | World Development Indictors |
| Institution Environment | ROL | Rule of Law: Percentile Rank | Perceptions of the extent to which agents have confidence in and abide by the rules of society. | Worldwide Governance Indicator |
| Bank Concentration | Con | Bank concentration (%) | Assets of three largest commercial banks as a share of total commercial banking assets. | Global Financial Development Database |

*Sources: Organized by the author*

## 4.2 Methodology

The common methodology adopted by the existing literature includes the ordinary-lest-square (OLS) model (Chadi et al., 2017; Classen & Horen, 2014), fixed-effect model (Claessens et al., 2001; Hermes & Lensink, 2004) , generalized least squares model (Horen, 2006). But one concern about using these models is that foreign bank penetration and financial development may exist an endogenous relationship, which lies in the possibility of two-way effects (Detragiache et al., 2008; Classen & Horen, 2014). Foreign banks usually enter the host country market out of commercial considerations, seeking broader development opportunities. On one side, a relatively better-developed financial market means more development opportunities and usually attracts banks to acquire a larger share of that market. This will lead to an upward bias of the OLS coefficient. But from another side, a relatively low-developed financial market probably represents the potential of the bank market, which will attract foreign capital. This will in turn cause an upward bias of the OLS coefficient. Therefore, the relationship between the two runs both ways and cannot be explained by simple causality.

Taking into account the endogeneity problem, the article chooses the dynamic Gaussian Mixture Model (GMM). For dynamic models, suitable instrumental variables are needed to reduce the effect of endogeneity. Temple (1999) found that the first differenced GMM utilises lagged variables as instrumental variables, but lagged level variables are often weak instruments. Blundell & Bond (1998) argued that the first differenced GMM is susceptible to weak instrumental variables and obtains biased estimates. Therefore, Blundell & Bond (1998) and Arellano & Bover (1995) proposed a more efficient system GMM. System GMM combines an ordinary regression equation with a differenced regression equation. The lagged level is used as an instrumental variable for the first-order difference, which in turn is used as an instrumental variable for the ordinary variable. In this article, the lagged form of independent variables is used as instrumental variables. And the validity of the model is tested based on Sargan test and AR(2) test. Sargan test is the overidentification test, which examines the validity of instrumental variables chosen. The AR(2) test is a diagnostic test used to assess the validity of the assumption of second-order autocorrelation.

In view of this, this article develops the following system GMM model, which is modified from Classen & Horen (2014) and Chadi (2019):

$$FD_{i,t} = \alpha_i + \beta_1 * FD_{i,t-1} + \beta_2 * FB_{i,t} + \gamma * \boldsymbol{X}_{i,t} + \varepsilon_{i,t} \qquad (1)$$

where $FD_{i,t}$ represents four aspects of financial development of country $i$ in year $t$. $FD_{i,t-1}$ is the lag form of the dependent variable. Given the persistence in finance development, it is included as an additional control to reduce the endogeneity and omitted variable problem. $FB_{i,t}$ represent the foreign bank presence of country $i$ in year $t$. $\boldsymbol{X}_{i,t}$ is a vector of the control variable, including GDP per capita, inflation, rule of law and bank concentration. $\beta_1$ and $\beta_2$ are the coefficients of the lag form of the financial development index and foreign bank assets among total assets. $\gamma$ is the vector of coefficients on the control variables. $\varepsilon_{i,t}$ is the error term, representing the part of the dependent variable that is not explained by the regression model. Besides, the lag form of the control variables is used as the instrumental variables. For better regression results, variables are taken as their natural logarithm form except for return on asset (ROA). To be specific, the following 4 models will be analysed for each aspect of financial development.

$$lnZscore_{i,t} = \alpha_i + \beta_1 * lnZscore_{i,t-1} + \beta_2 * FB_{i,t} + \beta_3 * lnGDP_{i,t} + \beta_4 * lnInf_{i,t} + \beta_5 * lnROL_{i,t} + \beta_6 * lnCon_{i,t} + \varepsilon_{i,t} \qquad (2)$$

$$ROA_{i,t} = \alpha_i + \beta_1 * ROA_{i,t-1} + \beta_2 * FB_{i,t} + \beta_3 * lnGDP_{i,t} + \beta_4 * lnInf_{i,t} + \beta_5 * lnROL_{i,t} + \beta_6 * lnCon_{i,t} + \varepsilon_{i,t} \qquad (3)$$

$$lnCredit_{i,t} = \alpha_i + \beta_1 * lnCredit_{i,t-1} + \beta_2 * FB_{i,t} + \beta_3 * lnGDP_{i,t} + \beta_4 * lnInf_{i,t} + \beta_5 * lnROL_{i,t} + \beta_6 * lnCon_{i,t} + \varepsilon_{i,t} \qquad (4)$$

$$lnBranches_{i,t} = \alpha_i + \beta_1 * lnBranches_{i,t-1} + \beta_2 * FB_{i,t} + \beta_3 * lnGDP_{i,t} + \beta_4 * lnInf_{i,t} + \beta_5 * lnROL_{i,t} + \beta_6 * lnCon_{i,t} + \varepsilon_{i,t} \qquad (5)$$

***Table 2 Detailed Countries in the subsamples***

| | | |
|---|---|---|
| Economic Level | Richest | Czech, Estonia, Hungary, Lithuania, Slovak, Slovenia |
| | Poorest | Albania, Bulgaria, Croatia, Poland, Romania, Latvia |
| Institutional Quality | Best | Czech, Estonia, Hungary, Latvia, Lithuania, Slovenia |
| | Weakest | Albania, Bulgaria, Croatia, Romania, Poland, Slovak |
| Relative Importance on Foreign Bank Asset | Highest | Albania, Croatia, Czech, Estonia, Lithuania, Slovak |
| | Lowest | Bulgaria, Hungary, Latvia, Poland, Romania, Slovenia |
| Relative Importance on Foreign Bank Number | Highest | Albania, Estonia, Hungary, Lithuania, Poland, Slovak |
| | Lowest | Bulgaria, Croatia, Czech, Latvia, Romania, Slovenia |

*Sources: Organized by the author*

In order to test the relationship between foreign bank entry and financial development and whether the effect of foreign bank entry on financial development depends on host country characteristics and time, the article will estimate nine regressions for each dimension of financial development. Firstly of all, a complete regression on all countries and the whole time period will be tested. Then, the article will estimate different subsamples to investigate the hypotheses proposed. Firstly, the article studies the effect economic level of the host country. Two subsamples, one including 6 countries with a GDP per capita level higher than the average and one including 6 countries with a GDP per capita level lower than the average, will be tested. For the study of the institutional quality of the host country, the article split the sample between countries that have higher role of law scores (above median in the sample) and that have lower scores (below median). Thirdly, to study the influence of the relative importance of foreign bank, the article regress two subsamples, one include 6 countries with a higher portion of foreign bank asset (above the median in the sample) and one includes 6 countries with a lower portion of foreign banks (below median). Finally, to investigate whether foreign bank entry's negative effect will diminish over time, the article will split the sample based on time. For financial stability, efficiency and depth, two time periods 2000 to 2010 and 2011 to 2021 will be tested. As for financial access, the time periods 2004 to 2012 and 2013 to 2021 will be tested due to the data availability. Table 2 illustrates the detailed country in each subsample for financial stability, efficiency and depth. For detailed subsample information about financial access, please refer to Appendix 1.

### 4.3 Descriptive analysis of variables

Appendix 2 shows the descriptive analysis of the variables. Information regarding financial development (stability, efficiency, depth and access) and foreign bank entry (foreign bank assets among total assets and foreign bank numbers among total banks) have been analysed in the last section by evaluating the line plot and boxplot. The descriptive analysis indicates similar trends and information as we concluded. Now we focused on the interaction among the main variables with the control variables.

Regarding the economic level, indicated by the logarithm of GDP per capita, we can see that Slovenia stands out among the CEE countries in terms of having the highest mean value (9.931) of GDP per capita and displaying relatively lower variability (0.094) in economic development, making it an economically more advanced and stable country within the region. However, the mean value of financial stability for Slovenia is the lowest. Slovenia experienced a severe financial crisis in the early 2010s, which had a significant impact on its financial stability. Besides, as a small open economy, Slovenia's financial stability can be influenced by external risks and dependencies. Economic and financial developments in other countries, particularly in the Eurozone, can impact Slovenia's financial stability even if its GDP per capita remains high. Albania has the lowest level of economic development (8.134) and this is also accompanied by a low financial efficiency, depth and access. However, the financial system is very stable in Albania. One explanation may be related to the high presence of foreign banks in Albania. Albania might receive significant foreign direct investment or remittances from abroad, which can contribute to a stable financial system. These inflows can provide stability even in the presence of a lower GDP level.

From the statistic of the rule of law, it is obvious that the Czech Republic has the highest value of 4.376, which is accompanied by a well-developed financial system. And Albania again has the lowest value of 3.545. This suggests that a well-established institutional environment is favourable for financial development. This is in line with the research of Kunt & Levine (2004) and Chadi (2019). The natural logarithm of inflation shows that Hungary has the highest level of inflation level, and this is related to a relatively low value of financial development. This supports the research of Rousseau & Wachtel (2002) and Boyd et al.(2001). High inflation can hinder the proper functioning of financial intermediaries, as it may increase transaction costs and reduce the demand for financial services. This can limit the availability of credit and other financial services, particularly for small and medium-sized enterprises. Persistent high inflation can also lead to a loss of confidence in the country's economic policies and stability. This can deter both domestic and foreign investors, resulting in reduced capital inflows and investment.

Finally, when focusing on the concentration statistics, Bulgaria has the lowest mean value of 3.985 and Estonia has the highest mean value of 4.556 with a variance close to zero. While regarding financial access, the result is the opposite. The result is in line with Berger (2004). In a highly concentrated banking sector, a few large banks dominate the market, leading to limited competition. This lack of competition can result in higher interest rates, fees, and charges for financial products and services, making them less affordable and accessible to the general public. Mody & Peria (2004) also found that foreign bank entry was accompanied by an increase in the degree of market concentration of domestic banks, which was associated with greater market power and higher bank spreads and management costs, and as a result, the continued entry of foreign banks did not produce the expected significant efficiency effects. studying banks in countries in transition in

Central and Eastern Europe, he concludes that host country banking markets with a high degree of developmental sophistication are less exposed to foreign bank shocks.

### 4.4 Multicollinearity test

In order to avoid the bias of model estimation results caused by the strong correlation between variables, this paper conducts multicollinearity tests on the variables involved in the model. firstly, the article conduct the pairwise correlation matrix, the result is shown in Table 3.

The results show that the maximum value of the variance inflation factor (VIF) is 2.86, and the mean value of VIF is 1.66, which is far less than 10, indicating that there is no multicollinearity among the variables. Indicators of financial development are correlated with the independent variables. Foreign bank assets are positively related to bank z-score (48/5%) and return on asset (11.2%), but negatively related to private sector credit (-2%) and bank branches (-14.4%). The insignificant correlation between foreign bank numbers and financial efficiency, depth and access may related to the missing data. We will discuss this further in the robustness test.

**Table 3 Pairwise correlations**

| Variables | lnzscore | roa | lncredit | lnbr~es | lnfba | lnfbn | lngdp | lnrol | lninf | lncon |
|---|---|---|---|---|---|---|---|---|---|---|
| lnzscore | 1.000 | | | | | | | | | |
| roa | 0.297* | 1.000 | | | | | | | | |
| lncredit | -0.309* | -0.221* | 1.000 | | | | | | | |
| lnbr~es | 0.104 | 0.005 | 0.185* | 1.000 | | | | | | |
| lnfba | 0.511* | 0.112* | -0.020* | -0.144* | 1.000 | | | | | |
| lnfbn | 0.485* | 0.008 | 0.004 | 0.082 | 0.675* | 1.000 | | | | |
| lngdp | -0.296* | -0.202* | 0.729* | -0.428* | -0.028 | 0.029 | 1.000 | | | |
| lnrol | -0.437* | -0.083 | 0.588* | -0.406* | -0.180* | -0.124 | 0.792* | 1.000 | | |
| lninf | -0.010 | 0.158* | -0.044 | 0.244* | -0.157* | -0.073 | -0.188* | -0.050 | 1.000 | |
| lncon | 0.169* | 0.166* | -0.240* | -0.564* | 0.220* | 0.128 | -0.073 | 0.053 | 0.026 | 1.000 |

*** p<0.01, ** p<0.05, * p<0.1*

Sources: organized by the author

To further test whether there is a multicollinearity problem among the independent variables, the article adopts the variance inflation factor (VIF) test. The results are shown in Table 4. Table 4.1 reports the VIF test when the dependent variable is logarithm bank Z-score, return on assets and logarithm private credit from 2000 to 2021. Table 4.2 reports the VIF test when testing for financial access from 2004 to 2021. The findings indicate that the highest observed value for the variance inflation factor (VIF) is 4.4, which is much lower than the threshold of 10. This suggests the absence of multicollinearity among the variables.

***Table 4 VIF test***

***Table 4.1***

| Variables | VIF | 1/VIF |
|---|---|---|
| lnrol | 3.07 | 0.325518 |
| lngdp | 3.07 | 0.325837 |
| lnfba | 1.17 | 0.854799 |
| lncon | 1.11 | 0.900752 |
| lninf | 1.08 | 0.923702 |
| Mean VIF | 1.90 | |

***Table 4.2***

| Variables | VIF | 1/VIF |
|---|---|---|
| lnrol | 4.40 | 0.227488 |
| lngdp | 4.25 | 0.235418 |
| lnfba | 1.3 | 0.769993 |
| lncon | 1.25 | 0.797290 |
| lninf | 1.03 | 0.970319 |
| Mean VIF | 2.45 | |

*Sources: organized by the author*

### 4.5 Stationary – Unit Root Test

The main purpose of stationarity test is to judge whether a set of data has a stable trend. Specifically, it aims to answer whether there is some fixed long-run trend or cyclical variation law over the entire time horizon of the data. If there is a stochastic trend or a deterministic trend, there will be a spurious regression problem.

Unit root test is an important method in time series analysis, which is used to test whether time series data have stationarity. In this article, we apply the IPS (Im, Pesaran, and Shin) unit root test, which is a panel data test that examines the stationarity properties of individual time series within a panel dataset. It is a Fisher-type test that accounts for cross-sectional dependence and is commonly used to determine if the individual variables are integrated of order one, I(1), or stationary, I(0). The null hypothesis of the IPS test is that each individual time series is non-stationary or integrated of order one (I(1)), meaning it has a unit root. The alternative hypothesis is that the variables are stationary (I(0)).

Table 5 reports the result of the IPS test. All the p-value of the IPS test statistic is lower than 0.1, it indicates that we reject the null hypothesis of non-stationarity. In other words, the individual time series within the panel dataset are likely stationary (I(0)). As the variables are stationary, it is more appropriate to use stationary time series methods in panel data analysis. Dynamic panel data models, like the GMM model, are appropriate when dealing with stationary time series data. These models take into account both the contemporaneous and lagged effects of the variables, allowing for a more comprehensive analysis of the data. By accounting for the dynamics and potential endogeneity in the data, dynamic panel data models can provide more efficient and consistent estimates of the model parameters.

***Table 5 IPS test result***

| | lnzscore | roa | lncredit | lnbr~es | fba | fbn | lngdp | lnrol | lninf | lncon |
|---|---|---|---|---|---|---|---|---|---|---|
| t-statistics | -3.214 | -5.185 | -1.565 | -1.408 | -2.591 | -2.384 | -2.261 | -4.183 | -4.675 | -2.6662 |
| p-value | 0.001 | 0.0000 | 0.059 | 0.0795 | 0.005 | 0.009 | 0.0119 | 0.000 | 0.000 | 0.004 |

*Sources: organized by the author*

## 5. Empirical Result and Discussion

This section will discuss the empirical result of each aspect of financial development and analyze the four hypotheses we proposed. Xtabond 2 command in Stata 17.0 is utilized for all the GMM regression.

First of all, the Sargan test and AR(2) test are shown at the bottom of each table. All the p-value for the Sargan test is greater than 0.1, which means the null hypothesis of overidentifying restrictions is valid and cannot be rejected at 10% significance level. The test result supports the validity of instrumental variables. And the p-value of the AR(2) test all exceed 0.1, which supports the null hypothesis that there is no autocorrelation in the model’s residuals. In all, as the Sargan tests and AR(2) tests cannot reject the original hypothesis, the instrumental variable constraints are valid and residuals of the GMM do not have a significant second-order serial correlation. This suggests that all the dynamic panel model setups in this article are reasonable.

In all the result tables below, regression (1) is the complete regression for 12 countries in the whole sample period. Regression (2) and regression (3) report the result of countries with GDP per capita below average and above average, respectively. Regression (4) and regression (5) report the result of countries with the institutional environment (rule of law score) below average and above average, respectively. Regression (6) and regression (7) report the result of countries with relative foreign bank importance below average and above average, respectively. Regression (8) and regression (9) report the result of all countries in the early stage and in the later stage of entry, respectively. For detailed information about variables and time tested, please refer to the note under each of the table.

## 5.1 Result of Financial Stability

Table 6 reports the result of the relationship between foreign bank presence, represented by foreign bank assets among total assets, and financial stability, indicated by the logarithm of bank Z-score.

Firstly, all the regression results show that the bank Z-score from the last period has a significant positive influence on the next period's bank Z-score. In all, the coefficients of the lagged form of the dependent variable are close to one, which indicates the highly correlated relationship and supports the utilise of the GMM model. To be specific, for all 12 CEE countries from 200 to 2021, a 1% increase in bank Z-score in the last period will lead to a 0.762% increase in bank Z-score in the current period. From columns (2) and (3), we can see that a 1% increase in bank Z-score in the last period will have a more positive influence on the current bank Z-score in richer countries(0.856%)than in poor countries (0.755%). This is also the case regarding the relative importance of foreign banks (columns (6) and (7)). Last period Z-score's positive influence is more obvious in countries with a higher portion of foreign bank assets. However, the last period Z-score will have a slightly more positive influence in countries where the institutional quality is worse than in countries where the quality is good.

From the whole sample regression reported in column (1), it can be inferred that financial stability is significantly affected by foreign bank entry. A 1% increase in foreign bank assets among total assets will lead to an increase of 0.343% increase of the bank Z-score. To study the first hypothesis about whether the foreign bank effect depends on the economic level, we focus on regression (2) and (3). The coefficient of foreign bank assets is significant at a 1% significance level for both the poorest and the richest countries. A 1% increase in foreign bank assets will cause a 0.216% and 0.112% increase in Z-score among the six poorest and the six richest countries, respectively. This is against our first hypothesis that foreign banks have more positive effects on countries with higher economic levels. But it could explain Cull & Martinez (2010)'s research that when entering countries with lower economic levels, foreign banks may bring higher regulatory standards and best practices, leading to a more robust and stable financial environment. Next, we examine the result of regression (4) and (5) for the second hypothesis about institutional quality's influence. It can be seen that a 1% increase in foreign bank assets will cause a 0.0271% increase in Z-score among six countries with better institutional quality. But the coefficient of foreign bank presence for countries where institutional quality is bad and insignificant. This is in line with our second hypothesis and also the research of Shabir et al. (2023). The better regulatory environment and quality of institutions significantly increase the strength and resilience of banks. Thirdly, when examining regression (6) and (7), one could infer that foreign bank assets have a significant positive effect on financial stability for counties with less portion of foreign banks. Although this result is not in line with our hypothesis, it supports the literature of Boyd et al. (2003) that analysed that competitive market structures are likely to have banking system crises. Finally, when looking at the time effect from regression (8) and (9), it is obvious that whether in the early stage or in the later stage of entry, a 1% increase in foreign bank assets leads to an increase in bank Z-score of 0.506% and 0.413%, respectively. This means the influence of foreign bank entry on financial stability is constantly positive but the positive effect tends to decrease over time, so this result can be seen as a disagreement of our fourth hypothesis.

The control variables including GDP per capita, inflation, rule of law and bank concentration are significant only in the last regression for the time period 2011 to 2021. This indicates the effect of these control conditions will influence the bank stability in the later stage of bank entry. A 1% increase in GDP per capita, inflation and bank concentration will lead to a 0.0149%, 0.007% and 0.138% decrease in bank Z-score. This predicts that GDP, inflation and bank concentration will negatively influence financial stability in CEE countries. while the influence of the rule of law is positive for financial stability, it supports that better institutional quality will increase bank resilience and stability.

***Table 6 GMM regression result of foreign bank assets on financial stability***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore |
| L_lnzscore | .762*** | .755*** | .856*** | .821*** | .779*** | .554*** | .905*** | .604*** | .821*** |
| | (.051) | (.074) | (.058) | (.065) | (.075) | (.091) | (.046) | (.09) | (.028) |
| lnfba | .343*** | .216** | .112* | .187 | .176** | .271*** | .182 | .506*** | .413*** |
| | (.082) | (.199) | (.067) | (.209) | (.069) | (.086) | (.237) | (.13) | (.088) |
| lngdp | -.026 | 0 | .04 | .08 | -.103 | -.022 | .026 | -.053 | -.149*** |
| | (.047) | (.08) | (.067) | (.088) | (.069) | (.063) | (.079) | (.07) | (.044) |
| lninf | -.017 | .011 | -.021 | .031 | -.013 | .034 | -.003 | -.042 | -.007* |
| | (.022) | (.028) | (.029) | (.036) | (.021) | (.028) | (.028) | (.049) | (.1) |
| lnrol | -.048 | -.262 | -.333 | -.232 | .595 | -.194 | -.086 | -.029 | .229** |
| | (.129) | (.21) | (.315) | (.222) | (.401) | (.248) | (.169) | (.191) | (.1) |
| lncon | -.066 | -.131 | .042 | .041 | -.089 | -.033 | -.057 | .012 | -.138** |
| | (.094) | (.16) | (.159) | (.173) | (.132) | (.15) | (.132) | (.174) | (.069) |
| _cons | -.227 | 1.169 | .725 | -.4 | -1.527 | .863 | -.22 | -.712 | -.378 |
| | (.531) | (1.306) | (1.154) | (1.133) | (1.166) | (.982) | (1.052) | (1.061) | (.341) |
| Sargan value | 111.61 | 75.54 | 84.94 | 71.87 | 86.14 | 81.09 | 88.02 | 53.46 | 167.27 |
| p-value | 0.982 | 0.879 | 0.573 | 0.920 | 0.536 | 0.600 | 0.654 | 0.418 | 0.54 |
| AR(2) value | 0.27 | 0.38 | -0.71 | -0.77 | -0.39 | 0.78 | -0.33 | 0.30 | -0.18 |
| p-value | 0.789 | 0.579 | 0.480 | 0.538 | 0.700 | 0.433 | 0.745 | 0.761 | 0.858 |

Note: the tables shows the GMM regression result for financial stability. The dependent variable is the natural logarithm form of z-score. The independent variable is natural logarithm form of foreign bank asset among total asset. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation, rule of law and bank concentration. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank assets among total assets below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses.

*** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

### 5.2 Result of Financial Efficiency

Table 7 shows the GMM regression results of foreign bank presence, represented by foreign bank assets among total assets, and financial efficiency, indicated by return on asset.

The coefficients of the one-period lag form of ROA for all regression are strongly and positively significant, with the p-value all below 0.01%. it can be inferred that the last period's return on assets will have a positive effect on the current return on assets. As the influence is constant, our choice of dynamic GMM is again supported. For all countries from 2000 to 2021, a 1 unit increase in return on assets in the last year will lead to a 0.449 unit increase in return on assets this year. The positive relationship is more obvious in countries with lower economic levels (regression (2)'s coefficient of 0.582) than in countries with higher economic levels (regression (3)'s coefficient of 0.4). Regressions (4), (5), (6), (7) all have coefficients around 0.4, which indicates that a 1 unit increase of return on asset from last year will cause an increase in return on asset this year around 0.4 unit. Although the relationship is all positive for the two time periods 2000 to 2010 and 2011 to 2021, last period's return on assets has a stronger influence of a coefficient 0.41 in the early stage of foreign banks than in the late stage of entry with a coefficient of 0.2.

The coefficient of foreign bank assets for 12 CEE countries during the whole sample period equals 0.771. This means a 1% increase in foreign bank assets will lead to a 0.007 unit increase in return on assets. The positive relationship helps to prove the view of Bremus (2015) and Nikiel & Opiel (2002). Foreign bank penetration is conducive to enhancing the efficiency of the financial system among the CEE countries. For hypothesis one about the economic level, we focus on regression (2) and (3). Although both of the regressions have a positive coefficient of foreign bank entry, the coefficient is only significant for countries with a higher economic level. A 1% increase in foreign bank assets will lead to a 0.0058 unit increase in return on assets. It can be inferred that the positive influence of foreign banks is mainly because of the rich countries. The result is in line with our hypothesis and also the research of Van (2007) and Tan (2007). The reason may be countries with high levels of economic development usually have more open and competitive financial markets. The entry of foreign banks increases competition in the financial market, forcing local banks to improve their efficiency in order to remain competitive. This market competition may have contributed to efficiency gains in the financial system as a whole. For the second hypothesis about institutional quality, regression (4) and (5) are taken into analysis. It is obvious the positive influence of foreign bank entry lies mostly in the countries with better institutional levels (regression (5)) as the coefficient is significantly positive for regression (5) but insignificantly negative for regression (4). This supports our hypothesis and also the research of Lensink et al. (2008) and Yin (2021). Better obedience to the rule of law and institutional quality will mitigate the impact of foreign bank entry, increase competition and thus efficiency.

For hypothesis three about foreign bank relative importance, we compare the results of regression (6) and (7). Although both of the coefficients for foreign bank assets are insignificant, the coefficient value for countries with a higher portion of foreign banks is larger than the value for countries with a lower portion of foreign banks. This also supports our hypothesis that foreign banks have more positive effects on countries with better Institutional environments. Finally, regression (8) and (9) based on two time periods are analysed. The result is the same as for the financial stability and also supports the fourth hypothesis. The coefficient of foreign banks in the later stage of foreign bank entry is positive at a 1% significance level, but the coefficient in the early stage is insignificantly negative. A 1% increase in foreign bank assets will lead to a 0.025 unit increase of return on assets in the time period from 2011 to 2021. The result supplements the research of Lensink et al. (2004) and Zhuang (2008), foreign banks will result in increased competition, leading to lower costs and higher efficiency for banks in the long run. But in the short run, the influence of foreign banks may be negative due to the increased cost and competitive pressure.

***Table 7 GMM regression result of foreign bank assets on financial efficiency***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | roa | roa | roa | roa | roa | roa | roa | roa | roa |
| L_roa | .449*** | .582*** | .4*** | .486*** | .431*** | .487*** | .393*** | .409*** | .205** |
| | (.069) | (.092) | (.1) | (.079) | (.103) | (.103) | (.088) | (.109) | (.089) |
| lnfba | .771** | .125 | .584* | -.417 | .497** | .35 | .589 | -.045 | 2.542*** |
| | (.375) | (.643) | (.344) | (.576) | (.153) | (.424) | (1.152) | (.463) | (.522) |
| lngdp | -.629*** | -.091 | -.924** | -.148 | -1.148** | -.483 | -.418 | -.448* | -.095 |
| | (.233) | (.256) | (.391) | (.238) | (.473) | (.38) | (.31) | (.246) | (.602) |
| lninf | -.031 | .079 | -.098 | .201** | -.063 | -.034 | -.05 | -.054 | -.072 |
| | (.11) | (.097) | (.189) | (.097) | (.164) | (.178) | (.114) | (.207) | (.13) |
| lnrol | 1.387** | -.146 | 3.814** | -.624 | 4.861* | .156 | 1.087* | .62 | .943 |
| | (.61) | (.67) | (1.871) | (.606) | (2.607) | (1.403) | (.631) | (.671) | (1.294) |
| _cons | -2.569 | 1.205 | -9.287 | 3.35 | -11.473 | 2.913 | -2.4 | 2.57 | -13.378*** |
| | (2.418) | (3.533) | (7.343) | (2.904) | (8.658) | (5.256) | (4.907) | (3.12) | (3.598) |
| Sargan value | 184.710 | 116.41 | 90.51 | 87.71 | 96.14 | 100.24 | 87.28 | 96.01 | 101.68 |
| p-value | 0.122 | 0.138 | 0.465 | 0.549 | 0.309 | 50.67 | 0.648 | 0.238 | 0.276 |
| AR(2) value | -0.49 | 0.78 | -3.17 | 0.81 | -1.61 | -0.35 | 0.39 | 0.34 | -0.76 |
| p-value | 0. 625 | 0.433 | 0.102 | 0.419 | 0.107 | 0.728 | 0.697 | 0.733 | 0.450 |

Note: the tables shows the GMM regression result for financial efficiency. The dependent variable is the return on asset (ROA). The independent variable is natural logarithm form of foreign bank asset among total asset. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank assets among total assets below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

For the control variables, both the GDP per capita and inflation tend to have a negative influence on financial efficiency. For inflation, high inflation can create uncertainty in the economy and financial markets. Uncertainty makes it difficult for investors and businesses to plan for the future, leading to a decrease in the efficiency of resource allocation. Rule of law is more likely to have a significant positive influence on financial efficiency, especially for countries that are rich and with a lower portion of foreign banks. Richer countries attract more domestic and foreign investments. The rule of law plays a crucial role in providing a secure legal framework that protects the rights of investors and ensures fair treatment. Besides, in countries with a lower portion of foreign banks, domestic banks typically play a more dominant role in the financial system. The Rule of Law becomes particularly crucial in maintaining trust and confidence in domestic banks, ensuring proper regulatory compliance, and protecting the interests of various stakeholders, including depositors, borrowers, and investors.

### 5.3 Result of Financial Depth

Table 8 displays the GMM regression results of foreign bank assets among total assets' effect on financial depth, represented by the logarithm form of private sector credit on GDP.

It can be seen that the lagged form of the dependent variable, the logarithm of private sector credit to GDP, is strongly and positively related to the dependent variable. The first regression shows that a 1% increase in private sector credit to GDP in the last period will lead to a 0.899% increase in the current year's private sector credit to GDP. And the following regressions show similar results and trends. As all the coefficients are close to one, this again proves the utilisation of the dynamic GMM model.

From regression (1), it is evident that the coefficient of foreign bank assets exhibits a statistically significant negative relationship at a 5% level of significance. This means a 1% increase in foreign bank assets will lead to a 0.028% decrease in private sector credit to GDP. This supports many scholars' views, such as Barajas et al. (1999) and Natsir, et al. (2019). Foreign bank entry may be negatively related to private sector GDP. The reason may include increased non-performing loans, lowered quality of loans and increased administrative costs caused by an overheated credit market. The regression (2) and (3) report the results for the six poorest and the six richest countries. The foreign bank asset coefficient for the six poorest nations is significantly negative and for the six richest nations is insignificantly positive. A 1% increase in foreign bank assets will cause a 0.191% decrease in private sector credit to GDP. The result again supports our first hypothesis and it is align with the view of 'cherry picking' that haven been proven by Sengupta (2007) and Detragiache et al. (2008). For poorer countries, both the geographic and cultural distance between headquarters and local subsidiaries will be larger than for richer countries. This will increase the difficulty of foreign banks to acquire soft information and thus foreign banks will be more inclined to provide credit to those large multinational companies with hard information. And SMEs will obtain less credit from foreign banks. Next, we look at regressions (4) and (5) to investigate the second hypothesis. Although the coefficients are insignificant for both of the regressions, the value for countries with better institutional quality is negative and for countries with weaker quality is positive. This is against our hypothesis of better institutional quality is good for financial development. From the bank side, a strong rule of law can lead to stricter enforcement of financial regulation and contract laws, for which banks may adopt more conservative lending practices and be cautious about extending credit to riskier borrowers. From the borrower side, with a better rule of law, there may be higher standards for borrowers in terms of creditworthiness and collateral requirements. This could result in a smaller pool of eligible borrowers and a lower level of private credit.

To study whether foreign bank entry effects relies on the relative importance of foreign bank, we focus on regressions (6) and (7). When there is a less portion of foreign bank assets in the country, foreign bank presence tends to have a negative effect on financial depth. A 1% increase in foreign bank assets will cause a 0.071% decrease in private sector credit to GDP. While the coefficient of foreign bank entry is insignificantly positive for countries with a higher portion of foreign banks, we could conclude that foreign banks have more positive effects on countries with a higher portion of foreign banks on account of financial depth. Foreign banks typically have access to international capital markets and a broader pool of funds. When operating in countries with a higher portion of foreign banks, they may have the capacity to provide more extensive and diverse credit facilities to the private sector, boosting the availability of credit. (Giannetti & Ongena, 2009). Finally, we look at regressions (8) and (9) for the final hypothesis. The result and conclusion are the same as for financial stability and efficiency and are also aligned with our hypothesis. A 1% increase in foreign bank assets will cause a 0.09% increase in private sector credit to GDP in the period from 2011 to 2021. While the coefficient value for early-stage regression is also positive, it is insignificant. Therefore, we could conclude that foreign banks have a more positive influence in the long term, especially in the later stage of foreign bank entry. This supports the literature of Hawkins (2006) and Chadi (2019) because the cherry-picking phenomenon is diminishing over time. The reason maybe that the culture and business differences between foreign banks and domestic banks will decrease with time.

The GDP per capita tends to have a negative influence on financial depth for countries with better institutional levels and less portion of foreign bank assets. But the influence of GDP per capita is positive in the long term, which can be inferred from regression (9). Inflation has a positive influence on private credit on general. In some cases, borrowers and lenders may expect future inflation to be higher. When inflation is expected to rise, borrowers may be more inclined to take loans now, anticipating that the real value of their debt will decrease over time. While the influence of the rule of law is generally positive, higher bank concentration tends to have a significantly negative effect on private credit. Lack of competition in highly concentrated banking markets can lead to reduced incentives for banks to offer competitive loan terms and interest rates. As a result, borrowers may have limited options and may face higher borrowing costs, leading to reduced private credit.

***Table 8 GMM regression result of foreign bank assets on financial depth***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit |
| L_lncredit | .899*** | .952*** | .833*** | .853*** | .894*** | .955*** | .866*** | .903*** | .945*** |
| | (.019) | (.023) | (.034) | (.025) | (.03) | (.022) | (.028) | (.04) | (.019) |
| lnfba | -.028** | -.191*** | .005 | .069 | -.033 | -.071*** | .089 | .032 | .09*** |
| | (.025) | (.053) | (.022) | (.021) | (.021) | (.019) | (.104) | (.04) | (.024) |
| lngdp | -.012 | -.031 | .02 | -.05* | -.05* | -.079*** | .047 | .021 | .097*** |
| | (.019) | (.026) | (.028) | (.029) | (.029) | (.021) | (.033) | (.033) | (.023) |
| lninf | .021*** | .015* | .025** | .031*** | .031*** | .016** | .009 | .015 | -.007 |
| | (.007) | (.008) | (.011) | (.009) | (.009) | (.008) | (.011) | (.016) | (.005) |
| lnrol | -.012 | -.091 | .294** | .062 | .062 | -.037 | -.071 | -.04 | .175*** |
| | (.04) | (.056) | (.118) | (.158) | (.158) | (.067) | (.069) | (.058) | (.05) |
| lncon | -.026 | .03 | -.06 | -.037 | -.037 | .001 | -.003 | -.082 | -.099*** |
| | (.032) | (.055) | (.063) | (.055) | (.055) | (.048) | (.057) | (.059) | (.027) |
| _cons | .787*** | 1.561*** | -.591 | .912* | .912* | 1.365*** | -.004 | .612* | .023 |
| | (.173) | (.359) | (.457) | (.468) | (.468) | (.268) | (.432) | (.337) | (.145) |
| Sargan value | 272.71 | 197.60 | 138.02 | 164.87 | 165.49 | 186.31 | 150.56 | 98.16 | 102.24 |
| p-value | 0.786 | 0.645 | 0.775 | 0.694 | 0.694 | 0.788 | 0.413 | 0.339 | 0.056 |
| AR(2) value | -0.53 | -0.51 | -0.17 | -0.18 | -0.51 | -0.89 | -0.68 | -0.49 | -0.75 |
| p-value | 0.598 | 0.634 | 0.867 | 0.859 | 0.612 | 0.375 | 0.495 | 0.625 | 0.452 |

Note: the tables shows the GMM regression result for financial depth. The dependent variable is the natural logarithm of private credit to GDP. The independent variable is natural logarithm form of foreign bank asset among total asset. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank assets among total assets below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

## 5.4 Result of Financial Access

Table 9 shows the GMM regression results of foreign bank assets among total assets' effect on financial access, represented by the logarithm form of bank branches per 100,000 adults.

Firstly, from the coefficient result of the lagged form of the dependent variable, we could conclude that branches per 100,000 adults in the last period have a strong and positive influence on the current bank branches. For example, the first regression of 12 countries in the whole period shows a perfect linear relationship between the last term and the current term. A 1% increase in branches per 100,000 adults in the last period will lead to a 1% increase in the current year's branches per 100,000 adults. For regression (3) and (9), which are for the richest countries and for the time from 2012 to 2021, the coefficients even exceed one. The results indicate that an increase in banking infrastructure, as measured by the number of bank branches, is associated with a larger increase in the dependent variable's value, implying that the expansion of banking services contributes to the growth or changes in the dependent variable. This confirms our choice of the dynamic GMM model.

The coefficient of lagged foreign bank assets for the first model shows a value of -0.12, which indicates that a 1% increase in foreign bank assets will lead to a 0.12% decrease in the branches per 100,000 adults. And this relationship is significant at the 5% significance level. One explanation may be that domestic banks, especially smaller ones, may face increased competition and struggle to maintain their market share. This increased concentration of foreign banks can limit the variety of financial services offered, reducing financial access for certain segments of the population. From regression (2) and (3), we can see that although both coefficients are insignificant, the value for the richest countries is smaller than for the poorest countries. This indicates that the negative influence of foreign bank penetration on financial access is more severe and obvious for poorer countries, which is in line with our first hypothesis and also the research of Gormley (2010) and

Detragiache et al. (2008). Foreign banks may focus their operations on specific wealthy market segments, which leads to poorer financial access for low-economic level countries. Next, regression (4) and (5) based on institutional quality are being analyzed. The result is quite similar to the subsamples based on economic level. The negative effect in countries with better institutional environments is lower. This is in line with our hypothesis of a more positive influence on financial development for countries with better institutional environments and also supports the research of Yin(2021). Better enforcement of the law can mitigate the impact of foreign bank entry.

Regression (6) and (7) shows that foreign bank tends to have a more negative influence on countries with a higher portion of foreign bank assets. A 1% increase in foreign bank assets will lead to a 0.51% decrease in the branches per 100,000 adults for countries with more foreign bank assets. The result is against our hypothesis. Finally, we focus on the last two regressions to investigate the time effect. It can be seen from the two coefficients, the foreign bank's negative effect is diminishing over time. Because a 1% increase in foreign bank assets leads to a 0.21% increase in the branches in the later stage of entry but leads to a 0.179% decrease in the early stage of entry. The result is in line with our hypothesis and also the study of Chadi (2019), the negative effect of foreign bank entry tends to ease out over time.

Finally, the control variables are investigated. Firstly, GDP per capita has both positive and negative influences on financial access depending on different subsamples. Second, inflation's influence is positive for all the regression. One reason may be that high inflation can lead to currency instability and exchange rate fluctuations. Such instability may discourage foreign investment and participation in the domestic financial system, potentially affecting financial access. The coefficient for the rule of law is generally negative, the explanation can be that stringent rules and complete institutional regulations may lead to a reduction in borrower's demand and bank's supply. Finally, bank concentration also has a positive influence on financial access. Normally, larger banks with a significant market share may benefit from economies of scale, allowing them to operate more efficiently and offer a broader range of financial products and services. This efficiency can lead to reduced costs and potentially lower fees for customers, enhancing financial access.

***Table 9 GMM regression result of foreign bank assets on financial access***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es |
| L_ lnbr~es | 1*** | .938*** | 1.044*** | .955*** | .973*** | .978*** | .971*** | .936*** | 1.016*** |
| | (.025) | (.028) | (.04) | (.022) | (.043) | (.04) | (.046) | (.038) | (.039) |
| lnfba | -.12** | -.152 | -.047 | -.13 | -.032* | -.011 | -.517* | -.179** | .021* |
| | (.049) | (.107) | (.033) | (.081) | (.042) | (.039) | (.269) | (.08) | (.083) |
| lngdp | .019 | .035 | -.015 | .027 | -.077 | -.018 | .083* | .001 | .059 |
| | (.032) | (.042) | (.044) | (.033) | (.069) | (.055) | (.044) | (.04) | (.061) |
| lninf | .024*** | .016 | .02* | .013 | .03** | .021* | .025** | .028 | .014 |
| | (.009) | (.013) | (.01) | (.01) | (.013) | (.011) | (.012) | (.021) | (.011) |
| lnrol | -.204*** | -.176* | -.058 | -.161* | -.004 | -.07 | -.309*** | -.275*** | -.157 |
| | (.069) | (.097) | (.144) | (.085) | (.251) | (.16) | (.088) | (.093) | (.132) |
| lncon | .124* | .04 | .06 | .069 | -.033 | .021 | .111 | .18* | -.06 |
| | (.064) | (.094) | (.074) | (.08) | (.097) | (.087) | (.098) | (.098) | (.101) |
| _cons | .645* | 1.094* | .168 | .834** | 1.074 | .473 | 2.409* | 1.344*** | .163 |
| | (.345) | (.602) | (.764) | (.356) | (.816) | (.769) | .971*** | .936*** | 1.016*** |
| Sargan value | 138.67 | 84.20 | 106.14 | 101.59 | 97.09 | 101.55 | 80.71 | 27.74 | 84.16 |
| p-value | 0.004 | 0.065 | 0.001 | 0.002 | 0.005 | 0.002 | 0.091 | 0.727 | 0.032 |
| AR(2) value | -0.45 | -0.14 | -0.17 | 0.00 | -0.27 | -2.82 | -0.13 | 0.08 | -2.15 |
| p-value | 0.650 | 0.891 | 0.867 | 0.999 | 0.784 | 0.005 | 0.894 | 0.939 | 0.032 |

Note: the tables shows the GMM regression result for financial depth. The dependent variable is the natural logarithm of private credit to GDP. The independent variable is natural logarithm form of foreign bank asset among total asset. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2004 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank assets among total assets below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

### 5.5 Robustness Test

Figures from Appendix 3 to 6 report the GMM robustness test using the natural logarithm of foreign bank numbers as independent variables. Firstly, by checking the Sargan test and AR(2) test in each table, we cannot the null hypothesis that the overidentifying restrictions are valid and that there is no autocorrelation in the model's residuals. The p-values for both the Sargan test and AR(2) test exceed the threshold of 0.1, which indicates the result is valid under the 10% significance level. This suggests that all the dynamic panel model setups in the robustness tests are reasonable.

In general, the result and conclusions are in line with our analysis based on the foreign bank assets for the four aspects of financial development. Several small differences will be put forward and explained in the following paragraph.

One thing should be noticed that, in the regression (9) about the later stage of foreign bank entry (2011 to 2021), the coefficient for the foreign bank asset shifted from positive to negative, compared to our previous analysis and it also became insignificant. This indicates that we should not presume the positive effect of foreign banks will continue. For financial efficiency, one big difference is for the subgroups include countries with a lower portion of foreign bank numbers (regression (6)). The value of the coefficient turned negative when using foreign bank numbers as the measure of foreign bank entry. This indicates that the efficiency improvement effect is significantly related to the market share of foreign banks rather than their numbers. As for both the financial depth and access, the biggest difference is that the foreign bank asset coefficient became insignificant when measured by foreign bank numbers instead of foreign bank assets. This suggests the negative effect of foreign bank entry on private credit and on bank branches is not significant when the foreign bank account for a small portion of bank numbers, but the bad effects will increase as the foreign bank took more market share.

In all, table 10 summarizes the empirical results with the four hypotheses. The overall effect of foreign bank entry for financial stability and efficiency is positive but for financial depth and access is negative. Regarding each hypothesis, the conclusions are different for each aspect of financial development. Overall, Foreign banks have more positive effects on countries with higher economic levels and at the later stage of foreign bank entry, except for financial stability. This supports our first and fourth hypotheses. In general, a better institutional environment can build a favourable environment for financial development, while financial depth is an exception. There is a mixed conclusion for the third hypothesis that foreign banks have more positive effects on countries with a higher portion of foreign banks. Our results show that this hypothesis is valid for financial efficiency and depth but invalid for financial stability and access. The reason behind this mixed conclusion may be that all the 12 CEE countries included have a high portion of foreign banks. Therefore, the influence of the relative importance of foreign banks may not be that obvious.

***Table 10 Empirical Results Compared with Hypotheses***

| | Financial Stability | Financial Efficiency | Financial Depth | Financial Access |
|---|---|---|---|---|
| Overall Effect | Positive | Positive | Negative | Negative |
| H1: Economic Level | Against | Supports | Supports | Supports |
| H2: Institutional Quality | Supports | Supports | Against | Supports |
| H3: FB importance | Against | Supports | Supports | Against |
| H4: Time | Against | Supports | Supports | Supports |

H1: Foreign banks have more positive effects on countries with higher economic level

H2: Foreign banks have more positive effects on countries with better Institutional environment

H3: Foreign banks have more positive effects on countries with a higher portion of foreign banks

H4: Foreign banks have more positive effects on the later stage of entry

*Sources: organized by the author*

## 6. Conclusion

The article analyses the influence of foreign bank penetration on financial development in 12 CEE countries from 2000 to 2021. Four aspects of financial development, which are financial stability, financial efficiency, financial depth and financial access, are evaluated. Besides, four hypotheses regarding whether domestic countries' characteristics and time will have an influence on the effect are also tested. One big methodology difference from the established literature is that we applied the dynamic GMM model instead of the fixed-effect model to account for the possible endogeneity problem. Foreign bank assets among total assets are used to measure foreign bank entry. While the robustness test uses variable foreign bank numbers among all banks as the measure of foreign bank entry.

The findings indicate that foreign bank penetration has a favourable impact on financial efficiency and stability while having a detrimental impact on financial depth and access. In general, the empirical results support our hypotheses. A high level of economic development and a stringent and well-developed institutional environment is favourable for foreign banks to exhibit a positive influence on financial development. And the bad effect of foreign banks on financial depth and access is diminishing over time. We should not assume that cherry-picking phenomenon will be constant in the CEE region. Results on the subsamples based on the relative importance of foreign banks indicate a mixed conclusion. Therefore, this factor may not have a big influence on foreign bank effects among CEE countries. One thing that should be noticed is that foreign banks tend to have a more positive effect on financial stability in poorer countries and in the early stage of entry. This may be caused by the economic crises that happened in different time periods. In future analysis, we could include the dummy variable of the economic crisis of the CEE region to further investigate this phenomenon.

Based on the results of the study, several policy recommendations can be suggested to enhance the positive effects of foreign bank penetration on financial development in CEE countries. First, CE governments should foster economic development. To maximize the benefits of foreign bank entry, policymakers should focus on promoting economic development and raising the GDP per capita level. A higher level of economic development is found to be conducive to foreign banks' positive influence on financial development. The second suggestion is to improve institutional environment. Creating a stringent and well-developed institutional environment is crucial for foreign banks to have a positive impact on financial development. Strengthening rule of law, contract enforcement, and regulatory frameworks can encourage foreign banks to operate more efficiently and responsibly. Policymakers in poorer countries can pay more attention to the potential positive effect of foreign banks on financial stability. Encouraging the entry of foreign banks may help improve the overall stability of the financial system, especially during economic downturns.

Besides, while foreign banks may have a negative effect on financial depth and access in the short term, policymakers should closely monitor this trend over time. As economies grow and financial markets mature, the adverse impact of foreign banks on financial depth and access may diminish. Therefore, policymakers should remain vigilant to changing conditions and potential shifts in foreign banks' behavior. Flexibility in policy responses can help address any emerging challenges. Continuous research and data collection on the impacts of foreign banks in the region are essential to make informed policy decisions. Policymakers can collaborate with academia and international organizations to gather comprehensive data and conduct in-depth analysis. By implementing these policy recommendations, CEE countries can harness the potential benefits of foreign bank entry to promote financial development and stability, while effectively managing any potential challenges.

The limitation of this article focuses on that only the country-level and macroeconomic data is included, which could lead to the Ignorance of inter-bank differences. There may be differences in business strategies, asset quality and risk management among different banks. Country-level data may mask these differences, making it impossible to accurately assess the performance of individual banks. Some important bank-level variables, such as bank size, capital adequacy ratio, provision coverage ratio, etc., may be omitted from the country-level analyses, which may be important for the performance and impact of banks. For future research, micro-level and ban-level data could be included and analysed to further study the heterogeneity of foreign banks. For example, for the analysis of financial efficiency, we could include net interest margin and overhead cost to measure banks' efficiency. While for the study of financial depth and access, we can study how foreign bank entry affects the loan interest rate and loan loss provision. Moreover, the factors affecting foreign bank effect is mainly focused on domestic countries' characteristic. More dimensions and subsamples, including the distance of parent and host countries and characteristics of the home country, can be evaluated.

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## List of appendices

## 8. Appendix

***Appendix 1 Detailed Countries in the subsamples for financial access***

| | | |
|---|---|---|
| Economic Level | Richest | Czech, Estonia, Latvia, Lithuania, Slovak, Slovenia |
| | Poorest | Albania, Bulgaria, Croatia, Hungary, Poland, Romania |
| Institutional Quality | Best | Czech, Estonia, Hungary, Latvia, Lithuania, Slovenia |
| | Weakest | Albania, Bulgaria, Croatia, Romania, Poland, Slovak |
| Relative Importance on Foreign Bank Asset | Highest | Albania, Croatia, Estonia, Lithuania, Romania, Slovak |
| | Lowest | Bulgaria, Czech, Hungary, Latvia, Poland, Slovenia |
| Relative Importance on Foreign Bank Number | Highest | Albania, Estonia, Hungary, Poland, Romania, Slovak |
| | Lowest | Bulgaria, Croatia, Czech, Latvia, Lithuania , Slovenia |

*Sources: Organized by the author*

## *Appendix 2 Descriptive Statistic of Variables*

| | | lnzscore | lnroa | lncredit | lnbranches | lnfba | lnfbn | lngdp | lnrol | lninf | lncon |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Albania | Mean | 2.957 | 0.068 | 3.123 | 2.964 | 4.463 | 4.409 | 8.134 | 3.545 | 0.605 | 4.295 |
| | Variance | 0.028 | 0.286 | 0.504 | 0.069 | 0.004 | 0.003 | 0.241 | 0.056 | 0.906 | 0.043 |
| | Min | 2.607 | -1.656 | 1.583 | 2.27 | 4.324 | 4.29 | 7.027 | 2.939 | -2.995 | 4.003 |
| | Max | 3.169 | 0.826 | 3.672 | 3.183 | 4.526 | 4.454 | 8.76 | 3.811 | 2.05 | 4.605 |
| Bulgaria | Mean | 2.177 | 0.45 | 3.783 | 4.226 | 4.3 | 4.164 | 8.642 | 3.938 | 1.364 | 3.985 |
| | Variance | 0.018 | 0.368 | 0.261 | 0.054 | 0.001 | 0.014 | 0.344 | 0.001 | 0.459 | 0.019 |
| | Min | 2.025 | -0.701 | 2.481 | 3.882 | 4.233 | 3.829 | 7.391 | 3.877 | -0.116 | 3.777 |
| | Max | 2.659 | 1.566 | 4.232 | 4.525 | 4.348 | 4.248 | 9.411 | 3.995 | 2.514 | 4.261 |
| Croatia | Mean | 1.923 | 0.169 | 4.016 | 3.478 | 4.481 | 3.79 | 9.365 | 4.042 | 0.683 | 4.081 |
| | Variance | 0.03 | 0.26 | 0.047 | 0.01 | 0.001 | 0.087 | 0.124 | 0.007 | 0.65 | 0.005 |
| | Min | 1.621 | -1.606 | 3.447 | 3.29 | 4.394 | 3.258 | 8.508 | 3.877 | -1.866 | 3.977 |
| | Max | 2.109 | 0.606 | 4.248 | 3.603 | 4.514 | 4.19 | 9.784 | 4.15 | 1.805 | 4.203 |
| Czech Republic | Mean | 2.332 | 0.428 | 3.767 | 3.097 | 4.403 | 4.15 | 9.704 | 4.376 | 0.547 | 4.172 |
| | Variance | 0.018 | 0.188 | 0.049 | 0.005 | 0.007 | 0.015 | 0.183 | 0.003 | 0.938 | 0.002 |
| | Min | 1.978 | -0.973 | 3.288 | 2.907 | 4.19 | 3.951 | 8.704 | 4.229 | -2.131 | 4.085 |
| | Max | 2.505 | 0.974 | 3.982 | 3.19 | 4.512 | 4.344 | 10.197 | 4.438 | 1.85 | 4.269 |
| Estonia | Mean | 2.244 | 0.561 | 4.151 | 2.692 | 4.48 | 4.191 | 9.542 | 4.414 | 1.164 | 4.556 |
| | Variance | 0.074 | 0.381 | 0.079 | 0.139 | 0.007 | 0.056 | 0.307 | 0.007 | 0.776 | 0.001 |
| | Min | 1.525 | -0.923 | 3.584 | 2.069 | 4.331 | 3.761 | 8.312 | 4.222 | -1.906 | 4.495 |
| | Max | 2.591 | 1.476 | 4.619 | 3.179 | 4.575 | 4.357 | 10.238 | 4.499 | 2.338 | 4.59 |
| Hungary | Mean | 2.028 | 0.371 | 3.763 | 2.802 | 4.277 | 4.413 | 9.389 | 4.282 | 1.39 | 4.221 |
| | Variance | 0.023 | 0.606 | 0.063 | 0.023 | 0.002 | 0.002 | 0.135 | 0.004 | 0.487 | 0.01 |
| | Min | 1.777 | -1.924 | 3.462 | 2.624 | 4.209 | 4.331 | 8.439 | 4.188 | -0.929 | 4.066 |
| | Max | 2.272 | 1.152 | 4.219 | 3.154 | 4.35 | 4.477 | 9.84 | 4.387 | 2.283 | 4.463 |
| Latvia | Mean | 1.841 | 0.009 | 3.871 | 3.048 | 4.115 | 3.915 | 9.296 | 4.272 | 0.818 | 4.072 |
| | Variance | 0.052 | 0.654 | 0.188 | 0.311 | 0.042 | 0.091 | 0.314 | 0.011 | 1.668 | 0.022 |
| | Min | 1.153 | -1.426 | 2.941 | 1.892 | 3.689 | 3.296 | 8.12 | 4.029 | -1.962 | 3.885 |
| | Max | 2.122 | 0.904 | 4.55 | 3.621 | 4.382 | 4.159 | 9.956 | 4.415 | 2.735 | 4.486 |
| Lithuania | Mean | 1.831 | 0.222 | 3.588 | 2.904 | 4.489 | 4.232 | 9.323 | 4.286 | 0.625 | 4.406 |
| | Variance | 0.087 | 0.081 | 0.207 | 0.157 | 0.002 | 0.011 | 0.337 | 0.011 | 1.157 | 0.012 |
| | Min | 0.711 | -0.616 | 2.57 | 2.31 | 4.41 | 3.912 | 8.1 | 4.073 | -2.266 | 4.219 |
| | Max | 2.169 | 0.774 | 4.127 | 3.399 | 4.546 | 4.344 | 10.074 | 4.427 | 2.391 | 4.592 |
| | Mean | 2.107 | 0.187 | 3.728 | 3.396 | 4.181 | 4.298 | 9.271 | 4.22 | 0.792 | 3.959 |
| | Variance | 0.133 | 0.473 | 0.079 | 0.011 | 0.013 | 0.003 | 0.178 | 0.005 | 1.14 | 0.047 |
| | Min | 0.563 | -1.783 | 3.274 | 3.144 | 4.013 | 4.094 | 8.412 | 4.12 | -2.922 | 3.652 |
| Poland | Max | 2.311 | 0.96 | 3.997 | 3.525 | 4.369 | 4.344 | 9.798 | 4.361 | 2.293 | 4.339 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Romania | Mean | 2.41 | 0.524 | 3.171 | 3.4 | 4.346 | 4.165 | 8.83 | 4.024 | 1.854 | 4.162 |
| | Variance | 0.049 | 0.321 | 0.248 | 0.027 | 0.054 | 0.067 | 0.455 | 0.022 | 0.906 | 0.008 |
| | Min | 2.052 | -1.279 | 1.964 | 3.116 | 3.85 | 3.738 | 7.415 | 3.791 | 0.066 | 4.001 |
| | Max | 2.917 | 1.32 | 3.672 | 3.603 | 4.515 | 4.394 | 9.611 | 4.223 | 3.821 | 4.32 |
| Slovak Republic | Mean | 2.994 | -0.096 | 3.827 | 3.271 | 4.468 | 4.302 | 9.558 | 4.193 | 1.17 | 4.278 |
| | Variance | 0.06 | 0.189 | 0.064 | 0.002 | 0.072 | 0.018 | 0.175 | 0.004 | 0.458 | 0.01 |
| | Min | 2.431 | -1.366 | 3.374 | 3.149 | 3.761 | 3.912 | 8.599 | 4.098 | -0.044 | 4.079 |
| | Max | 3.26 | 0.476 | 4.224 | 3.342 | 4.595 | 4.443 | 9.989 | 4.311 | 2.488 | 4.491 |
| Slovenia | Mean | 1.38 | 0.115 | 3.97 | 2.561 | 3.393 | 3.463 | 9.931 | 4.401 | 0.9 | 4.126 |
| | Variance | 0.053 | 0.193 | 0.086 | 0.035 | 0.174 | 0.068 | 0.094 | 0 | 0.804 | 0.022 |
| | Min | 0.878 | -0.985 | 3.561 | 2.173 | 2.708 | 2.639 | 9.23 | 4.35 | -1.613 | 3.94 |
| | Max | 1.707 | 0.61 | 4.443 | 2.76 | 3.963 | 3.664 | 10.285 | 4.432 | 2.187 | 4.424 |

Sources: Organized by the author

***Appendix 3 GMM regression result of foreign bank numbers on financial stability***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore | lnzscore |
| L_lnzscore | .759*** | .565*** | .866*** | .717*** | .825*** | .423*** | .884*** | .629*** | .799*** |
| | (.056) | (.091) | (.057) | (.073) | (.071) | (.16) | (.045) | (.089) | (.039) |
| lnfba | .306*** | .276** | .123 | .302 | .168* | .303* | .108 | .495*** | -.043 |
| | (.09) | (.114) | (.087) | (.126) | (.088) | (.182) | (.094) | (.137) | (.075) |
| lngdp | .003 | -.003 | .045 | .124* | -.119 | -.064 | .036 | -.044 | -.201*** |
| | (.048) | (.065) | (.07) | (.068) | (.08) | (.174) | (.043) | (.07) | (.058) |
| lninf | -.018 | .009 | -.041 | .038 | -.026 | .027 | -.032 | -.056 | .003 |
| | (.028) | (.029) | (.038) | (.035) | (.029) | (.053) | (.026) | (.05) | (.013) |
| lnrol | -.152 | -.476*** | -.362 | -.325* | .549 | -.432 | -.104 | -.15 | .169 |
| | (.133) | (.17) | (.346) | (.187) | (.448) | (.914) | (.11) | (.185) | (.125) |
| lncon | .006 | -.207 | .116 | .14 | -.045 | -.33 | -.016 | -.051 | .148*** |
| | (.097) | (.158) | (.166) | (.161) | (.15) | (.323) | (.089) | (.177) | (.049) |
| _cons | -.158 | 2.569** | .448 | -1.049 | -1.388 | 3.577 | .005 | .048 | 1.236*** |
| | (.56) | (1.13) | (1.24) | (1.004) | (1.264) | (.491) | (.992) | (.992) | (.412) |
| Sargan value | 107.72 | 70.91 | 79.71 | 70.36 | 76.47 | 40.27 | 107.89 | 54.33 | 169.65 |
| p-value | 0.914 | 0.804 | 0.582 | 0.856 | 0.622 | 0.458 | 0.618 | 0.386 | 0.137 |
| AR(2) value | 0.27 | 0.38 | -0.73 | -0.36 | -0.38 | 0.53 | -0.88 | 0.31 | -1.25 |
| p-value | 0.788 | 0.657 | 0.466 | 0.754 | 0.706 | 0.595 | 0.380 | 0.756 | 0.211 |

Note: the tables shows the GMM regression result for financial stability. The dependent variable is the natural logarithm form of z-score. The independent variable is natural logarithm form of foreign bank number among total numberes. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation, rule of law and bank concentration. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank numbers among total numberes below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses.

*** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

***Appendix 4 GMM regression result of foreign bank numbers on financial efficiency***

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | roa | roa | roa | roa | roa | roa | roa | roa | roa |
| L_roa | .62*** | .479*** | .715*** | .42*** | .765*** | 1.346*** | .407*** | .395*** | .433*** |
| | (.084) | (.1) | (.114) | (.087) | (.119) | (.132) | (.093) | (.11) | (.102) |
| lnfba | .672* | -.316 | .838* | -.298 | .698* | -.448 | .078 | -.417 | 1.956*** |
| | (.347) | (.335) | (.44) | (.338) | (.433) | (.338) | (1.262) | (.463) | (.627) |
| lngdp | -.51** | -.045 | -.818** | -.024 | -1.101*** | .109 | -.13 | -.411* | -.091 |
| | (.208) | (.214) | (.34) | (.195) | (.421) | (.277) | (.35) | (.243) | (.569) |
| lninf | -.057 | .159 | -.136 | .191* | -.091 | -.244* | .07 | -.007 | -.046 |
| | (.121) | (.105) | (.205) | (.098) | (.187) | (.141) | (.16) | (.208) | (.127) |
| lnrol | .931* | -.449 | 2.515 | -.273 | 4.04* | -.345 | .386 | .471 | .708 |
| | (.527) | (.527) | (1.684) | (.501) | (2.311) | (.809) | (.787) | (.621) | (1.094) |
| _cons | -1.488 | 3.927* | -6.081 | 3.049 | -9.619 | -.456 | 2.206 | 4.316 | -9.86** |
| | (2.074) | (2.147) | (6.789) | (2.018) | (7.649) | (2.795) | (5.808) | (2.722) | (4.197) |
| Sargan value | 208.56 | 115.11 | 106.21 | 84.22 | 108.78 | 116.74 | 91.31 | 100.87 | 91.73 |
| p-value | 0.159 | 0.409 | 0.251 | 0.473 | 0.226 | 0.304 | 0.355 | 0.004 | 0.344 |
| AR(2) value | -0.31 | 2.96 | -0.90 | 0.69 | -1.61 | 0.02 | 0.39 | -0.35 | 2.52 |
| p-value | 0.757 | 0.433 | 0.368 | 0.488 | 0.107 | 0.980 | 0.697 | 0.729 | 0.112 |

Note: the tables shows the GMM regression result for financial efficiency. The dependent variable is the return on asset (ROA). The independent variable is natural logarithm form of foreign bank number among total number. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank number among total numbers below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

***Appendix 5 GMM regression result of foreign bank numbers on financial depth***

| | (1) | (2) | (3) | (4) | (5) | (8) | (9) | (6) | (7) |
|---|---|---|---|---|---|---|---|---|---|
| | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit | lncredit |
| L_lncredit | .902*** | .943*** | .851*** | .865*** | .899*** | .957*** | .875*** | .897*** | .946*** |
| | (.023) | (.026) | (.039) | (.026) | (.036) | (.028) | (.029) | (.039) | (.023) |
| lnfba | -.046 | -.104*** | .013 | -.033 | -.027 | -.05** | .02 | .008 | .148*** |
| | (.028) | (.028) | (.03) | (.031) | (.03) | (.023) | (.081) | (.036) | (.039) |
| lngdp | -.014 | -.06** | .012 | .027 | -.046 | -.054** | .011 | .028 | .144*** |
| | (.02) | (.027) | (.029) | (.026) | (.033) | (.027) | (.029) | (.032) | (.032) |
| lninf | .017** | .015* | .012 | -.004 | .037*** | .016* | -.007 | .017 | -.018*** |
| | (.009) | (.009) | (.014) | (.01) | (.014) | (.009) | (.013) | (.015) | (.007) |
| lnrol | -.018 | -.022 | .3** | -.108** | .049 | -.052 | .01 | -.056 | -.243*** |
| | (.04) | (.052) | (.123) | (.054) | (.176) | (.063) | (.06) | (.055) | (.06) |
| lncon | -.035 | -.009 | -.071 | -.106** | -.054 | .053 | .015 | -.082 | -.087*** |
| | (.034) | (.06) | (.061) | (.05) | (.061) | (.079) | (.041) | (.06) | (.027) |
| _cons | .939*** | 1.35*** | -.584 | 1.313*** | .947* | .902*** | .207 | .739** | -.407 |
| | (.187) | (.36) | (.487) | (.296) | (.507) | (.339) | (.455) | (.302) | (.252) |
| Sargan value | 110.08 | 168.57 | 131.82 | 148.69 | 147.97 | 162.95 | 153.13 | 99.23 | 104.95 |
| p-value | 0.507 | 0.485 | 0.587 | 0.213 | 0.344 | 0.267 | 0.458 | 0.145 | 0.213 |
| AR(2) value | -0.52 | -0.63 | -0.30 | -0.26 | -0.32 | -0.03 | -0.76 | -0.47 | 0.06 |
| p-value | 0.602 | 0.532 | 0.762 | 0.793 | 0.752 | 0.980 | 0.446 | 0.637 | 0.952 |

Note: the tables shows the GMM regression result for financial depth. The dependent variable is the natural logarithm of private credit to GDP. The independent variable is natural logarithm form of foreign bank number among total number. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2000 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank number among total number below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author

## *Appendix 6 GMM regression result of foreign bank numbers on financial access*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es | lnbr~es |
| L_ lnbr~es | .957*** | .916*** | 1.038*** | .932*** | .932*** | 1.027*** | .895*** | .911*** | 1.036*** |
| | (.029) | (.033) | (.05) | (.025) | (.052) | (.062) | (.044) | (.035) | (.049) |
| lnfba | -.06 | -.062 | -.094 | -.086 | .021* | -.108 | .233** | -.097 | .243** |
| | (.053) | (.075) | (.066) | (.056) | (.067) | (.074) | (.193) | (.063) | (.122) |
| lngdp | -.014 | -.023 | .008 | -.045 | -.066 | .016 | -.016 | -.027 | .164* |
| | (.039) | (.057) | (.05) | (.048) | (.08) | (.056) | (.045) | (.044) | (.097) |
| lninf | .032*** | .015 | .035** | .01 | .057** | .026 | .017 | .037* | .018 |
| | (.012) | (.014) | (.018) | (.011) | (.022) | (.017) | (.014) | (.022) | (.017) |
| lnrol | -.143** | -.05 | -.176 | -.021 | -.049 | -.137 | -.065 | -.16* | -.267 |
| | (.072) | (.112) | (.17) | (.112) | (.305) | (.161) | (.08) | (.083) | (.183) |
| lncon | .014 | -.023 | .121 | .017 | -.101 | .157 | -.089 | .085 | -.095 |
| | (.058) | (.087) | (.1) | (.064) | (.118) | (.122) | (.06) | (.08) | (.084) |
| _cons | 1.021** | 1.049 | .383 | 1.026** | 1.308 | .083 | .962 | 1.224** | -1.241 |
| | (.484) | (.689) | (.889) | (.429) | (.956) | (.985) | (1.15) | (.527) | (.896) |
| Sargan value<br>p-value | 127.410<br>0.114 | 76.58<br>0.119 | 85.97<br>0.158 | 90.37<br>0.005 | 82.66<br>0.012 | 76.79<br>0.041 | 93.29<br>0.002 | 30.93<br>0.570 | 60.23<br>0.093 |
| AR(2) value<br>p-value | -0.79<br>0.430 | -0.16<br>0.872 | -0.90<br>0.368 | -0.14<br>0.892 | -0.39<br>0.700 | -0.71<br>0.478 | -0.04<br>0.964 | -0.17<br>0.867 | -1.94<br>0.052 |

Note: the tables shows the GMM regression result for financial depth. The dependent variable is the natural logarithm of private credit to GDP. The independent variable is natural logarithm form of foreign bank number among total banks. Control variables include one period lag of dependent variable, natural logarithm form of GDP per capita, inflation and rule of law. One period lag of control variables are used as instrumental variables. Column (1) is the complete regression for 12 countries in the whole sample period from 2004 to 2021. Column(2) and Column(3) report the result of countries with GDP per capita below average and above average, respectively. Column(4) and Column(5) report the result of countries with institutional environment (rule of law score) below average and above average, respectively. Column(6) and Column(7) report the result of countries with foreign bank number among total banks below average and above average, respectively. Column(8) and Column(9) report the result of all countries for the time periods 2000 to 2010 and the time periods 2011 to 2021, respectively. For detailed information on subsamples, see the main text. Standard errors are in the parentheses. *** p<.01, ** p<.05, * p<.1. Sargan test with its p-value and AR(2) test with its p-value is also reported in the table.

Sources: Organized by the author