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Financial Development and Central Bank Bilateral Currency Swaps: Is there Trade Effect?

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ABSTRACT

The proper assessment and understanding of the financial system are at the core of a robust analysis of macroeconomic fundamentals (Svirydzenka, 2016). Bilateral currency swap enables countries to boost their liquidity access in the financial system for trade and financial transaction. Significantly, we examine the financial development of both China and its currency swap partners. We test our empirical model using data on financial development for a sample of 27 countries. We provide empirical evidence that currency swap is important for trade especially for countries with relatively low level of financial development. It is well documented that the differences in development amongst countries are substantial, and such differences are important in the determination of trade pattern. The level of financial development was proxied by the interaction term of disaggregated measure of financial development such access, depth, and efficiency each interacted with swaps. We provide empirical evidence that differential level of financial development can be a key determinant of whether a country can use currency swap lines for international trade. In rich countries, strong financial system promote trade, the opposite is the case in poorer ones. Perhaps, empirical tests on the influence of financial system and on trade remain on the research agenda especially looking at industry-level import and export data.

Keywords: Financial Development, Central Banks, RMB Bilateral Currency Swap Line, and Bilateral Trade.

1. Introduction

The spread of Central Bank foreign currency swap since the financial crisis of 2007 has received substantial recognition around the global economy amongst Central Banks (Aizenman et al., 2011; Lin et al., 2016; Destais, 2016; Aizenman et al., 2008; Kwon, 2015; Liao and McDowell, 2015; and Aizenman et al., 2010). The agreement allows a Central Bank in one country to exchange currency, usually its domestic currency, for a determined amount of foreign currency from the Peoples' Bank of China (PBOC). While the recipient Central Bank offer lending facility to its domestic banks from the foreign currency obtained from the provider (Peoples' Bank of China (PBOC)) on its own predetermined terms and conditions and risk. Swaps involving the Peoples' Bank of China (PBOC) were one of the most important and rapidly growing swap networks as a response to the 2007 global financial crisis (Lin et al., 2016 and Lai, E. L., and Yu, X. 2015). It is not yet clear to what extent this sort of interaction of between currency swap and trade is driven by the financial development of both the recipient and provider country, while it is equally relevant to understand financial development and trade within the currency swap network. Similarly, a large empirical literature has established the importance of financial development for growth, trade performance and equity of economies, at the same time fragile and overleverage financial system perhaps brings about major crisis as experienced in 2007 (Cihák M., Demirgüç-Kunt A., Feyen E. and Levine R. 2013). First, our empirical investigation seeks to assess the extent to which the mixture of financial institutions and markets exerts influence on trade. In the bid to examine whether too much or little finance drives the bilateral currency swap agreement, we visually inspect the graphical plots of financial development index for the 27 RMB currency swap recipients in both advanced and emerging economies. The data depicts that their financial structure differs markedly (see Figure 3).[1]Therefore, the assessment of the depth (size), access (activity), and efficiency of the financial system is fundamental in shedding light on what lies behind the bilateral currency swap agreement, trade and overall financial development.[2] Secondly, currency swaps usage provides buffer against financial crisis in recent time. Which allows countries that subscribe to the arrangement to boost liquidity access in their financial systems. Therefore, it is important to assess financial development of these economies in terms of the fundamental functions of the financial system: (1) producing and processing information about possible investments and allocation of capital; (2) monitoring individuals and firms in the exertion of corporate governance; (3) facilitation of trade and risk management and diversification; (4) pooling

[1]The proper assessment and understanding of the financial system are at the core of a robust analysis of macroeconomic fundamentals (see Svirydzenka, 2016).

[2]This informs the question do financial institutions and markets development matter for trade?

and mobilizing savings; and (5) the degree with which exchange of goods, services and financial instruments is carried out with ease (Cihák, et al., 2013 and Svirydzenka, 2016). Moreover, financial institutions and markets across the globe differ markedly in the way they provide these vital financial services. In this manner, it will be relevant to understand and shed light on the underlying state of the economies that subscribe the cross-currency swap line (RMB swap line) since 2008 as a form of international financial derivative. Thus, the Peoples' Bank of Chinas' (PBOC's) RMB swap line and the counterparties (signatories) to the agreement will be the focal point of our empirical investigation, in terms of financial development and trade openness.

This paper, to the best of our knowledge, is the first study which tackles the issue of financial development and trade in the light of Central Bank bilateral currency swap network by highlighting the role of financial institutions and market size (depth), activity (access), and efficiency. In addition, we seek to overcome the drawback in major empirical work that largely focus on ratio of private credit to GDP as a key proxy of financial development (see Kiendrebeogo, 2012; Arcand, Berkes, and Panizza, 2011 and Cavallo and Scartascini, 2012). Recently, Cihák M., Demirgüç-Kunt A., Feyen E. and Levine R. (2013), Svirydzenka (2016) introduces and expanded version of financial development and recent trend in the database structure of development in financial institutions and markets across countries. The database provides measures of size, access, and efficiency of financial institution (such as banks and insurance companies, mutual funds, and pension funds) and financial markets (including stock markets, bond markets, and derivative markets) exert a powerful influence on trade and investment, growth and economic development, poverty alleviation, and economic stability (Levine, 2004 and Cihák et al., 2012). These new measures of financial development more comprehensively capture differences in the domestic financial system across countries and time.[3] Thus, we seek to enhance our understanding on the relationship between trade and financial development in the light of Chinas' bilateral swap network in different countries with diverse of financial system within the framework of panel data.[4]

2. Literature survey

In both theoretical and empirical literature financial development and the degree of international trade openness are among key variables the economic growth literature highlights as being highly connected with growth performance across countries (e.g. Beck et al., 2002; 2000; Beck 2002;

[3]World and IMF database provides statistics on size, activity, and efficiency of banks and non-banks, equity markets and bonds markets across abroad range of countries. More so, it contains many indicators of financial globalization that include statistics on international bond issues, international loans offshore deposits and remittance flows. The database is drawn on a wide array of primary sources that cover several dimensions of the financial system(http://econ.worldbank.org/programs/finance).

[4]We depart from the realization that financial development affects trade patterns, the paper poses the question: will external finance through RMB bilateral currency swap matter for international trade.

Demetriades and Andrianova, 2004; Darrat et al., 2006; Ductor and Grechyna, 2015; Levine, 2003; Guariglia and Ponchet 2008 and Levine, 1997). An important source of financial development documented in the small but growing literature is trade openness. The related literature focuses on two variable relation between trade openness and financial development as in "Braun and Raddaiz, 2005; Do and Levchenko, 2004; Mishikin, 2009; and Beck, 2002". Trade openness greatly differs in the world's most open and least open countries. For example, Argentina, one of the relatively least open economies witnessed a trade volume of some 20% as a percentage of GDP compared to Singapore that had around 440% over the period of 1971 – 2010. For example, the average financial development as traditionally measured by the domestic credit private sector (% of GDP) is apparently more than 22 times higher in the most financially developed country like Japan in comparison to least developed such as Ghana (see Kiendrebeogo, 2012).

Rajan and Zingales (2003) suggests that empirical findings based on the two-variable relationship are likely to be misleading and invariably incomplete. Furthermore, the Rajan and Zingales studies suggested three variable relationship among financial development, trade openness and financial openness. Particularly, they maintained that trade openness without financial openness may not yield higher financial development and they verified the hypothesis using data for 24 industrialized countries from the span of 1913 – 1999. Rajan and Zingales (2003) utilizes the interest group theory to benchmark their findings. Their results argued that Interest groups, particularly industrial and financial incumbents perhaps stand to lose from financial development. Since financial development provides new opportunities for new entrant firms into the market, this propels competition and erodes the incumbents' interests. They argued that financial development will be weaker when the economy is open to trade and finance.

Baltagi et al. (2009) verifies the Rajan Zingales's (2003) hypothetical assertion using data drawn for both developing and industrialized countries. They show the interactive effects of trade and financial openness on financial development in investigating the dual openness hypothesis. The interaction between trade openness, financial openness and trade can be used to investigate the marginal effect of increasing trade (financial) openness on financial development conditional on financial (trade) openness.

In addition, the financial system is considered as an endowment and therefore disparities across country lead to different levels of trade performance. With identical technology and factor endowments between countries, comparative cost varies when countries differ in their respective institution of credit enforcement (see Kiendrebeogo, 2012). Since financial services provided by the endogenous financial systems are unique across countries, and as such the pattern of industrial

specialization is influenced by the level of financial intermediation. Recently, theoretical developments on the relationship between finance and international trade patterns underpins the relevance of external finance in production (see for example Beck, 2002; Manova, 2006; Matsuyama, 2005; and Antras and Caballero, 2009). Similarly, many studies find that international trade is largely propelled by financial development (Manova, 2006; Becker and Greenberg, 2007; and Svaleryd and Vlachos, 2005). Recently a growing body of literature underscore that the demand for a well-developed financial center is higher in countries with industrial structures that heavily depends on external finance. In contrast, demand for external finance tends to be lower in countries that specialize in goods that do not require external finance (Huang and Temple, 2005; Klein and Olivei, 2008; and Baltagi et al., 2009).

Furthermore, in this strand of empirical literature, except for Kiendrebeogo, (2012) and Ju and Wei (2011), less emphasis has been placed on the relevance of institutions in relation to finance and trade. Ju and Wei (2011) develop a general equilibrium framework and show that finance is passive in countries with relatively high-quality institutions and seems to be an important source of comparative advantage for countries with low-quality institutions. Kiendrebeogo, (2012) argued that countries with high quality institutions makes transaction in financial and goods markets better cleared owing to better information and increased competition. Similarly, when shareholders and property rights are well secured firms tend to have improved levels of governance and greater efficiency in the allocation of productive resources. Thus, higher quality of institutions might enhance perceived positive impact of financial development on international trade flows (Huang and Temple, 2005; Klein and Olivei, 2008).

More so, a recent expanding literature stresses the impact of financial markets and institutions on economic development and allocation of productive economic activities (Levine, 1997; Baltagi et al., 2009; Demirgüç-Kunt and Levine, 2009). The studies show that a well-functioning financial system constitutes a potential mechanism for economic growth. Especially, where information related to profitable projects, diversifying risks, lesser liquidity risks, rationing the allocation of resources towards more productive utilization, resource mobilization and corporate monitoring. In addition, a well-functioning financial system enhances capital formation and efficiency in the allocation, promotion of resources, and consequently higher economic growth (see Hondroyiannis et al., 2005; King and Levine, 1993; Levine, 1997; Levine andZervos, 1998; Rousseau and Wachtel, 2000; and Beck andLevine, 2004). Finance constraints prevent less developed countries from taking full advantage of technology transfer and that leads to divergent growth rate. Less developed countries with underdeveloped financial system are trapped into a vicious circle, where deficient financial

development leads to low economic performance and in turn more deficient financial development (Aghion et al., 2005 and Fung, 2009).

3. Data Measurement and Stylized Facts

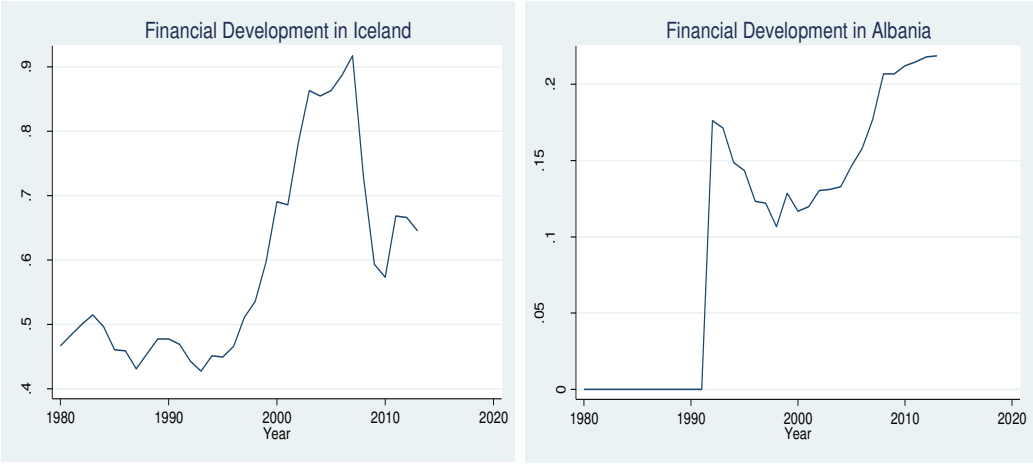
This section describes the data employed in the empirical analysis. We consider six different measures of financial development namely, financial institutions size (depth) (FID), access (activity) (FIA), and efficiency (FIE) and financial markets size (depth) (FMD) access (activity) (FMA), and efficiency (FME). The six sub-indices measure how deep, accessible, and efficient financial markets and institutions are overall across countries and time. In addition, these sub-indices are aggregated into a higher-level sub-indices FI and FM, which captures how developed financial institutions and markets are across the globe. Overall, FI and FM sub-indices are aggregated into the overall measure of financial development (FD index). We compile data from IMF database for the analyses of the effects of trade openness on these different measures of financial development in 27 countries that signed China's currency swap network over the span of 1980 to 2013 obtained from IMF's international financial statistics database. Similarly, we use the respective economic sizes (GDP) and per capita income of these economies. Trade openness (TO) depict the degree to which countries allow trade with other countries measured by the ratio of total trade (i.e., exports plus imports) to the nominal GDP in each country. In the data set, trade data relies on the direction of trade statistics (DOTs), real GDP come from the World Bank's *World Development Indicators (WDI)*.

3.1 Measures of Financial Development

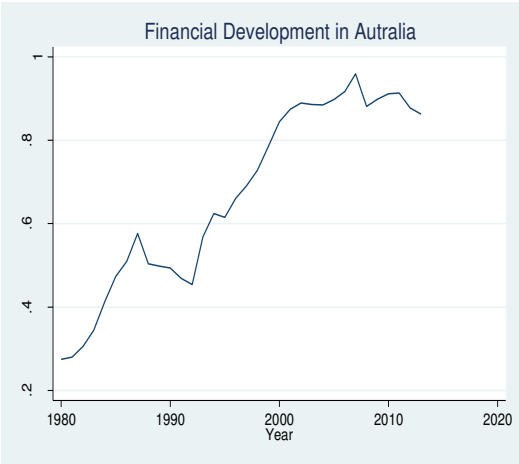
The debate about financial development and trade-cum growth is yet unsettled. One central concern relates to the question whether there is too much financial development, or too little. Also, can economists measure it well? Arcand, Berkes, and Panizza (2011), used the private credit to GDP to examine whether there is too much finance; and Cavallo and Scartascini (2012) pointed out that several countries still have too little finance. Čihák et al. (2012) argued that the commonly used measures of financial development are poor proxies of the functioning of the financial system. Traditionally, the researchers often focused on the ratio of private credit to GDP in measuring financial development. For example, suppose one visit a doctor for a medical check-up usually involves one being weighed. Weight could provide a useful information that may indicate something about the persons' eating habit, exercise, and other behaviors. However, this is not a sufficient basis to assess the overall persons' medical state, health and wellbeing. Normally, Doctors resort to measure pulse, temperature and a series of other vital medical examination to well establish the person health. Although this seems fine, however, looking only at the ratio of private credit to GDP does not provide adequate and sufficient yardstick for the assessment of financial development. But

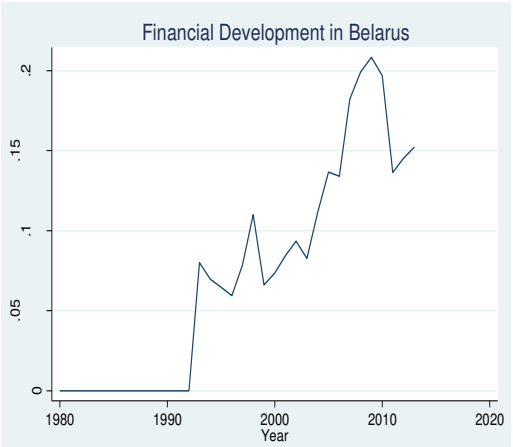
doing so, would be equivalent to the analogy of "weighing in" at a Doctor's office at first glance. The ratio of private credit to GDP is an essential form of credit available and an important category of financial of service. The ratio of private credit to GDP also captures the size of banks' loan book relative to the economic size (output), yet this does not say anything about the financial sector and its stability. However, focusing only on one characteristic (financial depth) would mean missing out some vital aspect of financial system. Apparently, a large amount of credit may not tally with the broader use of financial sizes, since the credit spread can be skewed among the largest firms and wealthy entrepreneurs (Cihák, et al., 2013 and Svirydzenka, 2016). Figure 2 shows the use of formal accounts been imperfectly correlated with the common measure of financial depth. For instance, Vietnam has a very high domestic credit to the private sector corresponding to 125% of GDP, but only 21% of adults possess formal account. Conversely, an economy may have relatively modest financial depth (private credit to GDP at 56%) like Czech Republic but have high financial access i.e. relatively high account penetration amounting to (81% adults have access to finance). Therefore, this suggested that financial depth and financial access or inclusion are distinct characteristics and dimensions of financial development (Cihák, et al., 2013). Similar vein, a financial system can be deep without inclusivity and providing access to all. More so, figure 2 also indicates the absence of significant correlation between financial access and financial stability.

Figure 2: Financial Development of Bilateral Currency Swap Recipients

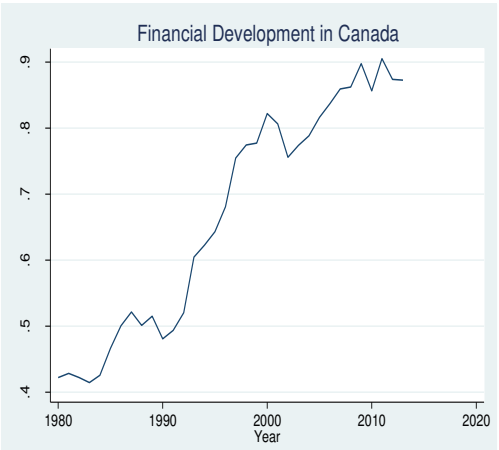



Financial Development in Argentina
.2
.25
.3
.35
.4
.45
1980
1990
2000
2010
2020
Year

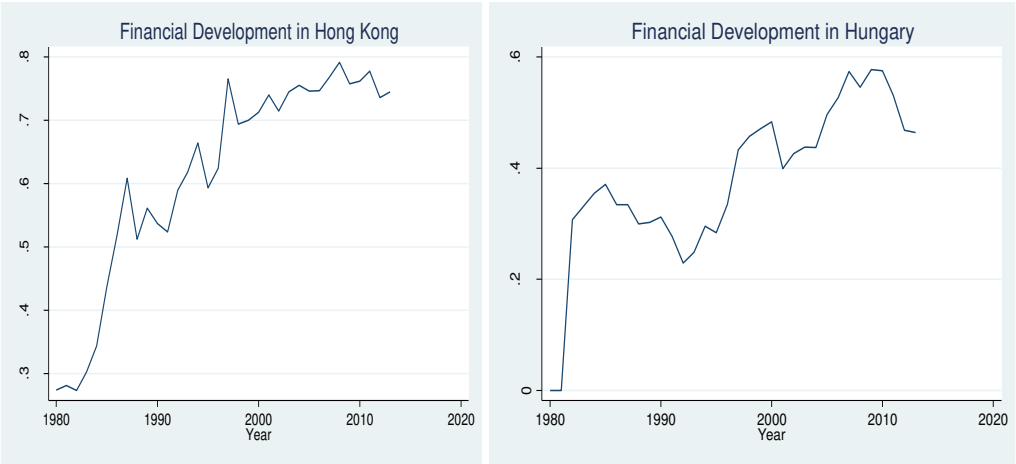

Financial Development in Autralia
.2
.4
.6
.8
1
1980
1990
2000
2010
2020
Year


Financial Development in Belarus
0
.05
.1
.15
.2
1980
1990
2000
2010
2020
Year


Financial Development in Brazil
.2
.3
.4
.5
.6
1980
1990
2000
2010
2020
Year


Financial Development in Canada
.4
.5
.6
.7
.8
.9
1980
1990
2000
2010
2020
Year


Financial Development in China
0
.2
.4
.6
1980
1990
2000
2010
2020
Year



Source: Authors' Computation.

Most often researchers lack solid measures of the degree to which financial system perform its functions. Beck et al. (2010), Cihák, et al. (2013), World Bank (2012) and Svirydzenka (2016) introduced financial development and incorporated in the both IMF and World Bank database structure, which presents the expanded and updated trends in structure and development of financial institution and markets across time and countries. The database provides new multi-dimensional measure of financial development that comprises size (depth) of financial institutions and markets, degree of which individuals do use financial services (access), and efficiency of financial intermediaries and markets in intermediating resources and facilitating financial transactions (efficiency) of the financial system (see Čihák, Demirgüç-Kunt, Feyen, and Levine 2013). All the newly constructed dimensions of the financial development measured both financial institutions such as banks and insurance companies and financial markets such as bond and stock markets take account of the overall financial system.

Table 1: 3 x 2 Matrix of Financial System Characteristics

	Financial Institutions	**Financial Markets**
Depth	**Private credit to GDP**	**Stock market capitalization plus outstanding domestic private debt securities to GDP**
	Pension fund to GDP	
	Mutual fund to GDP	
	Insurance premiums, (life and non-life to GDP	Private debt securities to GDP
		Public debt securities to GDP
	Gross value-added of the financial sector to GDP	International debt securities to GDP
		Stock market capitalization to GDP
		Stocks traded to GDP

Access	**Accounts per thousand adults** (commercial banks) Branches per 100,000 adults (commercial banks) % of people with a bank account % of firms with line of credit (all firms) % of firms with line of credit (small firms)	**Percent of market capitalization outside of top 10 largest companies** Percent of value traded outside of top 10 traded companies Government bond yields (3 month and 10 years) Ratio of domestic to total debt securities Ratio of private to total debt securities (domestic) Ratio of new corporate bond issues to GDP
Efficiency	**Net interest margin** Lending-deposits spread Non-interest income to total income Overhead costs (% of total assets) Profitability (return on assets, return on equity) Boone indicator (or Herfindahl or H-statistics)	**Turnover ratio** (turnover/capitalization) for stock market Price synchronicity (co-movement) Private information trading Price impact Liquidity/transaction costs Quoted bid-ask spread for government bonds Turnover of bonds (private, public) on securities exchange Settlement efficiency

Source: Calculations based on the Global Financial Development Database and Čihák et al. (2013) and World Bank (2012) and (Svirydzenka, 2016).

The matrix above in table 1 contains a subset measures of financial development for the dimensions defined the 3x2 matrix. The measures were highlighted in bold. The financial institution depth sub-index used the standard banking sector depth i.e. private credit to GDP captures the domestic private credit to the real sector by deposit money banks to GDP and then add indicators for other non-bank financial institutions: the assets of mutual fund and pension funds industries and the size of insurance premium (life and non-life). Financial institution access is proxied by the accounts per thousand adults i.e. number of depositors with commercial banks per 1,000 adults for each type of institution, computed as the (reported number of depositors) *1000/adult population is each country.

While financial institution efficiency of intermediating savings to investment is measured by the net interest margin (the accounting value of banks' net interest revenue as of its average interest bearing (total earnings) assets and lending deposit spread; which captures operational efficiency measures, such as non-interest income to total income and overhead costs to total assets; and measure of profitability such as return on assets and return on equity.

The financial markets depth indicator relies on stock market and debt market development. The depth sub-index includes the size of the stock market i.e. stock market capitalization plus outstanding domestic private debt securities to GDP defined as the value of listed shares to GDP plus amount of outstanding domestic private debt securities to GDP. While financial markets access is measured by the percentage of market capitalization outside the top 10 largest companies. The financial markets efficiency measure is captured by turnover ratio (turnover/capitalization) for stock markets is defined by the ratio of the value of total shares traded to market capitalization (see for example, Svirydzenka, 2016)[5]. Čihák et al. (2013) shows that financial system across the world exhibits a striking and huge disparity. They argued that even if the financial systems were to be rescaled by the corresponding economic size (i.e. by their GDP), the deepest financial system is some 110 times bigger than the smallest (least deep) ones. For instance, Denmark has 99.7% of adults were covered by bank accounts, in comparison Turkemenistan only 0.4% have access to bank accounts (this shows a huge disparity). Interestingly, Denmark is also a country with the highest turnover/capitalization ratio in the securities markets at, 538 while most countries stood at a ratio below 1. This is enough to demonstrate the huge degree of unevenness in the size of financial system. Similarly, the cartogram in Figure 2 depicts the unevenness of development in of financial system around the world. For instance, Russia's financial system far exceed that of China, and Germany's alone is bigger than the combined financial systems of the entire sub-Saharan Africa, indeed, the disparities are huge.[6]

4. Empirical Methodology

The econometric model aims to examine the effect of financial development on trade flows in the light bilateral currency swap line of China. We seek to investigate the general relationship between

[5]For example, Do and Levchenko (2004) theoretically show that each country's financial system is an endogenous outcome of the level at which entrepreneurs demand for external finance. Similarly, when a poor and rich country open to international trade, poorer countries tend to import financially dependent good, as against producing it domestically, and by implication demand for external finance decrease and that deteriorates the domestic financial system. Indeed, the relevance of financial development in strengthening long run growth and reduction of output volatility has received substantial attention literature (seeLevine, 2004; Cavallo and Scartascini, 2012; Arcand, Berkes, and Panizza, 2011; Manova, 2006; Becker and Greenberg,2007).

[6]Recent evidence suggests that banking crises negatively exert influence on international trade flows through their effect on trade-finance-cum growth (see for example Lacovone and Zavacka, 2009; Chor, andManova, 2010; Ronci, 2004; and Kiendrebeogo, 2012).

financial development and trade, the following panel regressions àla structural gravity in line with Head and Mayer (2014) as follows:

$$X_{ni} = \underbrace{\frac{Y_i}{\Omega_i}}_{S_i} \underbrace{\frac{X_n}{\Phi_n}}_{M_n} \emptyset_{ni}, \quad (1)$$

Where $Y_i = \sum_n X_{ni}$is exporter income$X_n = \sum_i X_{ni}$ is importer expenditure on all sourcedestination, $\Omega_i$and $\Phi_n$are "multilateral resistance" term defined as follows:

$$\Phi_n = \sum_\ell \frac{\emptyset_{n\ell} Y_\ell}{\Omega_\ell} \qquad and \qquad \Omega_\ell = \sum_\ell \frac{\emptyset_{n\ell} X_\ell}{\Phi_\ell} \quad (2)$$

The key and apparent feature of structural gravity is its multiplicative form. After taking logs, this denotes that the effect of multilateral resistance term can be captured by exporter and importer fixed effects. While $\emptyset_{ni}$ captures a vector of bilateral trade costs variables, which includes RTAs and bilateral currency swaps:

$$lnX_{ni} = lnG + lnS_i + lnM_n + ln\emptyset_{ni} \quad (3)$$

Moreover, another key characteristic of the structural gravity is that trade flows between n and i is affected by third countries, only through Ω_i and $\Phi_n$terms, that are specific to n and i respectively. Once armed withmeasures of income and expenditure for each country and bilateral trade costs for all country pairs, those terms can be solved easily. In what follows we incorporate the disaggregated measures of financial development to feature into the structural gravity set up.

$$lnX_{ni,t} = \beta_1 lnS_i + \beta_2 lnM_n + \beta_3 FIA_{i,t} + \beta_4 FIA_{n,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FIA_{i,t} * \lambda'_{ni,t} + \beta_7 FIA_{n,t} * \lambda'_{ni,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it} \quad (4)$$

Where $X_{ni,t}$ is the measure of bilateral trade between country i and n. $FIA_{i,t}$ and $FIA_{n,t}$denotes financial institution access for both country i and n respectively, i.e. degree to which firms can and do use financial services. We use the percentage of firms with lines of credit to measure access.The lnS_i factor represents "capabilities" of exporter i as a supplier to all

destinations. lnM_ncapturesall characteristics of destination market n that promote imports from all sources, in order words the respective exporter income and importer expenditure of country i and n.[7] $FID_{i,t}$and $FID_{n,t}$captures the financial institution depth is measured by the standard banking sector depth proxy (private credit to GDP), which is defined as domestic private credit to real sector by deposit money banks excluding credits issued by central banks, and credit issued to government agencies and public enterprises. $FIE_{i,t}$and$FIE_{n,t}$ denotes the financial institution efficiency measures the banking sector efficiency in intermediating savings to investment, as proxied by the net interest margin (an equivalent of an accounting value of banks' net interest revenue as a share of its average interest – bearing assets) and lending – deposit spread. The index is integrated to profitability measures as return on assets and equity, and operational efficiency measures as a non – interest income to total income and overhead cost to total assets. $\lambda'_{ni,t}$, is a dummy variable that captures central bank bilateral currency swap of China (Renminbi swap line) signed by both Advanced and Emerging economies to exchange principal and interest payments in two different currencies at fixed interval.[8] During the life of the cross-currency swap each offers interest in the currency of the principal received. While at the maturity of the swap, both parties make exchange of the principal amount back to back.[9] The $FID * \lambda'_{ni,t}$, is an interaction term between financial institution depth and the currency swap variable to investigate how deep financial institutions with the existence of the bilateral currency swap line. γ_{ni}, captures the country pair fixed effects, $\rho_{i,}$ denotes country i fixed effects and μ_n, denotes country n fixed effects.[10]

4.2 Empirical Results

The estimate equations (1) to (6) for countries that signed the RMB bilateral currency swap line. Overall, the alternative measures of financial development have if anything Table 2 depicts the estimation results for the gravity equation with disaggregated measures of financial development index across the countries that are signatories to the bilateral currency swap line. Our data for

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[7] (See Head and Maye, 2014)

[8] $lnX_{ni,t} = \beta_1 lnS_i + \beta_2 lnM_n + \beta_3 FID_{i,t} + \beta_4 FID_{n,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FID_{i,t} * \lambda'_{ni,t} + \beta_7 FID_{n,t} * \lambda'_{ni,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it}$(5)

$lnX_{ni,t} = \beta_1 lnS_i + \beta_2 lnM_n + \beta_3 FIE_{i,t} + \beta_4 FIE_{n,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FIE_{i,t} * \lambda'_{ni,t} + \beta_7 FIE_{n,t} * \lambda'_{ni,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it}$(6)

[9] The exchange of the notional amount is aimed at boosting liquidity, and eliminates the uncertainty associated to foreign exchange fluctuation, and therefore hedge fully exchange rate risks. Moreover, the cross-currency swap is an over the counter international financial derivative in a form of agreement. This type of currency swap is used to take advantage of comparative advantages. For instance, suppose a Chinese firm is looking to acquire New Zealand dollar and a New Zealand firm is seeking to acquire Chinese Renminbi, these two firms could engage into a swap. This is due to the fact New Zealand firms are likely to have better access to New Zealand debt market and could get a more favorable term on a New Zealand dollar than if Chinese firms went in directly to the New Zealand debt market itself, the situation is for China if New Zealand if firms require Renminbi liquidity (Detais, 2016 and Khurshedi, 2012).

[10] (see Zhang and Lu, 2015; Svirydzenka, 2016; Demirgüç-Kunt, et al., 2012 and Cihák, et al., 2013).

financial development is divided into two: the financial development of China as swap provider (which we called financial development in the origin country) and the recipient of China's RMB swap line (destination countries). The RMB currency swap network include some Advance economies, Emerging markets, and developing countries. All things been equal exporter income and importer income predicted a positive impact on trade in line with the conventional trade gravity equation literature. Furthermore, the results show that the estimated parameters of the disaggregated measures of financial development are statistically significant at 1 percent level, although the magnitude of each component of financial development relatively differ. First, Currency swap results suggests a high impact on trade. Also, the results in Table 2 depicts positive effect on trade for both the swap provider (financial development in origin country) and signatories (financial development in the destination country). Our empirical model utilizes data on financial development for the sample of sample 27 countries that signed China's swap line. The key effect that our model illustrates is that swap and alternative measures of financial development affects trade differently.[11] For example, swap-financial development interaction term is negative and significant at 1% level. Row 5 and 7 indicates full set of swap interaction terms paired with financial institution and markets sub-indices that include access, depth, and efficiency. This allow the effect of other regressors on trade to be affected differentially for countries with high and low level of financial development. The results indicate that RMB currency swap matter for trade differentially based on countries level of financial development. It is evident and well documented in the literature that differences in financial development amongst countries are substantial and these differences are key determinants of trade patterns. We also discern that negative impact of our financial development and swap interaction on trade should be attributed to disparity in terms of financial development a cross China's swap line partners with varying level of financial development.

[11]The extend of financial access, depth and efficiency of a country's financial system determines the local demand and supply for external finance currency swap lines. Therefore, the impact on swap on trade is expected to be differential across countries. Suppose trade results to increase specialization in financially dependent commodities, that leads to growth of the financial system. Conversely, countries that relies on the imports of financially dependent commodities rather than produce them domestically, the financial system weaken because of trade opening, *ceteris paribus.*

Table 2: Currency swap and Alternative Financial Development Measures

	[1]	[2]	[3]	[4]	[5]	[6]
Exp_Income	0.900***	0.993***	1.030***	1.044***	1.022***	1.087***
	(0.111)	(0.105)	(0.0999)	(0.106)	(0.102)	(0.106)
Imp_Exp	0.880***	0.991***	1.092***	1.047***	1.058***	1.067***
	(0.0895)	(0.0848)	(0.0877)	(0.0890)	(0.0903)	(0.0910)
FinDev_Destin	0.394***	0.303***	0.363***	0.0778***	0.0820***	0.00338
ation	(0.0540)	(0.0545)	(0.0954)	(0.0299)	(0.0290)	(0.0194)
FinDev_	0.161**	0.0364*	0.131**	-0.0107	0.0127*	0.0358*
Origin	(0.0724)	(0.0648)	(0.0856)	(0.0284)	(0.0283)	(0.0190)
FinDev_Destin	-0.031*	-0.233**	-0.969***	-0.0868	-0.225***	-0.158***
ation#swap	(0.155)	(0.0992)	(0.296)	(0.0824)	(0.0645)	(0.0505)
FinDev_	-0.026*	-0.514**	-0.4.61*	-0.313*	-0.749*	-0.72**
Origin#swap	(0.147)	(0.865)	(0.404)	(0.326)	(0.645)	(0.084)
Currency swaps	0.695***	0.889***	0.889***	0.897***	0.805***	0.903***
	(0.117)	(0.102)	(0.103)	(0.117)	(0.103)	(0.104)
Observations	15,300	15,300	15,300	14,565	15,300	13,582
R-squared	0.671	0.616	0.673	0.611	0.652	0.6132
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Overall, results further suggest that financial access, depth and efficiency has different impacts on trade both in China and its trading partners that are in the renminbi swap line. We also note that the negative coefficients of the interaction enter with negative results, which means that low level of financial development is likely to drive currency swap line. This is the case when the global financial crisis deepens, many countries flexibly embrace the swap line to either substitute or compliment reserves and use it for self-insurance motive. Broadly, swaps can also substitute or compliment reserve apart from its usage for trade, which is a safety verve in case of unexpected shortages in international liquidity. Although, there could be a limit to which swap line can be use, however, the usage is determined by the recipient's level of financial development and the credibility of the

provider. Another evidence suggests that swap lines are motivated essentially by self-interest of the provider (China), but in fact the benefits are substantial for recipient countries. For instance, a provider like China, swaps are useful in safeguarding the economic interest they have in countries they extend the swap lines. We believe that the interests may take different dimension for provider – e.g. significant export share or market in the swap destinations. For recipient countries swaps can foster financial stability especially when reserves cannot reassure markets during the financial crisis mainly for countries with low level of financial development and weak macroeconomic fundamentals. Therefore, it is possible that swaps possess mutual benefits that is not mainly resort to in the period of crisis, but also in good times. Swap lines can be formalized or institutionalize from a temporary anti-crisis measure to a long-term financial tool to boost liquidity especially when the need for precautionary reserve holding becomes necessary.

Moreover, our empirical evidence reaffirms the relevance of both financial institutions and markets access, depth and efficiency for trade as positively depicted row 3 and 4 of Table 2. Notably, large declines in the access and depth index reflects the volatility of returns by financial institutions in many countries and most financial markets. Figure A2 in the appendix also show that overall financial development has decline in recent times and to some extend that translates to other sub-indices, such as access and depth to finance and reduction in efficiency, especially, in financial markets. Disparities in financial system during the global crisis in many low- and medium-income countries incentivize countries to resort to swaps during the liquidity shock. On the average financial institutions rebounded faster than financial markets, with improvement in depth and efficiency after the crisis.[12] Another implication of the positive impact of financial institutions and market access, depth and efficiency on trade openness of China indicates high financial requirement for China and its trading partners. More so, industrial incumbents have an incentive to face competition in financial markets and demand for more external finance like swaps. This will push for greater access and efficiency for firms that intend to recover investments or main the status quo.

4.3 Endogeneity Issues and Dynamic Panel GMM Estimation

The alternative specification is to ensure the robustness of our analysis on the effect of financial development and trade in China and its cross-currency swap recipients. Baltagi et al. (2009) Zhang and Lu (2015) and Kılınç et al. (2017) show that financial indicators display considerable persistence, following prior studies on dynamic panel à laArellano and Bover (1995), Islam (1995) and Caselli et al. (1995) and Blundell and Bond (1998). We specify a dynamic log linear equation for financial development on trade that includes the lagged dependent variable in equation (7).

[12] Many European countries exhibit a high level of financial institution depth. But United States and Korea financial markets are deeper. While financial systems tend to be less efficient and provide less access.

$$X_{it} = \beta_0 + \omega X_{it-1} + \beta_1 FD_{it} + \beta_2 FD_{it} * \lambda'_{ni,t} + \rho_{it} + \mu_{it} + \varepsilon_{it} \quad (7)$$

The set up address the potential endogeneity and unobserved country specific effects, in such a way that the inclusion of the lagged dependent variable in the model depicts the correlation between the regressors and the idiosyncratic error term. Since the lagged trade openness depends on ε_{it-1} which is a function of the ε_ii.e. the country specific effect (see Baltagi et al., 2009).[13] Consequently, because of this correlation, the dynamic panel in specification (4) suffers the drawback called Nickell (1981) bias which on wither away only if T approaches infinity. Suggestively, the GMM in the tradition of Arellano and Bond (1991) and Blundell et al. (2001) basically differentiates the model to get rid of cross-section and any time -invariant country specific variable. Using the system GMM approach which includes the lagged differences and lagged levels of variable as instruments in the levels equation and the differenced equation. Therefore, this pin down any endogeneity attributed to any correlation of these country specific effects and regressors of the model. To depict this problem of endogeneity, let us define $\rho_{i,t} + \mu_{i,t} + \varepsilon_{it} = \nu_{i,t}$.

Then, we see that the $E[\nu_{i,t}|X_{i,t}]\neq 0$, since $TO_{i,t-1} = \beta_0 + \omega X_{i,t-2} + \beta_1 FD_{i,t-1} + \beta_2 FD_{i,t-1} * Cswap_{i,t-1} + \nu_{i,t-1}$ and $\nu_{i,t-1}$include $\mu_{i,t}$, which is also imbedded in $\nu_{i,t}$.

The first difference transformation of specification (4) eliminates the country – specific effects although the possibility remains that past shocks contemporarily predicts regressors. In the assumption of Arellano and Bond (1991), we can circumvent the bias with the following:

$$E[FD_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for s} \geq 2; \text{ t} = 3 \ldots, n \quad (8)$$

$$E[TO_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for s} \geq 2; \text{ t} = 3 \ldots, n \quad (9)$$

However, Blundell and Bond (1998) and Kılınç et al. (2017) shown that when the explanatory variables are persistent overtime, the lagged levels of the variables are weak instruments in the regression equation depicted in first differences. Therefore, this is likely to lead to biased coefficients, especially in a small sample where this type of problem largely exacerbates. Similarly, Blundell and Bond (1998) suggests the composition of the system which includes the lagged differences and lagged levels of the variables as instruments in the levels equation and the first differenced equation. Such that the additional moments conditions follow;

[13] Ordinary least square (OLS) estimation are not necessarily consistent and unbiased, consequently, rather than either GMM is preferred as a robust technique as it considers unobserved heterogeneity (Blundell et al., 2001).

$$E[\ (TO_{i,t-1} - TO_{i,t-s-1})\ (\rho_{i,t} + \varepsilon_{i,t})]\ = 0 \text{ for s = 1} \quad (10)$$

$$E[\ (FD_{i,t-1} - FD_{i,t-s-1})\ (\rho_{i,t} + \varepsilon_{i,t})]\ = 0 \text{ for s = 1} \quad (11)$$

The moment conditions used the orthogonality conditions between the differenced errors and the lagged values of the dependent variable. This presumes that the original disturbance in specification (4) are serially uncorrelated and the differenced errors follows first order moving average - MA (1) with a unit root. As a result, two diagnostics tests are computed using the Arellano-Bond GMM approach to test for first and second order serial correlation in the disturbances. In effect, we should reject the null of the absence of first order serial correlation and not reject the absence of second order correlation (Baltagi et al., 2009; and Kılınç et al., 2017). The moment conditions in equation (8) (9) (10) and (11) are used to obtain the GMM estimations, and one important characteristics of the dynamic panel is that the number of moments conditions increases with *T*. Therefore, to ensure the validity of the instruments, we utilize the standard Hansen test of over-identifying restrictions, where the null hypothesis states that the instrument are not correlated with residual. In addition, we conduct the serial correlation test, where the null hypothesis states that there is no second order serial correlation in the error term (see Kılınç et al., 2017).[14]

5. Conclusion

We provide empirical evidence that currency swap is important for trade especially for countries with relatively low level of financial development. It is well documented that the differences in development amongst countries are substantial, and such differences are important in the determination of trade pattern. The level of financial development was proxied by the interaction term of disaggregated measure of financial development such access, depth, and efficiency each interacted with swaps. We provide empirical evidence that differential level of financial development can be a key determinant of whether a country can use swap lines for international trade or not. In rich countries, strong financial system promote trade, the opposite is the case in poorer ones. Perhaps, empirical tests on the influence of financial system and on trade remain on the research agenda especially looking at industry-level import and export data.

Similarly, economies with a well-developed financial system tend to have a faster growth and consequently finance is not only pro-growth but also pro-poor economies suggesting that financial development can serve well the less developed economies to catch up with the rest of the world (Demirgüç-Kunt and Levine, 2009; Baltagi et al., 2009; Niroomand et al., 2014; and Menyah et al.,

[14] There is growing evidence that too many moments conditions are likely to introduce bias and simultaneously increase efficiency. This suggests the use of a subset of moment conditions to take the advantage of the tradeoff between minimizing bias and efficiency (Baltagi et al., 2009).

2014). Furthermore, the theory of endogenous growth as articulated by Greenwood and Javanovic (1990) and Bencivenga and Bruce (1991) among others maintained that financial development is a vital factor in strengthening long run growth given that finance helps in fostering growth via efficient intertemporal allocation of resources, technological innovation and capital accumulation.[15] Similarly, cross country evidence establishes the coexistence of positive long run and negative short run relationship between trade flows and financial development as in Loayaza and Ranciere (2006) and Kim (2010). The negative short run impact was linked to financial fragility and the positive effect to long run impacts of financial liberalization. In addition, the study further investigates the dual role of financial liberalization effects on heterogenous long and short run responses of trade openness to financial development. Supposing that financial intermediation affects trade openness this perhaps offer one mechanism through which the impact of financial development exerts influences on long run growth and short run fluctuation of economic activities. Levine (2004) stressed that financial development is accompanied by the enhancement of production *ex ante* information on possible investment opportunities, pooling savings, mobilization and exchange of goods and services for efficient utilization of resources and this influence trade flows and translates into growth.

[15]Moreover, several empirical and theoretical studies analyzed finance growth nexus and provides more supportive evidence. For example, the theoretical model in Blackburn and Hung (1998) and Blackburn et al. (2005) also opines that trade liberalization and financial development foster economic growth.

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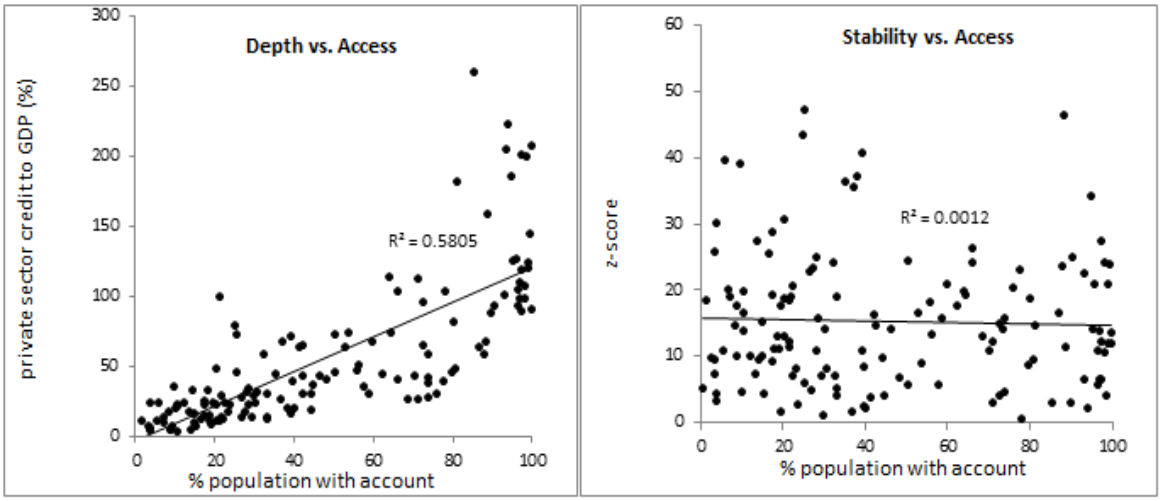
Appendix

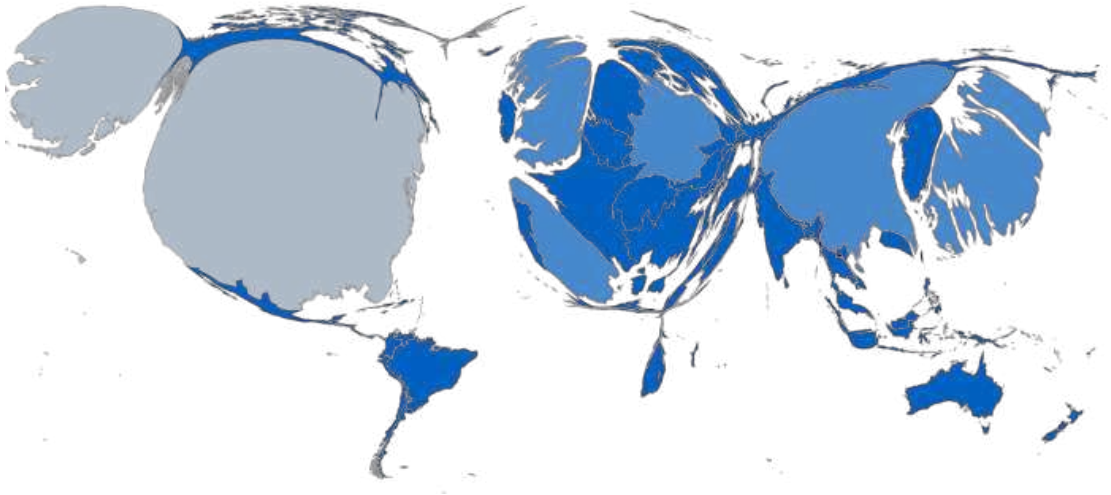
Figures

Figure A1: Financial depth, stability and inclusion



Source: Data from and calculations based on the Global Financial Development Database (http://www.worldbank.org/finanacialdevelopment)

Figure A2: The Uneven Size of Financial System



Source: Calculations Based on the Global Financial Development Database.

Table A1: Empirical Results, Alternative Measures of Financial Development

Dependent variable: Exports	(1)	(2)	(3)	(4)	(5)	(6)
FD_fia_destination	0.476***					
	(0.0599)					
FD_fia_origin	0.226***					
	(0.0761)					
Bcswap	0.695***	0.889***	0.889***	0.897***	0.805***	0.903***
	(0.117)	(0.102)	(0.103)	(0.117)	(0.103)	(0.104)
FD_fid_destination		0.410***				
		(0.0566)				
FD_fid_origin		0.146**				
		(0.0659)				
FD_fie _ destination			0.449***			
			(0.0966)			
FD_fie _origin			0.233***			
			(0.0881)			
FD_fma_destination				0.201***		
				(0.0289)		
FD_fma_origin				0.112***		
				(0.0297)		
FD_fmd_destination					0.188***	
					(0.0305)	
FD_fmd_origin					0.118***	
					(0.0313)	
FD_fme_destination						0.0379*
						(0.0216)
FD_fme_origin						0.00610
						(0.0205)
Observations	15,402	15,402	15,402	14,663	15,402	13,676
R-squared	0.616	0.616	0.615	0.615	0.615	0.559

We further incorporate variables, to investigate whether financial markets development matter for trade flows? In seeking to answer this question we specify a modified version of equation (1), (2), and (3), as follows:

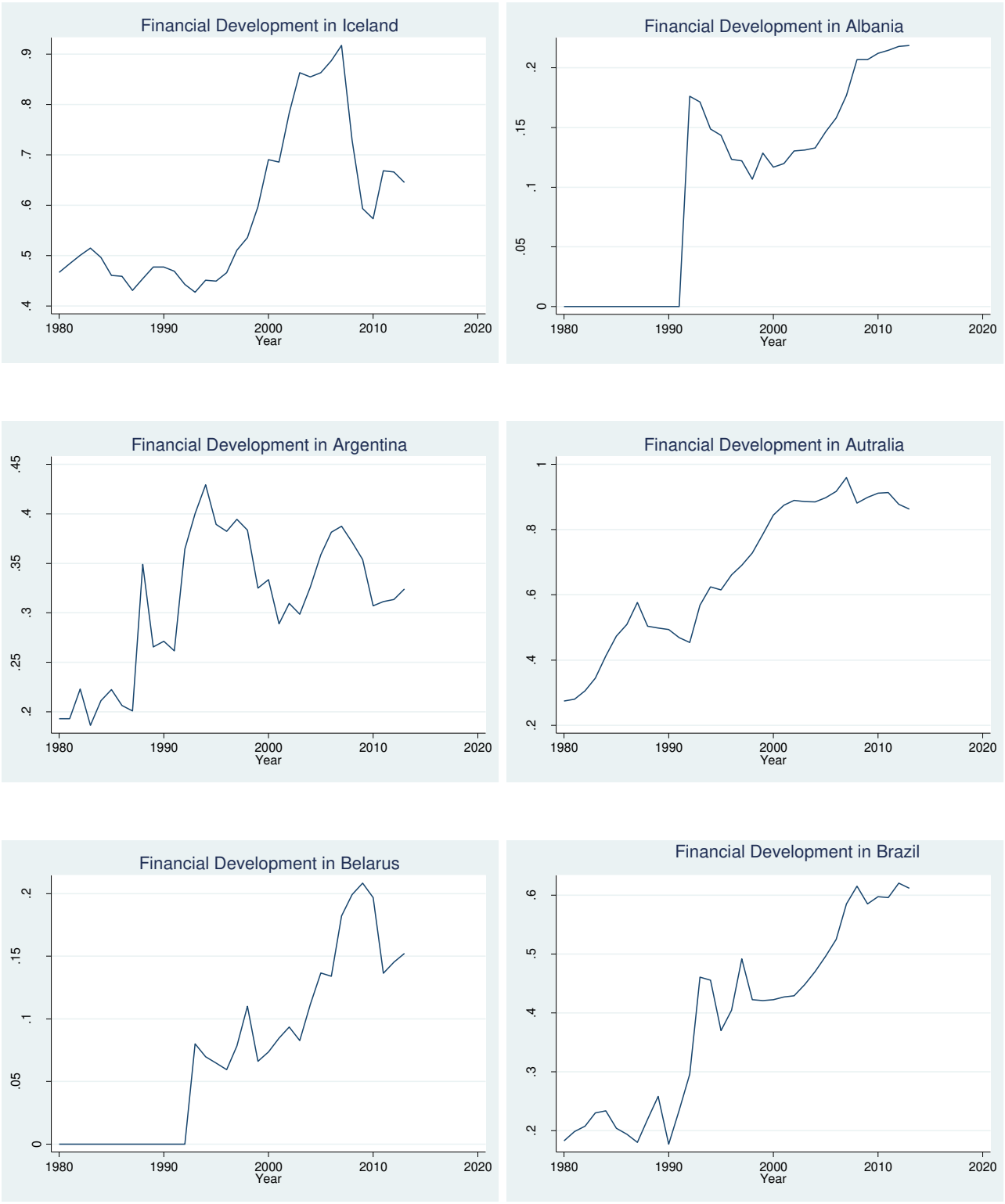
$$lnX_{ni,t} = \beta_1 lnS_i + \beta_2 lnM_n + \beta_3 FMA_{i,t} + \beta_4 FMA_{ni,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FMA_{i,t} * \lambda'_{i,t} + \beta_7 FMA_{n,t} * \lambda'_{n,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it} \quad (4)$$

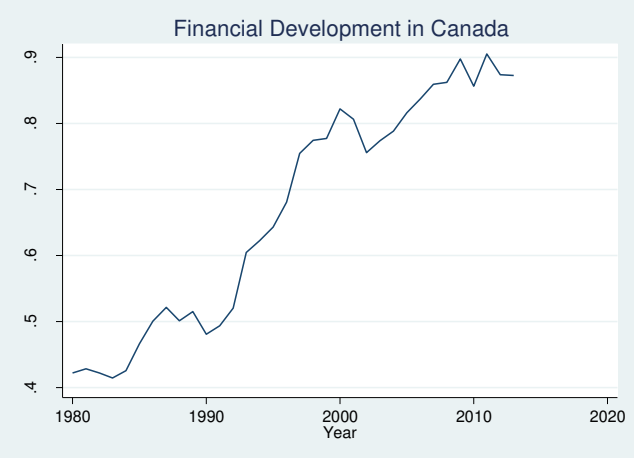
$$lnX_{ni,t} = \beta_1 lnS_i + \beta_2 lnM_n + \beta_3 FMD_{i,t} + \beta_4 FMD_{n,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FMD_{i,t} * \lambda'_{ni,t} + \beta_7 FMD_{n,t} * \lambda'_{ni,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it} \quad (5)$$

$$lnX_{ni,t} = \beta_1 S_i + \beta_2 lnM_n + \beta_3 FME_{i,t} + \beta_4 FME_{n,t} + \beta_5 \lambda'_{ni,t} + \beta_6 FME_{i,t} * \lambda'_{ni,t} + \beta_7 FME_{n,t} * \lambda'_{ni,t} + \gamma_{ni} + \rho_i + \mu_n + \varepsilon_{it} \quad (6)$$

Financial market access, $FMA_{i,t}$ and $FMA_{ni,t}$ is measured the percentage of market capitalization outside top 10 largest companies to proxy access to markets. A high degree of stock market concentration reflects greater difficulties in accessing the stock market by new or emerging issuers. Financial market depth indicator focusses on stock market and debt market development, $FMD_{i,t}$ and $FMD_{n,t}$ captures the depth (size) of the stock market (capitalization or the value of listed shares) and how active it is (stocks traded), plus the outstanding volume of international debt securities of sovereigns, international and domestic debt securities of both financial and nonfinancial corporations. Recent studies stressed the idea that financial market development leads to greater trade openness and integration into the global economy (Svirydzenka, 2016; Niroomand et al., 2014; and Ahmed, 2013).[16] $FME_{i,t,}$ and $FME_{n,t}$ captures the financial market efficiency sub-indices which relies on the stock market turnoveri.e. the ratio of the value of traded stock to stock market capitalization. γ_{ni}, captures the country pair fixed effects, $\rho_{i,}$ denotes country i fixed effects and μ_n, denotes country n fixed effects. Suggestively, higher turnover reflects higher liquidity and more efficient market. The purpose of disaggregating the financial development measures into sub-indices is to capture key features of the financial system as in equation (1) to (6) we investigate how depth, accessible, and efficient the financial institutions relative to financial markets are vital for the assessment of country's overall financial system and financial structure.

Figure A3: Financial Development of Bilateral Currency Swap Recipients




Financial Development in Canada
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Financial Development in China
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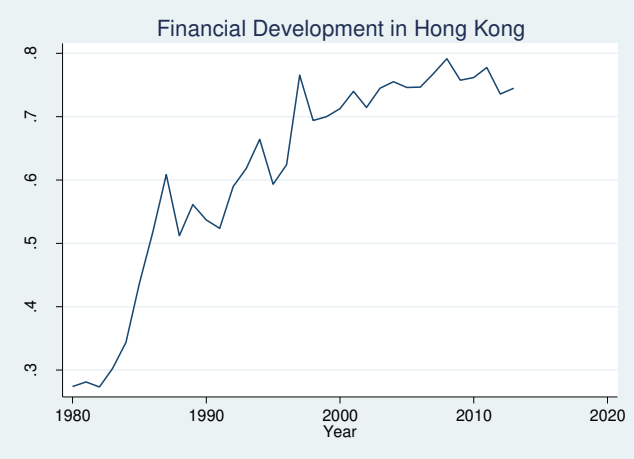
Financial Development in Hong Kong
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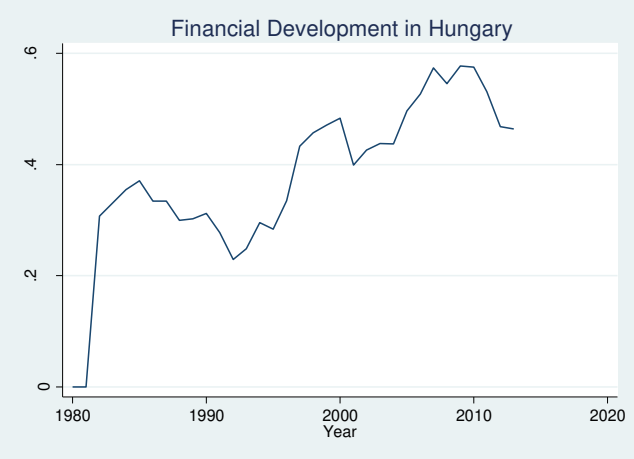
Financial Development in Hungary
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Financial Development in Indonesia
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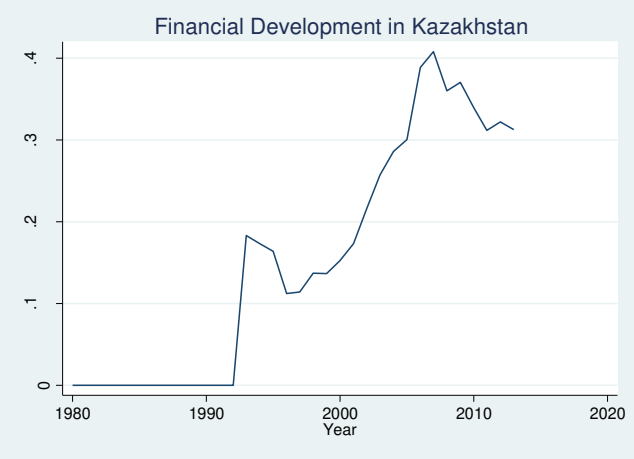
Year


Financial Development in Kazakhstan
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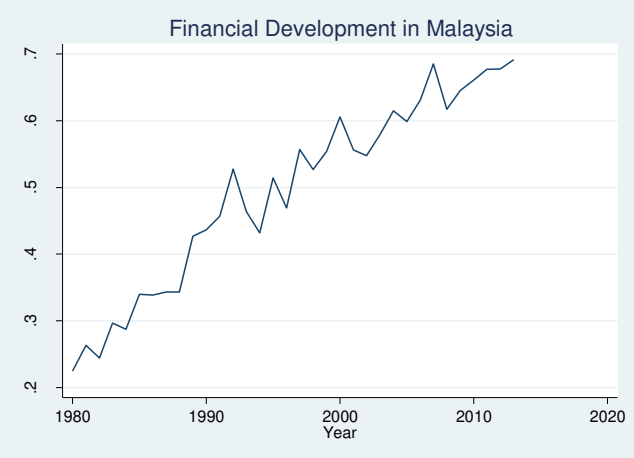
Financial Development in Malaysia
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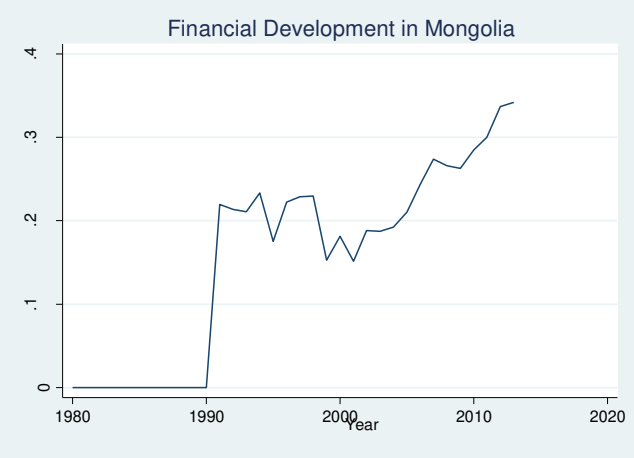
Financial Development in Mongolia
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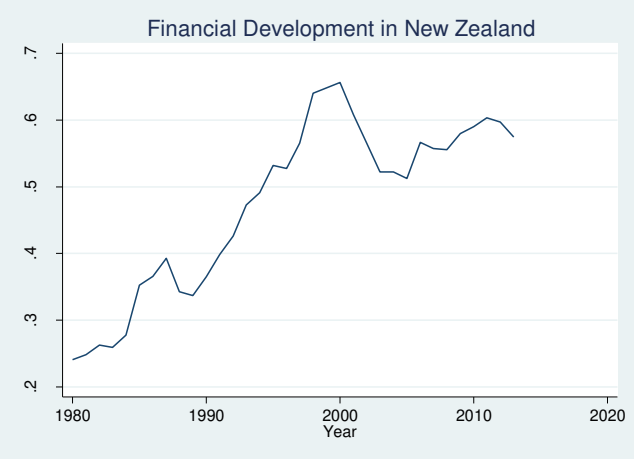
Financial Development in New Zealand
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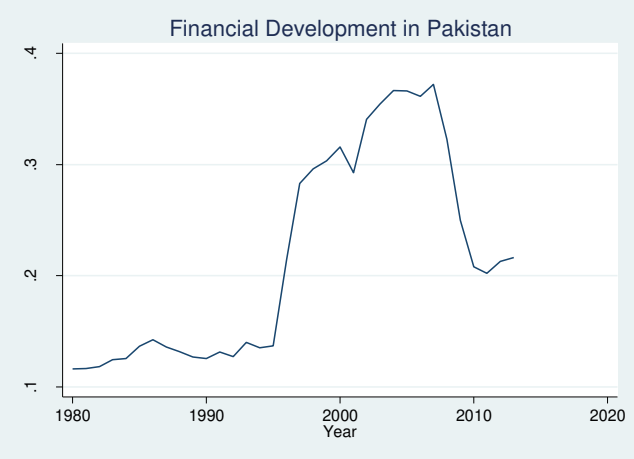
Financial Development in Pakistan
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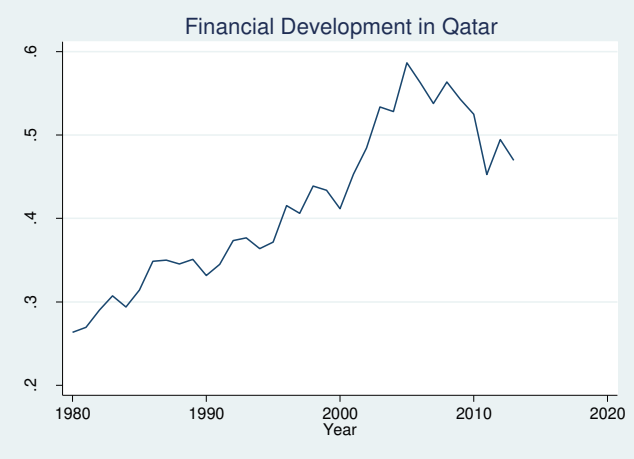
Year


Financial Development in Qatar
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Financial Development in Russia
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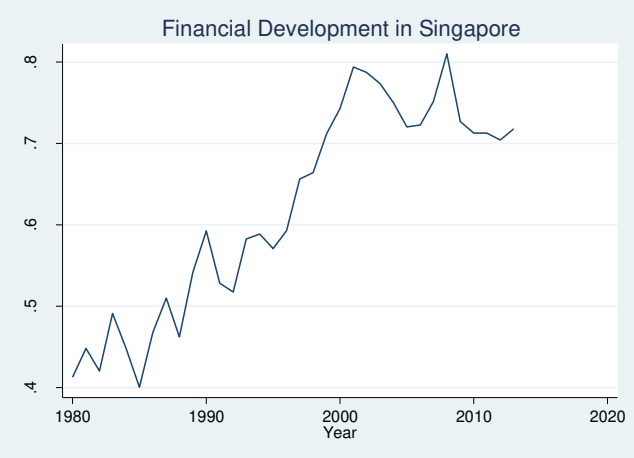
Financial Development in Singapore
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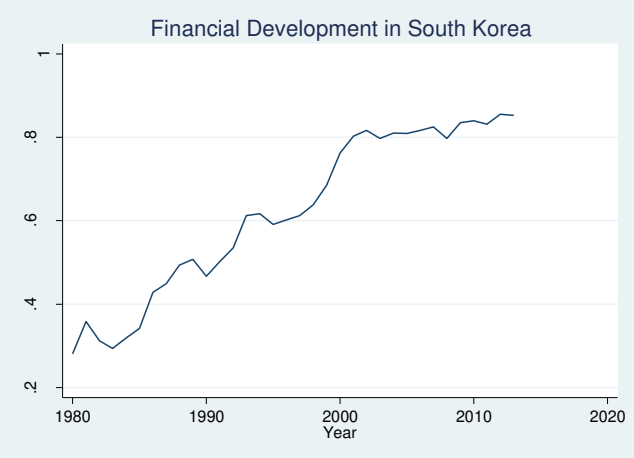
Financial Development in South Korea
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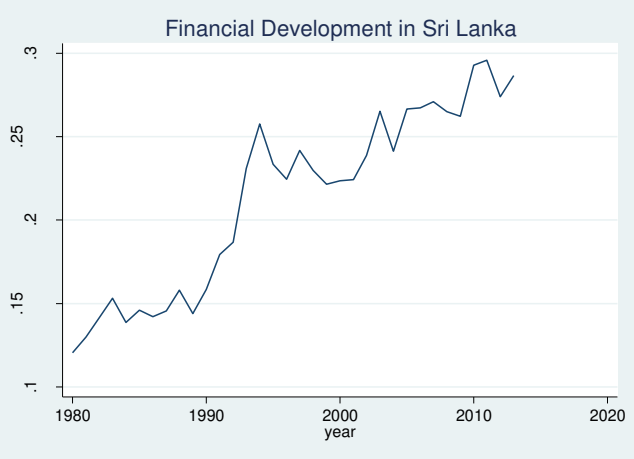
Financial Development in Sri Lanka
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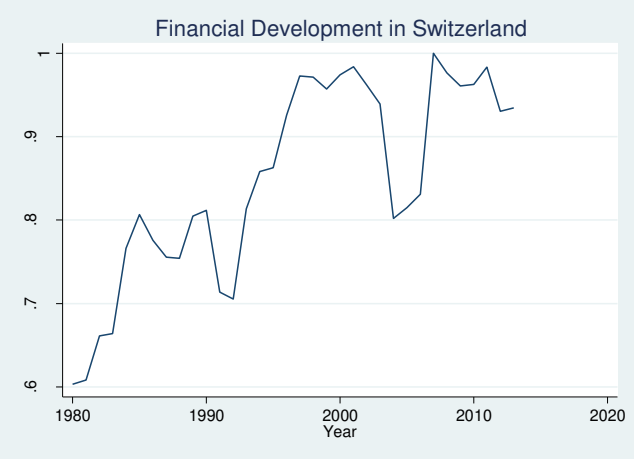
Financial Development in Switzerland
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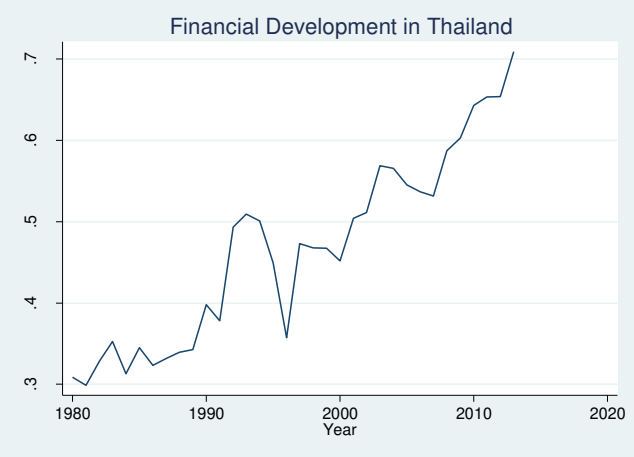
Financial Development in Thailand
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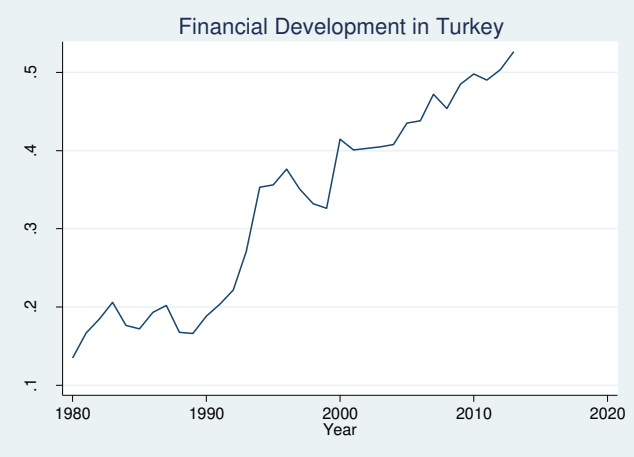
Financial Development in Turkey
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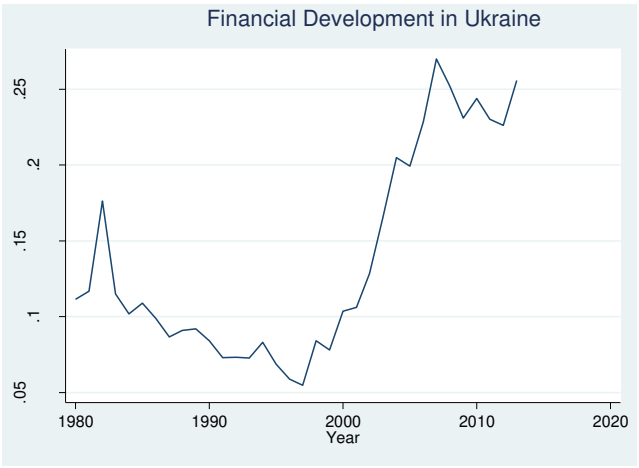

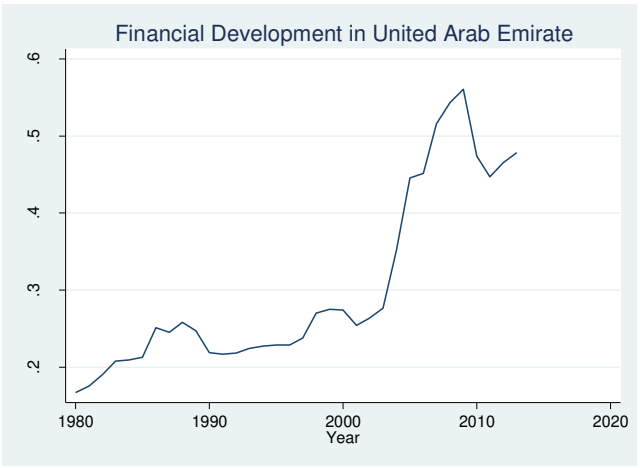

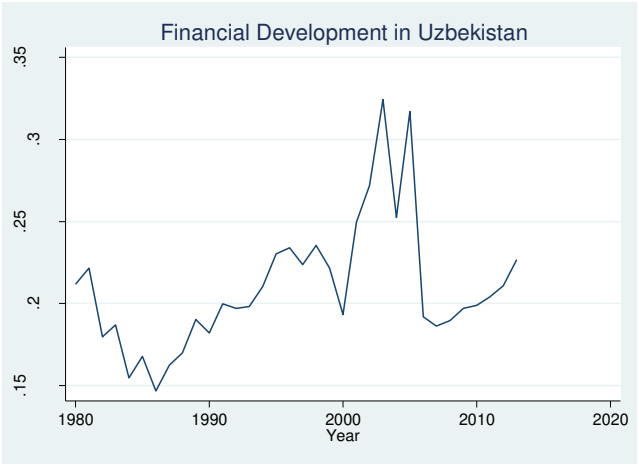

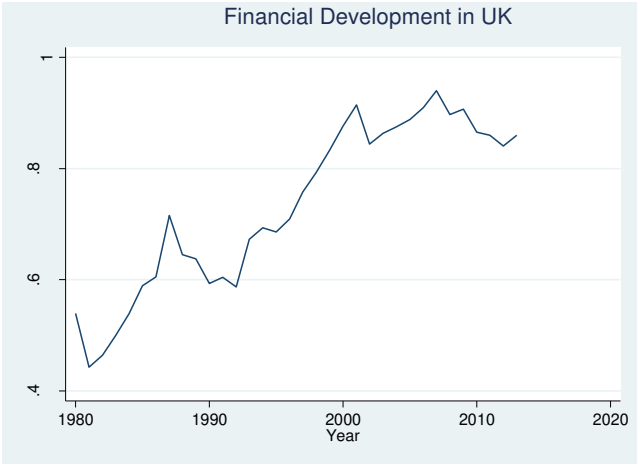

Source: Authors' Computation

Abbreviation

Financial Institutions Access Index (FIAI)

Financial Institutions Depth Index (FIDI)

Financial Institutions Efficiency Index (FIEI)

Financial Markets Access Index (FMAI)

Financial Markets Depth Index (FMDI)

Financial Markets Efficiency Index (FMEI)

Renminbi (RMB)

Financial Development (FD)

Generalized Method of Moments (GMM)