

Reserve Accumulation and Sudden Stops: Evidence from Foreign Direct Investment Dynamics in Selected Emerging Economies

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Abstract

Capital flows exert an exogenous impact on economies, however, there exists some level of ambiguity regarding these impacts in emerging economies. On the contrary, emerging economies often provide safe havens for surges in capital inflows in different forms of investments. After decades of loose, accommodative monetary policies and unconventional monetary policies encouraged investors from developed economies quest to seek higher yields and returns on investment portfolios allocated more direct capital towards emerging economies notwithstanding the risk on return exposure in some of these volatile economies. With the slow pace of global growth and continuous increments in interest rates, the possibility of sharp capital reversals and eventual outflow of investments is eminent and can cause balance-of-payment crises in recipient countries. As most research work demonstrates, the effects of profit repatriation and foreign exchange gaps are a few drawbacks to worry about. The paper presents a comprehensive study of these investment trends and capital flows in some selected emerging economies. Emphasis on China's foreign reserve accumulation policy as a reference benchmark is discussed. The objective of this paper is to contribute to the behavior of foreign direct investment in the presence of reservation accumulation within an economy, especially among the selected emerging economies. The article employs a panel data set for the selected countries for analysis of these emerging economies via methods of panel regression, pooled OLS, LASSO regression and Kaplan-Meier curves. Quarterly data of national accounts from 2006-2019, including gross domestic product and unemployment rate are used in the analysis.

Keywords

Capital Flows, Foreign Direct Investment, Emerging Economies, Reserve

1. Introduction

In economic theory, countries can pursue only two out of three policies at the same time: a fixed foreign exchange rate, a free capital movement, and an independent monetary policy, i.e. the trilemma or the impossible trinity hypothesis research and investigated by Obstfeld (2015) posits the ideas of an international policy trilemma. Depending on the country of choice of currency management strategy in relation to other baskets of external currencies, this policy choice will certainly create some room for currency speculations, and this might have long-term effects on the output gap of the economy. The term sudden stop popularized by Dornbusch et al. (1995) inspired by the banker's adage: "it isn't the speed that kills you, it's the sudden stop" has become well-studied and researched before and after economic meltdowns such as the Mexican economic crisis of 1994 and other identical currency crisis that subsequently followed.

A Sudden stop might be defined as an unexpected and large decrease in international capital inflows into an economy, which might have a significant negative impact on a country's output. At times, sudden stops are followed by currency or banking crises. Research works including Calvo et al. (2004) to quantify a sudden stop, described it as a phenomenon that starts with an annual decrease in capital flows by more than one standard deviation, then followed by a fall of two standard deviations as measured by the year-on-year change. The process ends when the negative change in capital flows is bigger than one standard deviation.

Alternatively, authors like Bordo et al. (2010) describe it as a negative change in the financial account that exceeds 3 percent of a country's gross domestic product. Foreign direct investment as a source of capital flow for many economies must be well monitored together with host countries' exchange rate systems. As such, large economies relying on a floating exchange rate system with supervision of monetary policy governing bodies must put in place measures to mitigate any pitfalls from the forex market. The choosing of an exchange rate basket can influence the selection of trade partners and in consequence real income or gross domestic product of an economy (Flanders & Helpman, 1979).

Free capital movement allows investors to freely pursue the most attractive investment opportunities in regions where there is financial and political stability. Most emerging economies create such opportunities for investors with higher interest rates and this has quite frequently translated into positive financial accounts for these economies. These inflows of funds stimulate the economies through expansion of credit and increase forms of foreign investment. The long-term effect of these positive spillovers adds to gross domestic product, adds value to assets and stabilizes a country's currency and eventually appreciates it.

However, net financial inflows can also result in over-reliance on foreign financing and can result in a balance sheet foreign exchange exposure risk. So long as capital flows increase, the countries experience expansion, however, once the sentiment or confidence in the country changes, i.e. flight to safety, the economy undergoes massive adjustment, pushing the country into crisis (Bakker & Lipschitz, 2014).

The objective of this paper is to investigate the behavior of foreign direct investment in the presence of foreign reservation accumulation within an economy, especially among the selected emerging economies in the context of open market macroeconomics. The selection criteria for these emerging economies consider its market volatility, trade openness, levels of inflation and other macroeconomic indicators as contained in the modelling technique adopted for the paper. The article employs a panel data set for the selected countries to analyze their impacts on emerging markets via methods of panel regression, pooled OLS, LASSO regression and Kaplan-Meier curves. Quarterly data of national accounts from 2006-2019, including gross domestic product and unemployment rate are used in the analysis.

To further elaborate on the individual economies, a comparative analysis of the selected economies during periods of capital flights or sudden stops of capital inflows provides a multifaceted view of how these diverse economies respond to similar financial shocks. The chosen countries vary significantly in their economic structures, their reliance on foreign capital, policy frameworks, and resilience to external pressures. The research work examines the impact on key macroeconomic indicators such as exchange rates, inflation, GDP growth, foreign reserves, current account balances and interest rates. This approach seeks to highlight each country's vulnerabilities and strengths during such periods¹.

The research identifies that with exchange rates, the Brazilian, Turkish, Mexican, and South African economies have experienced significant currency depreciations during capital flight, reflecting their heavy reliance on foreign capital and floating exchange rate regimes (Cuddington, 1986). On the other hand, China, has a managed exchange rate policy, that has stabilized the Yuan during periods of capital outflow, although it faces pressure to devalue during significant outflows, while Saudi Arabia ties its currency to the U.S. dollar, providing macroeconomic stability during capital flight but at the expense of monetary policy independence that affects and overshadows the creditability of policy choices and decisions by the central bank. On inflation, the overview and dynamics show that in Türkiye, episodes of higher inflation are accompanied by capital flight and exacerbated by currency depreciation and economic vulnerabilities. Other economies like Brazil, Mexico, and South Africa experience moderate to high inflation with depreciating currencies during periods of sudden stops. But it is worth noting here that both China and Saudi Arabia generally

¹<https://pubdocs.worldbank.org/en/232951452034668895/Global-Economic-Prospect-2016-Exchange-rate-pegs-or-capital-controls.pdf>

maintain low inflation due to strict monetary policy and capital controls, while that later is supported by currency pegs and substantial oil revenues. Another indicator is gross domestic product, i.e. economic growth in economies such as Brazil, Türkiye, South Africa, and Mexico often slows during capital flight, due to decreased investment and consumption caused by domestic negative demand shock. The other remaining economies like China and Saudi Arabia, do also maintain relatively stable economic growth through state-directed investment capital controls in the case of China, while the Gulf State of Saudi Arabia's economic growth is by and large aligned with oil prices than capital flows but are can also be affected by negative global demand shock².

The foreign reserves accumulation policy equally demonstrates the unique nature of the selected economies. The Brazilian, Turkish, Mexican, and South African economies use reserves to stabilize their currencies, which depletes during sustained outflows since most of these economies are commodity-based dependent economies. Unlike the aforementioned economies, China and Saudi Arabia boast of substantial foreign reserves that provide a buffer against capital flight through significant reserves. The last but not the least indicator is the current account balance positions and interest rate dynamics of these economies. Economies from the selected pool, for example, Türkiye and South Africa have often run current account deficits, making them more vulnerable to sudden stops, while the Brazilian and Mexican oscillate between deficits and surpluses, as a direct result and nature of the commodity-based economy mentioned earlier, whereas the Chinese and Saudi Arabian economies run surpluses, supported by strong export regimes. Another crucial economic indicator is interest rates. The likes of Brazil, Türkiye, Mexico, and South Africa hike interest rates to combat inflation and stabilize currencies, though this hinders economic growth in the long term, alternatively, the Chinese economy uses a variety of tools to manage liquidity without depending solely on interest rates, while Saudi Arabia interest rate policy regime is hugely influenced by the U.S. Federal Reserve in their policy design and implementation. In conclusion, the selected variable of unemployment depicts a very similar trajectory and dynamics in Brazil, Türkiye, Mexico and South Africa. Unemployment tends to increase significantly during economic turmoil and downturns while economies like China and Saudi Arabia maintain lower thresholds of employment figures usually supported by state-sponsored central policies³.

Different events can cause or account for investments slowing down, which may include investors losing confidence after reassessing levels of high and substantive foreign debt which is unsustainable in the long term. Alternatively, they may shift their funds in response to changes in interest rate differentials. Nevertheless, these rational economic decisions will result in a sudden stop if not managed. From the outlook of balance of payments positions, we know that the

¹<https://www.haver.com/viewpoints>—on country data analysis.

²Ibidem.

sudden decrease in capital inflows must be adjusted for by a symmetrical decrease in the current account deficit or by fall in official reserve assets. Both circumstances are undesirable for an economy and are negative signals for the economy.

In response, portions of foreign accumulated reserves can be liquidated to support and create a higher buffer in relation to the drop in the capital base. However, in cases where official reserves are completely depleted, the impact must be accommodated by the current account, i.e. decrease in imports. Aggregate demand must shrink since the greater part of demand is financed by foreign investors (Bakker & Lipschitz, 2014; Rokicki, 2019).

Most governments face a difficult dilemma where they either allow currency depreciation or an increase in interest rates, to stabilize the value of its currency. In case of depreciation, foreign borrowers will want to withdraw any capital still left in the country, since assets will lose their value as measured per real exchange rate and businesses with foreign-denominated credits will be concerned with bankruptcy. Yet the negative impact could be mitigated by facilitating an export growth and reorienting business for tradables. On the other hand, raising interest rates would undermine the position of borrowers, mostly local companies, who might struggle with repayments of debt and eventually default. Poorer-performing debtors and an increase in non-performing loans may lead to a credit crunch or even banking crisis. All the effects combined dramatically will contract an economy and push it into recession (see e.g. Calvo, 1998; Calvo, Izquierdo, & Mejía, 2004).

Concisely, the mechanism and consequences of sudden stops demonstrate how the volatility of capital flows may push countries into crisis. Crises are triggered by a combination of factors, among them also arbitrary ones, such as sentiment of investors and volatility of capital flows. Sudden stops often concern emerging markets and small economies without fully developed financial markets. These countries offer attractive investment opportunities during low interest rates in developed countries, which attract significant amounts of foreign investment. Additionally, volatility is increased due to restricted information transparency and low liquidity, which induces herd behavior among investors (My & Truong, 2011; Chang, Cheng, & Khorana, 2000).

Between 2008-09, most economies experienced one of the longest deep economic recessions, foreclosures in the housing market. Several authors have touched on the similarity and comparability of the 2008 mortgage crisis to some previous ones. Allen and Gale (2007), crisis occurred in four eras, which was during the gold era from 1880 to 1913, the war periods of 1945-1971 and the immediate periods of 1973 and the famous financial crisis of 2008/09 caused by a host of factors researched.

2. Synopsis of Sudden Stops of Capital Flows

Episodes of sudden stops in capital flows are often characterized by an abrupt

and significant reduction in the inflow of foreign capital. This phenomenon has been a subject of extensive research in the fields of international economics, finance, and macroeconomics, especially among developing and emerging economies. This part of the paper seeks to provide a comprehensive overview of some of key themes, findings, and debates surrounding sudden stops of capital flows. One of the earlier research works conducted by Obstfeld (1994) in his seminal works introduced the concept of sudden stops and its implications for macroeconomic stability. Calvo (1998) further elaborated on the definition, emphasizing the role of external financing and the concept of balance sheet vulnerabilities triggering sudden stops.

Various definitions and measurement approaches have since been proposed, focusing on various aspects such as net versus gross flows, resident versus non-resident flows, and the role of domestic and external factors (Ghosh et al., 2014; Forbes & Warnock, 2012). More importantly is the understanding of the causes and determinants of sudden stops to afford policy makers the best tools for early interventions and risk mitigation. Several factors thus contribute to episodes of sudden stops, amongst them, external shocks, financial contagion, domestic policy choices, and global financial conditions (Eichengreen et al., 2004; Frankel & Roubini, 2001).

Other research works by Calvo and Reinhart (2002) highlighted the role of balance sheet effects and currency mismatches in amplifying the vulnerability of economies and exposing them to sudden stops. Recent studies have also examined the importance of global liquidity conditions, risk perceptions, and investor behavior in driving sudden stops (Reinhart & Rogoff, 2009; Rey, 2015).

Additionally, some selected empirical evidence has demonstrated that sudden stops can be attributed to external vulnerabilities and contagion effects from investment portfolios from mostly developed and advanced economies Calvo et al. (2004). By employing the use of a global dataset, empirical investigation by Forbes and Warnock (2012) showed different patterns and episodes of capital outflows among different economies.

3. An Overview of Capital Flows: A Sharp Shot Analysis of China

Foreign Direct Investments (FDIs) in China have increased in the last decade, reaching \$59.1 billion in 2012, which made China the first recipient of foreign direct investment. In 2012, only five countries accounted for 44% of global FDI inflows, with China attracting more than half of these inflows into its economy. Moreover, China received 11% more of FDI as compared to 2011 while FDI inflows to India, Russia or South Africa decreased by more than 15%⁴.

The importance of attracting foreign investments and enhancing the service sector growth have been shown by such decisions as the negotiating of free trade

⁴FDI in Figures-April 2013, OECD International Direct Investment statistics, <http://www.oecd.org/investment/statistics.htm>, p. 8.

agreements with major global partners and the introduction of an experimental free zone in Shanghai. These activities intend to support the weakening economy, aiming further to strengthen China's goal of becoming a more open and innovative economy in the 21st global economy.

The Chinese Trade Ministry negotiated international agreements on free trade with, *inter alia*, Switzerland, the Gulf Cooperation Council, Australia, Japan, Korea, and the Organization of ASEAN. Additionally, the Shanghai Free-Trade Zone was also set in September 2013 as the first of its kind in China to create a special space to test major policy reforms in the areas of the financial services, trade and investments and support the building of the International Financial Centre (IFC) in Shanghai by 2020⁵.

This entertaining initiative highlights the fact that China is seeking to become fully engaged in the process of introducing free cross-border trade, which demonstrates the determination of Chinese authorities to implement economic reforms. These preventative measures could lead to revive China's economy and strengthen its international position.

3.1. Motives for Foreign Reserve Accumulation: The Chinese Perspective

Considering the factors that account for the accumulation of China's foreign exchange reserves, its relevant role during downturns, is extremely critical. Maintaining such a high volumes of foreign exchange reserves is considered a precautionary tool, which could be a helpful mechanism during times of crisis, especially during a speculative attack. Worth noting, that having this kind of "insurance" is strongly connected with fear of losing reserves, [Blanchard et al. \(2010\)](#). The authors in their work identified that even countries with highest volumes foreign exchange reserves including China, were unwilling to decrease accumulated stocks of foreign currencies, or unwilling to use them, as confirmed by [Aizenman and Pasricha \(2010\)](#). The analogy of fear of floating ([Calvo & Reinhart, 2002](#)), [Dominguez et al. \(2011\)](#) draw our attention to liquidity problems, which relates to treating reserves accumulation as an insurance policy. Emphasis is laid on an economy's ability to maintain the optimal level of foreign exchange reserves; however, this threshold can easily be underestimated.

When this occurs and reserves fall below their optimal levels, an economy may suffer from debt rollover problems caused by the sudden stop of new net capital inflows. Furthermore, since the practice of foreign exchange reserves accumulation is seen as a tool to reduce risk, it also contributes to consumption smoothing. Empirical evidence by [Prasad and Wei \(2007\)](#) state that a good access to foreign financial markets in turn may enhance some new investment opportunities, which at the same time means the lack of close linkage to economic growth, which results in consumption volatility being significantly

⁵China opens Shanghai free-trade zone, *The Guardian*, 29.09.2013, <http://www.theguardian.com/world/2013/sep/29/china-shanghai-free-trade-zone>.

reduced.

Dooley, Folkerts-Landau, and Garber (2003) argue that because Chinese development strategy is mostly export-driven and a result, it becomes highly reasonable to accumulate foreign exchange reserves. The authors appeal to “mercantilist” motives claiming that keeping the exchange rate stable, which means preventing appreciation (or revaluation), helps Chinese firms and producers to remain competitive in the global market. China maintaining high volumes of foreign exchange reserves may also be based on its foreign policy and geopolitical strategy. This enables China to conduct its fiscal policy in an organized way, which is especially the case, using the sovereign wealth funds as an example (Griffith-Jones & Ocampo, 2009).

In Morrison and Labonte (2013), Congress argues that China’s attempt to buy foreign securities, especially United States securities can be considered as a kind of “subsidy” that may help to improve U.S. consumption of Chinese products. Therefore, it has become a self-driven mechanism in the form of transfers from Chinese savers to U.S. borrowers aiming at supporting China’s export industry. However, other research works also mention that because of the undervalued renminbi, this “subsidy” is an actual cost for other industries, as well as for Chinese consumers. The accumulation of the foreign exchange reserves gives certain advantages to the Chinese economy. China’s exchange rate policy attempts to slow the appreciation of the Renminbi (RMB) against the dollar. This makes Chinese exports less expensive and imports into China more expensive than would be if China kept a floating currency. The principal purpose of this policy is to promote China’s export industries and foster foreign investment.

The reserves, especially gold, can reduce the likelihood of economic crises and tone down their costs if they come off. Large foreign reserves accumulation acts, as a defense mechanism for self-insurance, very essential for China a country that is sceptic of the current international financial institutions led by western powers⁶. For this reason, China together with Russia, India, and South Africa leaders have set up a new development bank to provide the resources for sustainable development projects within the BRICS and other emerging countries, as they would like to be more financially independent from the existing international institutions.

The BRICS bank might supplement the existing efforts for global growth and development. The idea of creating the BRICS bank is viewed by the current financial international architecture as a major step by those emerging countries to compete with the current international financial institutions, dominated by Western powers. China does not report its currency composition of its foreign exchange reserves, but it is estimated that 70 percent of them are held in dollar-denominated assets, while the remaining assets are dominated in euro and

⁶Sorkin I., Prasad E., Sky’s the Limits? National and Global Implications of China’s Reserves Accumulation, <https://www.brookings.edu/articles/skys-the-limit-national-and-global-implications-of-chinas-reserve-accumulation/>, The Brookings Institution.

yen⁷. Recent attempts to reduce the overreliance on portfolio of U.S. treasury obligations and shares is quite clear since China sees the U.S. economy unstable during financial crisis. The percentage of dollar holdings in China's foreign-exchange reserves fell to a decade low of 54% in the year 2011, from 65% in 2010⁸.

The possession of such a huge amount of foreign exchange reserves has implications for global business in several spheres. Primarily, if China starts reducing its purchases of U.S. treasury bills and bonds, the borrowing costs of U.S. government would rise, as the United States would need other investors to fill in the gap. These new investors would require higher interest rates than those prevailing today. One economist in 2007 estimated that a Chinese decision to move away from long-term U.S. securities might increase U.S. interest rates by about fifty basis points⁹. Its implication would be, China shifting into euro-denominated bonds, which will cause the U.S. to lose the hegemonic position it derives from being the major reserve currency.

This situation can cause the overall foreign demand for U.S. assets to decline and cause the dollar to depreciate. Furthermore, China might use its reserves to achieve foreign policy goals, as it did in the purchasing of \$300 million of Costa Rican bonds. The effects of such a strategic investment strategy and economic diplomacy caused Costa Rica to switch its diplomatic recognition to China¹⁰. Chinese expanding influence in Africa through foreign investments and reserve holdings have been going into investments in resource extraction industries and sources of commodities¹¹. It is worthy to note that the international financial institutions such as the International Monetary Fund (IMF) and the World Bank are seeking new opportunities to increase their capital base. After the recent international financial crisis, China agreed to contribute funds to the IMF via a newly invented mechanism: buying \$50 billion worth of special drawing rights IMF bonds. The purchase of SDR denominated bonds, promoted by the Chinese government, renewed interest in the use of the SDR as a reserve currency¹². Over time, China will look to visibly tie its contributions to constant increases in the IMF's resource pool to an increase in its voting rights. The implementation of the reform proposed by IMF already in 2012 would increase Chinese voting

⁷Morrison Wayne M., Labonte M., China's Holdings of U.S. Securities: Implications for U.S. Economy, 19 August 2013, Congressional Research Service 7-5700, p. 5.

⁸Orlik T., Bob D., Beijing Diversifies Away from U.S. Dollar. The Wall Street Journal, 02.03.2012, <http://online.wsj.com/news/articles/SB10001424052970203753704577254794068655760>.

⁹Morrison Wayne M., Labonte M., China's Holdings..., Ibidem, p. 16.

¹⁰Bowley G., Cash Helped China Win Costa Rica's Recognition, 12.09.2008, The New York Times, http://www.nytimes.com/2008/09/13/world/asia/13costa.html?_r=0.

¹¹Sorkin I., Prasad E., Sky is the Limits? Ibidem.

¹²Momani B., China at the International Monetary Fund: Continued Engagement In Its Drive for Membership and Added Voice at the IMF Executive Board, Journal of Chinese Economics, 2013 Vol 1., No. 1: pp 125-150, https://uwaterloo.ca/scholar/sites/ca.scholar/files/bmomani/files/china_at_the_international_monetary_fund_continued_engagement_in_its_drive_for_membership_and_added_voice_at_the_imf_executive_board.pdf, p. 148.

power from 3.8 percent to 6.0 percent, however the United States was and is still against raising China's voting power mostly because it will raise the importance of this country¹³. China is also likely to expand its contributions to and seek greater influence in other multilateral institutions like the Asian Development Bank.

3.2. China's Foreign Exchange Reserves Accumulation Policy as a Benchmark

The foreign exchange reserves policy that a country undertakes has a strong relationship to its exchange rate regime. International reserves were important only for economies with fixed exchange rates and are perceived as a "buffer" necessary to maintain a country's exchange rate against other currencies (e.g. Dominguez et al., 2011). This "buffer" is primarily held to protect a country from a speculative attack on its currency. Central banks and monetary authorities protect an economy's exchange rate from devaluation and at the same time they perform operations in the foreign exchange market (Fernandez-Arias & Montiel, 2009) buying domestic currency and selling foreign currencies. The stabilization of a devaluing currency requires a large stock of foreign currency. The USD, EUR or JPY function as reserves currencies that are accepted in the foreign exchange market and typically account for the most significant part of reserves held by most economies. Financial globalization has made most emerging economies prone to contagion effect and negative spillover effects. Another primary motive for accumulating foreign exchange reserves may be to function as a back-up to international debt incurred by domestic and private sector borrowing. Liquidity crisis or insolvency and the inability to meet short term debt obligations makes countries intervene and bailout sensitive sectors of the public and private sectors to restore financial stability and investor confidence.

The role that international reserves play in reducing a country's exposure to financial risks is accompanied by some costs that cannot be overlooked or underestimated. When monetary authorities increase their international reserves by a given amount of foreign currency, they must find a source of these funds. In countries such as China, with fixed exchange rates and barriers on capital flows, the most common way to carry this operation is to buy foreign currency in the domestic market. Since the Chinese economy constantly keeps a trade surplus and Chinese exporters are paid for their products with the main global currencies (e.g. USD or EUR), there is a huge supply of potential reserves for Chinese authorities. When the Central bank of China buys any amount of foreign currency in the Chinese market it needs to sterilize the effects of the additional injection of RMB into the economy, thereby by selling government bonds to domestic banks.

¹³Tordjman J., "U.S. proves stumbling block in IMF reform" AFP. 24-08-2012, <https://www.cigionline.org/articles/us-proves-stumbling-block-imf-reform/>.

This leads to a monetary contraction and an insufficient supply of money in relation to China's massive investment projects, the result; Chinese investors must borrow funds from abroad. At the same authorities, "invest" foreign currency in safe American or European bonds that typically yields exceptionally low interest rates of between 2 and 3 percent. The difference between the yields China earns on foreign bonds and the interest Chinese investor pays for foreign loans is precisely the cost that accompanies accumulation of international reserves (Rodrik, 2006)¹⁴. Once the cost-benefit analysis of foreign exchange reserves is concerned, the optimal level of international reserves becomes very important. In measuring the adequacy of reserves for mitigating external negative shocks, this became apparent after the 2nd World War through the impacts of the Great depression and in the writings of John Maynard Keynes. The International Monetary Fund has also been pivotal in setting the optimal level of reserve currencies.

Another author Triffin (1947) stated that demand for reserves must be expected to grow in relation (in a linear fashion) with trade, suggesting that the ratios of reserves and imports could be used as a metric for reserve adequacy. Another author defines the optimal point where marginal utility equals marginal cost has also defined an optimal level of international reserves. Most importantly, the benefit of precautionary motive for holding reserves helps an economy smooth consumption and production in case of a balance of payment deficits respectively (Heller, 1966).

In analyzing China's foreign exchange reserves during the recent crisis, it is useful to examine the economic position and circumstances. There is a broad consensus among economists that the most significant event that influenced the accumulation of international reserves by China and other emerging economies was the Asian financial crisis of 1997 (Dominguez et al., 2011). As a result of the East Asian financial turmoil, the Mexico crisis in 1995, followed by the Russian economic crisis of 1998 and finally the Argentina crisis in 2000, emerging economies realized that solely relying on the international financial institutions (such as World Bank or International Monetary Fund) when it comes to financial distress and related risks it was not sufficient. This is particularly true for most of the important risks, like the so-called sudden stop, the urgent outflow of funds driven by various, and sometimes non-fundamental reasons, such as investors' sentiment or herd behavior.

Emerging economies' exposure to financial risks can be diminished either by reducing their level of debt, especially with reference to short-term liabilities, or by accumulating foreign exchange reserves. Drawing lessons from the experience of other Asian countries, China started accumulating reserves with the aim of providing additional "insurance" for any upcoming crisis. As an economy with a roughly fixed exchange rate, China has institutions that govern and manage its

¹⁴Rodrik (2006) estimated the social cost of foreign exchange reserves accumulated by EMEs to be around 1 percentage point of their GDP annually.

foreign currency reserves namely the State Administration of Foreign Exchange institution and the People's Bank of China.

These institutions not only manage accumulated reserves, but also invest substantial portions in foreign assets. International reserves play a significant role in the Chinese economy, because of the approach towards economic development. The so-called export-led growth of the Chinese economy can be implemented best when RMB remains undervalued, keeping the prices of Chinese products low. All this results in an unprecedented balance of power in the international monetary system, which has been called by some economists as global imbalances. The term global imbalances refer particularly to the United States, running permanent current account deficits and China running large surpluses and some researchers even perceive global imbalances as one of the main roots of the financial crisis of 2007.

4. Model Motivation and Description

Following the rationale of understanding Capital Flight (CF) in scope of balance of payments laid down by the World Bank in their International Capital and Economic Development report as of 1985, capital flight is seen as a residual of changes in capital inflows and official reserves with an adjustment. To put in structural terms, the capital flight can be estimated as:

$$CF = \Delta DEBT + NFI + CA - \Delta RES \quad (1)$$

where $\Delta DEBT$ is a change in official capital inflow, NFI is private inflow, CA is a current account and ΔRES represents a change in official reserves¹⁵. While the exact determination of capital flight as an economic identity is not free of ambiguity, for the case of sudden stops analysis, the presented equation serves its purpose. Importantly, the critical measures of capital and account dealings are taken into consideration, allowing the analysis to be done on a higher-level macroeconomic generalized landscape.

Data used in the modelling technique was obtained from Haver and Refinitiv, respectively. It covers the National Accounts of the selected emerging economies and includes variables such as gross domestic product and unemployment rates as well. Data is presented in a quarterly format, spanning from 2006 to 2019. A full list of variables can be found in **Table A1** in **Appendix**.

The modelling strategy and technique is classified in steps to ensure the required granularity. The purpose of the analytical design is to test quantitatively, whether the conclusion of importance of currency reserves in the context of capital flows is to be reflected under randomized environment. To ensure sufficient sample of models, exhaustive combinations of variables are calculated (without permutations) and categorized into sets of 2-, 3-, 4- and 5-variable combinations¹⁶. The selection criteria for the model is well considered and based on the parameter and functional form soundness, mainly p-value of each explanatory

¹⁵All variables are measured in unit of currency.

¹⁶Which results in approx. 12,000 unique combinations for each panel modelling technique.

variable must be less than 0.05, the Variable Inflation Factor (VIF) being less than 10 and p -value of F-Test for overall statistical significance must be less than 0.05 as well.

Once the models are tested and passed the said criteria, they are sorted by best fit, i.e. adjusted R-squared value. Each set of initial variables models with 2-, 3-, 4- and 5-explanatory variables are analyzed in terms of selected variables. To avoid singular occurrences that do not present a uniform, ongoing selection, the criteria of sign consistency and presence were deployed, specifically, the sign of a given covariate must be consistent across all models runs and ought to be present in at least half of the selected models. These criteria were used for both fixed-effect/pooled panel models (**Table 1**) and LASSO-regressions (**Table 2**).

Table 1. Fixed-effects panel model and pooled OLS. Source: Authors' own calculations.

Modelling Technique	Variable Name	Sign	Presence
Pooled OLS	Reserves	Positive	100%
Pooled OLS	Debit Side of Income	Positive	55%
Pooled OLS	Unemployment Rate	Negative	40%
Fixed Effect Panel Model	Reserves	Positive	90%
Fixed Effect Panel Model	Goods Imports	Positive	45%
Fixed Effect Panel Model	Income	Negative	60%

Table 2. Country-specific LASSO model results. Source: Authors' own calculations.

Country	Variable Name	Sign	Presence
Brazil	Oil Exports	Positive	78%
Brazil	Service Balance	Positive	56%
China	Service Balance	Positive	50%
China	Income	Negative	50%
China	Reserves	Positive	50%
Mexico	Goods Balance	Negative	60%
Mexico	Income	Negative	70%
Mexico	Unemployment Rate	Negative	45%
Saudi Arabia	Reserves	Positive	100%
Saudi Arabia	Goods Balance	Negative	50%
Saudi Arabia	Debit side of Income	Negative	45%
South Africa	GDP	Negative	95%
South Africa	Reserves	Negative	65%
South Africa	Service Exports	Negative	55%
Türkiye	Service Imports	Negative	80%
Türkiye	Unemployment Rate	Negative	100%

To test the robustness, researchers employed the expanding window method. The reason for this method is that from modelling perspective we are interested in prevalence of certain variables under set of criteria, rather than plain error metric. The original dataset spans from 2006 to 2019. Sequentially, the latest years were dropped, and models were trained again with the same set of criteria as before. In the end, we created 5 datasets (spanning 2006-2014; 2006-2015; 2006-2016; 2006-2017; 2006-2018) to test robustness of methodology and its conclusions. Ideally, if the method is robust, it should produce comparable results to **Table A2** for all robustness subsamples. Results are presented in **Appendix**.

The first step is the panel model with fixed-effects estimated for all in-scope countries. This selection criterion follows naturally from the international data structure, but for the purpose of this studies a couple of emerging economies were selected. Fixed-effects are in place to cover country-inherent signals that may have a more severe impact in one country, while stumbling in the other. The research investigation aims to the determine general tendency of the dynamics of capital flights as signs of shortage in foreign direct investment (FDI net) that are assumed important to economic growth. To establish a second-eye check regime, in addition to the panel linear model, the pooled ordinary least squares model is estimated on the same data.

This analysis is followed by each country-specific multivariate linear model calibrated via Least Absolute Shrinkage and Selection Operator (LASSO) regression. The reason for selecting LASSO regression is that the structural variables (coming from National Accounts) used as predictors may reflect general or period-clustered correlation which is undesirable for a variety of reasons (i.e. multicollinearity). The shrinkage penalty there is the adding to the sum of squared residuals, virtually “pushing” down the function’s global minimum, resulting in more suppressed coefficients, which in turn spread the influence on the response variables across the predictors. The last step involves the comparative analysis of the Kaplan-Meier curves methodology for all selected countries, with negative net capital flows being a time-to-event occurrence of interest.

4.1. Model Output and Interpretation

4.1.1. Panel Models

As such, the presented models are utilized as an illustrative tool of the FDI dynamics given balance of payments data, supplied with GDP and unemployment rate. For the benchmarking purposes¹⁷, an identical procedure is pulled through the pooled Ordinary Least Square model.

To determine the general tendency in FDI, the top five (in terms of adjusted R-squared) models from each procedure are selected. To avoid singular occurrences that do not present a uniform, ongoing selection, the criteria of sign con-

¹⁷In a sense of comparing results across two, widely known statistical procedures for analyzing panel data, not in a benchmark-beat sense.

sistency and presence were deployed, specifically, the sign of a given covariate must be consistent across all models runs and ought to be present in at approximately half of the selected models. These runs are summarized in **Table 1**.

Results from the general models clearly divert attention to the importance of official reserves, indicating that the higher the reserves, the higher the net flow of FDIs, as they are present in 100% and 90% of the selected Pooled OLS and Fixed Effect Panel Models respectively with positive sign of the regression coefficient. Such an outcome is reasonable in the context of a stable national currency and an independent monetary policy, which—not predominantly—strong reserve administration is a sign of. The unemployment rate is rather self-explanatory, rising rates are rarely bearers of serene times, both economically and financially, while the increasing imports of goods may be a sign of country's population increased spending power or modernization of labour force on the positive side, while it can also be a sign of deteriorating economic output on the negative side. Nonetheless, such instances of economic scenarios can, and often do, invite direct investments from willing participants with different risk aversion strategies for instance, quondam mentioned negative side would attract potential investors with higher risk appetite.

4.1.2. LASSO Regressions

To add granularity to the above analysis, the LASSO regressions were executed on the same set of explanatory variables for each country of interest separately. The same criteria for variable selection as in the panel setting were utilized. **Table 2** provides a synopsis of these runs, indicating country by country. As often expected, results vary between countries—which is a natural consequence of each country possessing an inherent and unique economic environment. Some countries rely more on commodities exports or general level of services, whilst others are more sensitive to the level of Reserves and Unemployment Rate. Next subsections will go more in-depth into country specific data and selected variables.

1) Brazil

Oil Exports alongside Service Balance were the most prominent parameters which—when held positive—would drive higher net FDIs. Brazil, comprising a sufficient portion of its BoP with oil industry and being a popular travel destination, expresses its growth (by means of FDIs) vulnerability with regards to commodity markets. **Figure 1** shows selected elements of BoP in comparison with net FDIs. The weak but stable growth trend in FDIs started in 2008, and peaked in 2012, right after the aftermath of GFC and Euro Monetary Union crises, whereas Service Balance were declining up until 2015. Oil Exports—being an important part of Brazil's economy—were steadily growing at modest rate throughout the time span of 2006-2019. On the verge, and during, the GFC & Euro Crisis, Brazil experienced a significant influx of FDIs, which could have highlighted investor's preference towards Brazil.

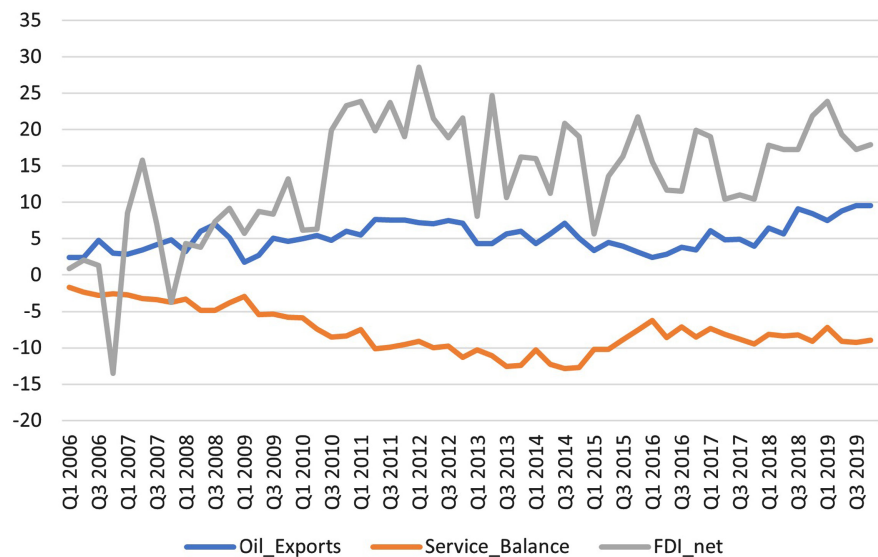


Figure 1. Oil exports, service balance and net FDIs of Brazil, 2006-2019. Source: Authors.

2) China

As mentioned in previous sections of the research work, China operates a strong currency reserve policy that allows for country's monetary defense in the international markets. Highlighted in **Table 2**, Reserves and Service Balance are positively correlated with FDIs, while Income has a negative correlation. In **Figure 2**, this relation is most visible between 2011 and 2017. The currency reserve is depleting, while income is oscillating around zero, as currency buffers aim to maintain a stable cash-flow to and from foreign investors. Net FDIs venture below zero in 2016 with sharp increase accompanied by preceding negative currency reserves.

3) Mexico

Mexico (**Figure 3**) on the other hand at least by BoP data exemplifies the textbook example of an emerging economy with consistent negative balance of Goods and Income as the country's economy relies more on imports and foreign infrastructure. Similarly to Brazil (**Figure 1**), FDIs exhibited a jump, followed by modest positive trend in FDIs in the wake of Euro Crisis. In Mexico case, unemployment rate played a role, which can be summed up with being in line in general macroeconomic intuition, i.e. country's economy shows promise of growth once the unemployment rate starts to decline. The net FDIs are somewhat stable throughout the selected timespan (with one notable peak in 2013), however a trend can be observed. Unemployment starts to rise amidst the GFC and during those higher unemployment levels, net FDIs experiences a downward trend. Although after an initial peak in the unemployment rate in Q3 2009 it starts to decline while FDI catches on around 2013-2014 (staying mostly above zero). Such lag in net levels of FDI can be attributed to promise of growth and betterment of macroeconomic landscape.

4) Saudi Arabia

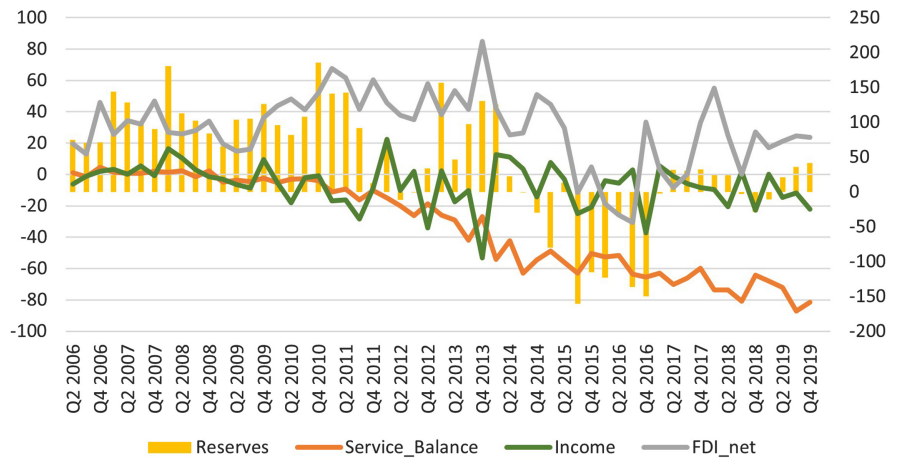


Figure 2. Reserves (plotted with yellow bars, right y-axis), service balance, income and net FDIs of China, 2006-2019. Source: Authors.

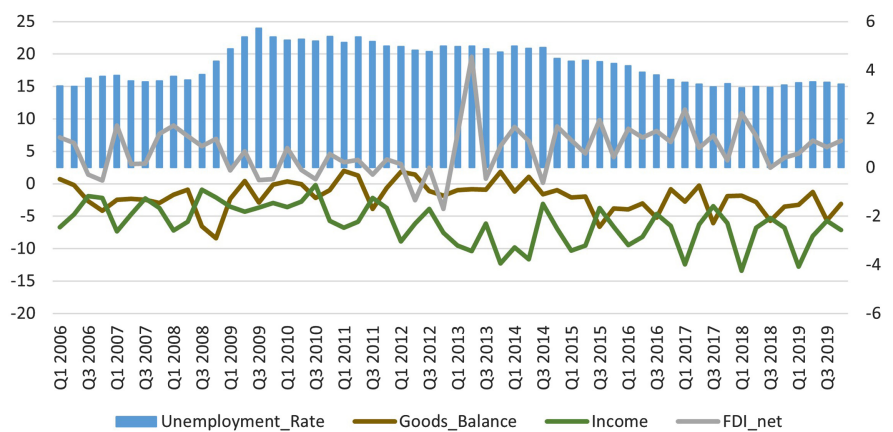


Figure 3. Unemployment rate (plotted with light blue bars, right y-axis), goods balance, income and net FDIs of Mexico, 2006-2019. Source: Authors.

For Saudi Arabia (Figure 4), reserves played the most important—model wise—role in maintaining positive FDI, with Reserves being present as a positively correlated explanatory variable in all LASSO regression models pertaining to Saudi Arabia. Of course, the effects of Reserves on the net level of FDIs is not instantaneous, however—as can be seen in Figure 4, once the level of Reserves starts converging towards zero and subsequently plunges below (Q1 2014), the net FDIs are also exhibiting similar behavior (especially after Q1 2011). Again, a strong, exporting economy usually results in a reduction of FDIs, which is also corroborated by the negative relationship between FDIs and Debit side of Income. Put together, both outflows of goods and capital are not necessarily accompanied by increased FDIs.

5) South Africa

South Africa shows Reserves and GDP having an inverse relationship with FDIs. Although, such examination of country’s economy would be outside of scope for this paper, some surface-level reasoning would point to the fact that South Africa

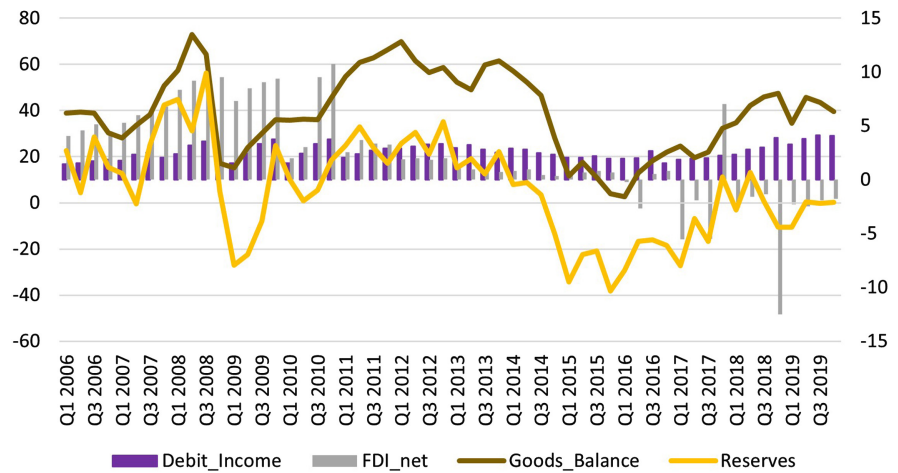


Figure 4. Debit balance, net FDIs (plotted with purple/grey bars, right y-axis), goods balance and debit side of income of Saudi Arabia, 2006-2019. Source: Authors.

used to be a developed country, which is now struggling with both social and economic strife, would eventually lead to misalignment and misadministration of private funds and volatile, hectic behavior of investors. Such conclusion is supported to a reasonable extent in **Figure 5**.

6) Türkiye

For Türkiye (**Figure 6**), the rising Service Imports and Unemployment Rate are potential signs of a lacking economy, which does not increase the chance of attracting new investors. The Unemployment Rate especially (as it is a one of the fundamental roles of Central Banks to stimulate economy to achieve full potential, either full employment or NAIRU-adjacent full employment) may reflect in a negative manner on country’s ability to utilize its economic output. However, as this paper is limited to BoP data that would require further investigation into the international political landscape and economic data not captured within BoP.

In general, results presented in **Table 2** follows the expected sign and economic intuition, however, researchers note the potential uncanny results for South Africa, which shows Reserves and GDP having an inverse relationship with FDIs. Although, such examination of country’s economy would be outside of scope for this paper, some surface-level reasoning would point to the fact that South Africa used to be a developed country, which is now struggling with both social and economic strife, would eventually lead to misalignment and misadministration of private funds and volatile, hectic behavior of investors. Such a conclusion is supported to a reasonable extent by. In other words, the results are grounded in expectations and create a segway to further investigations of FDI dynamics on a country-level.

4.1.3. Kaplan-Meier Curves

Treating FDI’s dynamics as a survival analysis problem, precisely the drops in

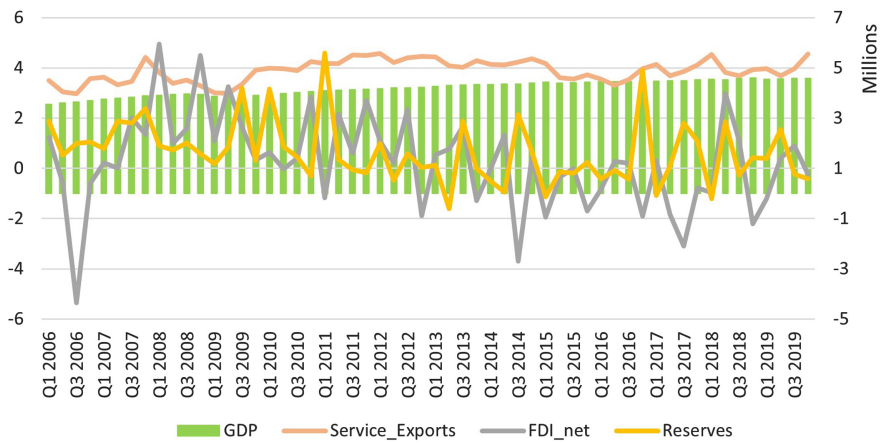


Figure 5. GDP (green columns, right y-axis), service exports, reserves and net FDIs of South Africa, 2006-2019. Source: Authors.

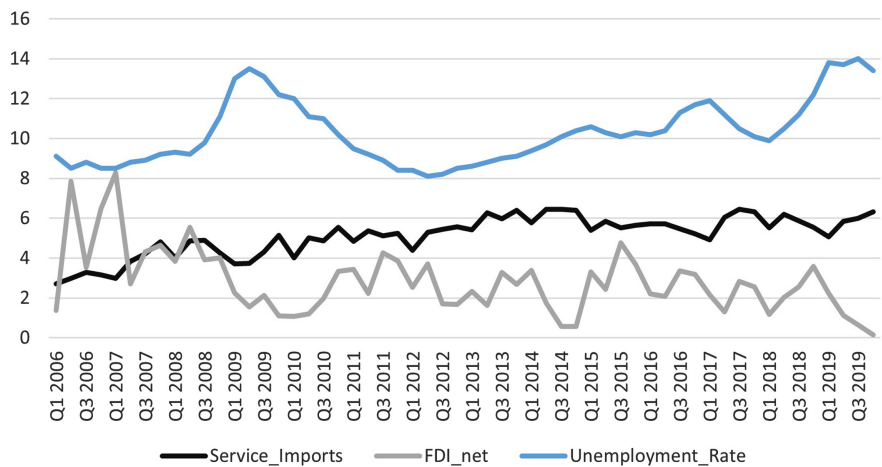


Figure 6. Unemployment rate, service imports and net FDIs of Türkiye, 2006-2019. Source: Authors.

net flows of FDIs being an “event” of interest, the Kaplan-Meier curves were calculated. Rationale for this approach is simply, the usually aggregated and snowballing effects of economic turmoil, which potentially reduce FDIs. The purpose of Kaplan-Meier curves is to illustrate whether the negative flow of FDIs is stringent and pervasive enough to accumulate over consecutive periods, or frankly, whether such occurrences tend to persevere. In **Figure 7**, Saudi Arabia, South Africa and China exhibited such consecutive periods, however China stabilized their net FDIs, while aforementioned snowballing effect remained for the former two. Researchers note that both Saudi Arabia and South Africa are commodity-rich countries that rely on those in the international trade framework.

5. Prevention and Policy Measures

East Asian economies made strong efforts to build self-insurance by the means

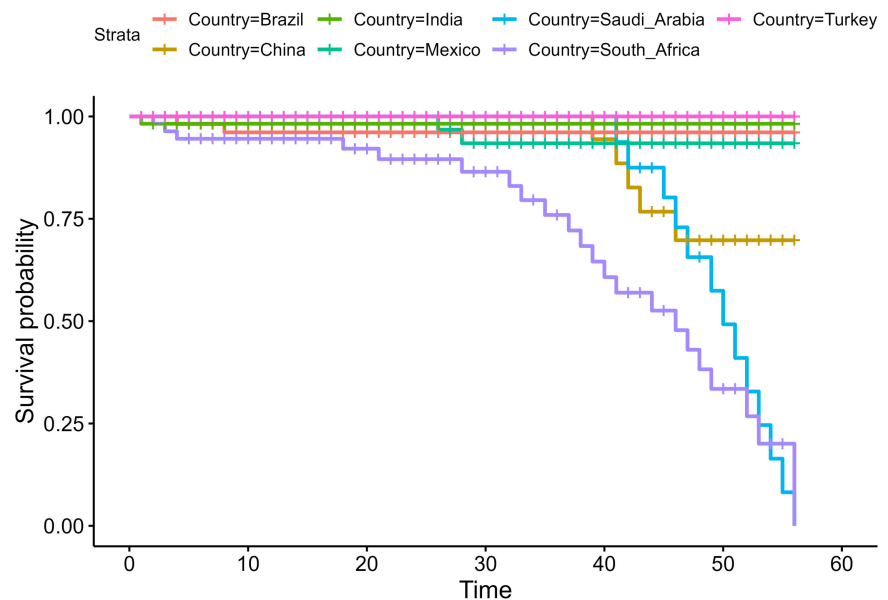


Figure 7. Kaplan-Meier curves for each country. Source: Authors.

of accumulating substantial amounts of international reserves. However, the reserves did not just come from capital inflows. Larger portions of these reserves were generated by current account surpluses. All the countries hit by the 1997 crisis made considerable progress in current accounts management. As to the reaction while facing the crisis, conventional wisdom is that countries should tighten monetary and fiscal policies to counter the drop in the exchange rate and to restore confidence and trust. In significantly difficult cases the International Monetary Fund provides emergency assistance. But in fact, this conventional response is helpful in a minority of cases.

However, in the analyzed research, focusing on the examples of sudden stops in the period 1991-2014, only 8 of the 43 cases considered did tighten both monetary and fiscal policies in response to the situation. Over the entire period, monetary policy was eased in response to sudden stops much more often than it was tightened. Additionally, governments respond to sudden stops with a variety of other measures targeted at restoring the stability of their financial systems to signal to investors the return of stable policies. Exchange rate manipulation is the first line of defense. Therefore, it is wary of excessive volatility and overshooting. Also, even the ones with floating exchange rates use reserves to take the pressure off the exchange rate by providing forex liquidity to importers. As to liquidity and the temporary freezing of capital markets, in response to the situation, there are open extra liquidity windows to provide relief for the banks. They seek to limit surges in capital flows and credit through macroeconomic instruments (exchange rates, monetary, and fiscal policies), through their capital control and macroprudential regimes, through a building up of defenses (reserve levels, swap agreements among central banks, and agreements with the IMF), and through careful monitoring of and adjusting to market perceptions (Bakker & Lipschitz, 2014).

6. Conclusion

In summary, it turns out that the frequency and duration of sudden stops are still similar no matter what the approach towards them is. Mostly the change in the scope can be seen and global factors appear to have become more important in relation to the local characteristics and policies. Nonetheless, conventional operations, which are known to be necessarily undertaken, do not seem to be the best solution. Each situation should be looked at individually. Responses shall not be identical to the ones in the past, rather they should be researched separately. Nowadays, sudden stops tend to affect different parts of the world as it is no longer just a regional but a global phenomenon. Greater flexibility appeared in terms of macroeconomic and financial frameworks and that facilitated better responses. Although the challenge of understanding and coping with capital-flow volatility is far from fully met, that topic is increasingly being researched and examined (Eichengreen & Gupta, 2016).

For emerging markets, the concept of foreign direct investments takes a central theme in the economic growth process and trajectory (Le, 2021). The changing and often volatile macroeconomic landscape across the world in terms of monetary policy impacts all economies and influences balance of payments, especially in developing and emerging economies. The disencumbered capital flow is the driving aspect of foreign direct investment, which is evidenced by the pursuance of trade agreements between emerging and developed economies. To provide additional evidence, the authors modelled different indicators, which have shown directly that appropriate currency reserves, positive trade balance and stable employment policies are key to sustaining capital inflows and reducing the potential blow to the economy once crisis arises, which curtails frequency and intensity of capital and labour flows. In addition, based on the selected emerging economies, reduced capital inflows tend to form a snowball effect based on balance of payment data.

Authors like Reinhart and Reinhart (2009) highlighted the importance of timely and coordinated policy responses in addressing the root causes of sudden stops and restoring confidence in the financial system. Some studies have also emphasized the role of exchange rate regimes, fiscal policies, and structural reforms in enhancing the resilience of economies to sudden stops (Aizenman & Pasricha, 2010; Ghosh et al., 2015).

To finally conclude further, the proliferation of different and sophisticated forms of new capital and its global interconnectivity to different markets in distant economies makes this topic more concerning and poses new challenges for both policymakers and researchers to seek long-term solutions to this phenomenon of sudden stops more especially within developing and emerging economies (Rey, 2013; Avdjiev et al., 2019). It is the suggestion of the research work that developing countries, especially commodity-based ones should hold various different investment positions and portfolios that are not highly correlated in order to mitigate the levels of exposure when national currencies depreciate.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Selected variables used in modelling exercise.

Variable	Source	Type
Current Account Balance	Haver	National Accounts
Goods Balance	Haver	National Accounts
Goods Exports	Haver	National Accounts
Goods Imports	Haver	National Accounts
Oil Exports	Haver	National Accounts
Oil Imports	Haver	National Accounts
Service Balance	Haver	National Accounts
Service Exports	Haver	National Accounts
Service Imports	Haver	National Accounts
Income	Haver	National Accounts
Credit side of Income	Haver	National Accounts
Debit side of Income	Haver	National Accounts
Transfers	Haver	National Accounts
Debit side of Transfers	Haver	National Accounts
Credit side of Transfers	Haver	National Accounts
FDI net	Haver	National Accounts
Reserves	Haver	National Accounts
GDP	Refinitiv	Macroeconomic
Unemployment Rate	Refinitiv	Macroeconomic

Table A2. Employed modelling techniques with selected variable.

Modelling Technique	Time Span	Variable Name	Sign	Presence
Pooled OLS	2006-2014	Reserves	Positive	100%
Pooled OLS	2006-2014	Income	Negative	55%
Pooled OLS	2006-2014	Unemployment Rate	Negative	55%
Fixed Effect Panel Model	2006-2014	Reserves	Positive	85%
Fixed Effect Panel Model	2006-2014	Income	Negative	75%
Pooled OLS	2006-2015	Reserves	Positive	100%
Pooled OLS	2006-2015	Income	Negative	45%
Fixed Effect Panel Model	2006-2015	Reserves	Positive	90%

Continued

Fixed Effect Panel Model	2006-2015	Income	Negative	70%
Fixed Effect Panel Model	2006-2015	Goods Import	Positive	50%
Pooled OLS	2006-2016	Reserves	Positive	100%
Pooled OLS	2006-2016	Debit side of Income	Positive	50%
Pooled OLS	2006-2016	Unemployment Rate	Negative	45%
Fixed Effect Panel Model	2006-2016	Reserves	Positive	70%
Fixed Effect Panel Model	2006-2016	Income	Negative	65%
Fixed Effect Panel Model	2006-2016	Goods Import	Positive	45%
Pooled OLS	2006-2017	Reserves	Positive	95%
Pooled OLS	2006-2017	Income	Negative	45%
Fixed Effect Panel Model	2006-2017	Reserves	Positive	75%
Fixed Effect Panel Model	2006-2017	Income	Negative	60%
Fixed Effect Panel Model	2006-2017	Goods Import	Positive	45%
Pooled OLS	2006-2018	Reserves	Positive	100%
Pooled OLS	2006-2018	Income	Negative	50%
Fixed Effect Panel Model	2006-2018	Reserves	Positive	85%
Fixed Effect Panel Model	2006-2018	Income	Negative	70%
Fixed Effect Panel Model	2006-2018	Goods Import	Positive	50%