Banco de México

Working Papers

N° 2021-17

Capital Flows to Emerging Economies and Global Risk Aversion during the COVID-19 Pandemic

Carlos Alba
Banco de México

Gabriel Cuadra
Banco de México

Juan R. Hernández
Banco de México

Raul Ibarra
Banco de México

October 2021

Documento de Investigación
2021-17

Working Paper
2021-17

Capital Flows to Emerging Economies and Global Risk Aversion during the COVID-19 Pandemic*

Carlos Alba†
Banco de México

Gabriel Cuadra‡
Banco de México

Juan R. Hernández§
Banco de México

Raul Ibarra**
Banco de México

Abstract: This paper analyzes recent changes in the relative importance of the determinants of capital flows to emerging market economies. For this purpose, we estimate vector autoregressive (VAR) models for the period 2009-2020. Based on these models, we estimate the effects on debt flows from shocks to their determinants. Then, we quantify the contribution of each of the variables included in the model to explain the evolution of these flows in each month of the sample through a historical decomposition analysis. The main results indicate that the contribution of global risk aversion to explain the evolution of debt flows increased during March 2020 compared to the past, although its relative importance has decreased since, particularly as the performance of financial markets improved.
Keywords: Capital Flows; Global Risk Aversion; COVID-19; Vector Autoregression
JEL Classification: F21; F32; F41; G15

Resumen: Este trabajo analiza los cambios recientes en la importancia relativa de los determinantes de los flujos de capital hacia las economías de mercados emergentes. Para ello, estimamos modelos de vectores autorregresivos (VAR) para el período 2009-2020. Con base en estos modelos, estimamos los efectos sobre los flujos de deuda de choques a sus determinantes. Posteriormente, cuantificamos la contribución de cada una de las variables incluidas en el modelo para explicar la evolución de estos flujos en cada mes de la muestra mediante un análisis de descomposición histórica. Los resultados principales indican que la contribución de la aversión al riesgo global para explicar la evolución de los flujos de deuda aumentó durante marzo de 2020 en comparación con el pasado, aunque su importancia relativa ha disminuido desde entonces, particularmente a medida que mejoró el desempeño de los mercados financieros.
Palabras Clave: Flujos de Capital; Aversión al Riesgo Global; COVID-19; Vectores Autorregresivos

*We thank the referees for their constructive comments. The views on this paper correspond to the authors and do not necessarily reflect those of Banco de México.

† Dirección General de Investigación Económica. Email: calbaf@banxico.org.mx.

‡ Dirección General de Investigación Económica. Email: gcuadra@banxico.org.mx.

§ Dirección General de Investigación Económica. Email: juan.hernandez@banxico.org.mx.

** Dirección General de Investigación Económica. Email: ribarra@banxico.org.mx.

1 Introduction

The effects of the COVID-19 pandemic led to a sudden increase in risk aversion among international investors, causing a reallocation of investment portfolios towards less risky assets and, thus, a significant reduction in their holding of assets from emerging market economies (EMEs). These adjustments were generalized, and global factors seem to have had a greater relevance than idiosyncratic factors. In this context, EMEs faced a financial shock that led, in a very short period of time, to significant increases in long term interest rates and risk premia, a depreciation of the domestic currency, as well as capital outflows (Cakmakli et al., 2020). In particular, debt portfolio investment declined significantly. In general, the largest impact on financial conditions took place in March 2020. Subsequently, the performance of global and financial markets improved, the latter associated with monetary, financial and fiscal measures adopted in systemically important economies (Alberola et al., 2020; Cavallino and De Fiore, 2020; Arslan et al., 2020). There are still risks, however, that could further intensify the financial shock.[1]

The current crisis has highlighted the challenges faced by monetary policy in EMEs that are integrated into international financial markets and world trade. Central banks in these economies need to consider the effects on inflation associated with the pandemic, as well as the impact of the financial shock, in particular adjustments in investment portfolios and in the exchange rate when conducting monetary policy. The latter seems to imply complex trade-offs considering that, for instance, investors could be more willing to invest in domestic securities when their return, relative to foreign securities, increases (Herrmann and Mihaljek, 2013; Nier et al., 2014; Ahmed and Zlate, 2014; Koepke, 2018). Hence, the analysis of the determinants of capital flows is essential for the monetary authorities of these economies.

This paper presents an analysis of the recent changes in the relative importance of the determinants of capital flows, specifically debt flows, to six large EMEs: Mexico, Brazil, South Africa, India, Turkey and Chile. Debt flows are of particular interest considering their significant reduction during the pandemic period compared to equity flows in our sample. In

[1] During the pandemic period, for instance, many countries have defaulted on their sovereign debt and all EMEs have experienced increased sovereign spreads (Arellano et al., 2020).

particular, VAR models are estimated for the period January 2009 to June 2020. These models include debt portfolio flows and several factors found in the literature to influence such flows, particularly global risk aversion, foreign output, domestic output, domestic inflation, interest rate spreads and exchange rate (Fratzscher, 2012; Ahmed and Zlate, 2014; Ibarra and Tellez-Leon, 2020). Based on these models, we estimate the effects on debt portfolio flows from shocks to their determinants using impulse response functions. Likewise, we analyze how these effects change when data from 2020 is considered in the estimation, when the pandemic had repercussions on financial conditions. Then, through a historical decomposition analysis of debt flows, the contribution of each of the variables included in the model to explain the evolution of these flows is quantified in each month of the sample.

Several empirical studies have analyzed the determinants of capital flows to EMEs through the push-pull framework. In this framework, external or push factors are beyond the control of EMEs. They include foreign interest rates, foreign output growth, international liquidity and global risk conditions. On the other hand, internal or pull factors provide information about domestic economic conditions, such as macroeconomic stability and financial vulnerability. Overall, much of the literature has highlighted the usefulness of this approach for explaining the dynamics of capital flows. Koepke (2019) presents a recent review of this literature.[2] In particular, global risk aversion has received great attention since the global financial crisis.[3] Milesi-Ferretti and Tille (2011), for instance, interpret the sharp retrench-

[2] Some of the early empirical studies include Calvo et al. (1996) and Fernandez-Arias (1996). These authors find that the reduction in foreign interest rates explained much of the capital inflows to Latin American countries, in the early nineties. In the same line, Taylor and Sarno (1997), Montiel and Reinhart (1999), Baek (2006), De Vita and Kyaw (2008) and Bluedorn et al. (2013) are some of the subsequent studies that highlight the role of US interest rates in the determination of capital flows to EMEs. In terms of foreign economy output growth, there is also evidence that support the notion that external growth encourages portfolio flows to EMEs (see, e.g., Baek (2006), De Vita and Kyaw (2008) and Forbes and Warnock (2012), among others). On the pull side, Baek (2006), De Vita and Kyaw (2008) and Ahmed and Zlate (2014) find supporting evidence for the role of domestic output growth as a driver of portfolio flows to EMEs. More recently, Eichengreen and Gupta (2016) show that the relative importance of push and pull factors to explain changes in capital flows changed after 2002. In particular, push factors (especially global risk) seem to be more important compared to pull factors. Likewise, Forbes and Warnock (2012) show that global factors -especially global risk- can cause extreme episodes of capital flows and note that macroeconomic features of the host country lose relative importance.

[3] Empirical studies including Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2013), Ananchotikul and Zhang (2014), Koepke (2018) and Bruno and Shin (2015), among others, have found a strong and statistically significant impact of increases in global risk aversion on different capital flows components.

ment in foreign capital flows during the financial crisis primarily as the result of a powerful 'push shock' in global risk aversion. In the same line, Fratzscher (2012) concluded that push factors became the main drivers of capital flows during the 2008-2009 financial crisis, while pull factors were more important onwards. In turn, other studies as Herrmann and Mihaljek (2013), Nier et al. (2014), Ahmed and Zlate (2014) and Koepke (2018) have analyzed the role of interest rate differentials between emerging and advanced economies and global risk aversion as determinants of capital flows. In general terms, their results show that these variables are statistically and economically important determinants of portfolio flows.[4] Thus, the evidence presented by these authors seems to support the theoretical result of Markovitz (1952) and Grubel (1968), in the context of the modern portfolio theory, that the portfolio share of a particular asset will depend on its expected return and risk relative to other assets.

This paper contributes to the literature on capital flows in two main aspects. First, the methodology used allows us to analyze the recent changes in the relative importance of the determinants of debt flows to EMEs. In particular, we analyze these changes in the context of the effects derived from the COVID-19 pandemic through a historical decomposition method based on a VAR model.[5] According to Obstfeld (2012), the importance of capital flows for financial stability is greater for EMEs, which are particularly exposed to swings in the avail-

[4] Based on a panel data set of bilateral cross-border bank flows from 17 advanced economies to 28 EMEs in Asia, Latin America and central and eastern Europe, Herrmann and Mihaljek (2013) find that bank lending flows seem to respond positively to interest rate differentials. Nier et al. (2014) show that, during periods of high financial volatility, global risk aversion becomes the dominant driver of capital flows to EMEs while other determinants, with the exception of interest rate differentials, lose statistical significance. Ahmed and Zlate (2014) examine the determinants of net private capital inflows to EMEs since 2002 finding that interest rate differentials and global risk appetite are statistically and economically important determinants of these flows. Finally, Koepke (2018) also analyzes the role of global risk aversion and the policy interest rate differential between emerging and advanced economies as potential drivers of portfolio flows to EMEs. This author finds that an increase in global risk aversion is associated with a reduction of portfolio flows, although the evidence in support of the hypothesis that policy interest rate differentials were a driver of aggregate portfolio flows to EMEs is less robust.

[5] Previous studies such as Ananchotikul and Zhang (2014) and Globan (2015) have also analyzed the dynamics of capital flows through a historical decomposition method. In particular, by using weekly portfolio fund flows data for the period 2003-2014, Ananchotikul and Zhang (2014) find that the short-run dynamics of these flows in EMEs seems to have been driven mostly by global "push" factors during the global financial crisis. Likewise, Globan (2015) suggests that sudden stop episodes during the period 2002-2013 in some European countries reflected changes in push rather than pull factors more often. More recently, ElFayoumi and Hengge (2021) employ a similar approach based on a panel data model to estimate the contribution of different factors, such as the number of COVID-19 cases, the stringency of the lockdown, and the fiscal and monetary policy response, to explain the evolution of portfolio flows in EMEs.

ability of foreign capital. In this sense, this work contributes to the literature by providing recent evidence of the drivers of capital flows to EMEs, which is important for the purpose of macroeconomic policy making. As mentioned above, the current crisis has highlighted the challenges faced by monetary policy in small economies that are integrated into international financial markets and world trade. In this context, the analysis of the determinants of debt flows is essential for the monetary authorities of these economies. In particular, the appropriate policy response to this challenge may depend on the extent to which capital flows are driven by domestic versus external factors (Calvo et al., 1993).

Second, this paper focuses on six EMEs, which are interesting cases of study considering the large volume of capital flows following the aftermath of the 2008–2009 financial crisis.[6] The sample used in this study covers the period 2009-2020 on a monthly basis. This allows us to consider episodes of high financial volatility, such as the Greek government-debt crisis in 2010, the sovereign debt crisis in Europe in 2011 and, more recently, the financial shock of the COVID-19 pandemic. Moreover, we use the Koepke and Paetzold (2020) recent dataset on monthly emerging market portfolio flows, which is broadly consistent with BoP accounting principles and can be analyzed and interpreted in conjunction with other standard macroeconomic data (Koepke and Paetzold, 2020).[7] This is relevant given that academic research has made little use of BoP-consistent portfolio flow data at high data frequencies.[8] Thus, proxy data on monthly, weekly and even daily flows from Emerging Portfolio Fund Research (EPFR) have been often used in the analysis of the determinants of capital flows to EMEs (Miao and Pant, 2012).[9]

[6] For a very detailed analysis of capital flows in emerging economies during and after the financial crisis see Ahmed and Zlate (2014). In fact, the global financial crisis was followed by a period of low interest rates in advanced economies and increased liquidity in international markets. This in turn increased capital flows to EMEs in general and Mexico in particular, as international investors were searching for high yields in those economies (Hernandez-Vega, 2017; Ibarra and Tellez-Leon, 2020). This new wave of capital flows was characterized by a rise in the participation of portfolio investment and other investment (Hernandez-Vega, 2019).

[7] In particular, the data are based on transactions between residents and non-residents of emerging market countries. The data reflect transactions at market prices and are not subject to valuation effects.

[8] Some empirical studies include Converse et al. (2020), Koepke (2018), Cerdeiro and Komaromi (2021), among others.

[9] The discrepancy between BoP portfolio flows and EPFR Fund Flows, however, is quite large (Koepke, 2019). Moreover, according to Koepke and Paetzold (2020) some empirical findings may be distorted by data availability. For example, the widespread use of fund flow data may have over-emphasized the importance of external

To analyze the determinants of debt flows in the short and medium term we employ a VAR model. This is an important departure from the literature on this subject that uses panel data models.[10] The panel data models are useful to obtain the contemporaneous mean effect for a group of countries of several factors on capital flows. However, there could be important differences between those countries and heterogeneity in the timing of the response of capital flows to various shocks. By contrast, we follow a VAR model, which allows us to examine the dynamic impact on debt flows of different shocks. In this way, we analyze the impulse response functions of debt portfolio flows to domestic and foreign shocks. Then, through a historical decomposition analysis of debt flows, the contribution of each of the variables included in the model to explain the evolution of these flows is quantified in each month of the sample.

The main results indicate that global risk appears to be an important determinant of debt portfolio flows to EMEs in the context of the effects derived from the COVID-19 pandemic. In particular, our results show that when 2020 data are included in the estimation, the negative response of debt flows to the shock in global risk aversion is larger and becomes statistically significant. This may be because, in the face of greater global uncertainty, investors are seeking refuge in lower-risk assets, such as securities issued by the US government. In addition, the monthly historical decomposition of debt flows shows that the contribution of global risk aversion to explain the evolution of debt flows increased during March 2020 compared to the past, although its relative importance has decreased since. Thus, the results suggest that in periods of high uncertainty in international financial markets, such as the recent episode of shocks resulting from the COVID-19 pandemic, global risk aversion tends to be more important in explaining capital flows, while idiosyncratic factors play a relatively less important role. In periods of low volatility, however, idiosyncratic factors such as spreads between domestic and foreign interest rates, influence the dynamics of these flows.

The remainder of this paper is organized as follows. Section 2 describes the data and

factors in empirical results, given that fund flows by construction are subject to “benchmark effects” that are common to many emerging markets (Raddatz et al., 2017; Arslanalp et al., 2020).

[10] See, e.g., Chuhan et al. (1998), Hernandez et al. (2001), Jeanneau and Micu (2002), Ferrucci et al. (2004) and Ahmed and Zlate (2014), among others.

reviews the evolution of debt flows and global risk aversion during the COVID-19 crisis. The VAR model is presented in Section 3. The estimation results are reported and discussed in Section 4. The last section concludes and discusses areas for future research.

2 The Data

2.1 Data Description

In this subsection, we present the description of the variables included in the model used to analyze the effects of the main determinants of debt portfolio flows to EMEs. In particular, we include the risk aversion index provided by Citigroup as a proxy for global uncertainty, the US industrial production as a proxy for foreign economic activity, domestic output, domestic inflation, the interest rate spread between the monetary policy rate and the Wu and Xia (2016) shadow federal funds rate, the exchange rate and debt portfolio flows. These variables were selected following previous studies about capital flows, including De Vita and Kyaw (2008), Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Ahmed and Zlate (2014), Koepke (2018) and Ibarra and Tellez-Leon (2020), among others. In particular, we analyze investment in debt securities by non-residents.[11] We focus on monthly flows during the period 2009M01-2020M06. The sample period starts in January 2009 as debt flows for Mexico are available from this date onwards. Using data at the monthly frequency allows us to analyze the short-run dynamics of debt flows during episodes of high financial volatility, measured by the risk aversion index, such as the Greek government-debt crisis in 2010, the sovereign debt crisis in Europe in 2011 and, more recently, the financial shock of the COVID-19 pandemic. In fact, during these episodes, the risk aversion index presented huge jumps and reached relatively high values. The period post global financial crisis was characterized by low interest rates in advanced economies and increased liquidity in international markets. Debt flows are of particular interest considering their significant reduction during

[11] According to Obstfeld (2012) and Broner et al. (2013), capital flows to EMEs are substantially affected by the actions of foreign investors. Therefore, these flows in general and portfolio flows in particular are of predominant importance from a financial stability perspective (Koepke, 2018).

the pandemic period compared to equity flows in our sample.[12] In particular, six EMEs are analyzed, Mexico, Brazil, South Africa, India, Turkey and Chile, which are interesting cases of study considering the large volume of capital flows following the aftermath of the 2008–2009 financial crisis. Indeed, own calculations with data from the International Monetary Fund show that, over the last twenty years, the aforementioned EMEs were among of the countries with the highest investment in debt securities by non-residents among EMEs.[13] Moreover, the sum of debt portfolio flows in these economies covers around 68 percent of their total portfolio flows over the sample period.

Debt portfolio flows are obtained from Koepke and Paetzold (2020) dataset, which in turn is constructed using data from national sources in a set of 19 EMEs. In particular, debt portfolio flows refers to net changes in liabilities (non-resident inward investment). Debt securities are measured in US dollars and include bills, bonds, notes, negotiable certificates of deposit, commercial paper, debentures, asset-backed securities, money market instruments, and similar instruments normally traded by the public and private sectors in the financial markets. In turn, these securities can be issued both in the domestic market and abroad and include both short-term and long-term instruments. This is also a gross measure of debt portfolio flows in the sense that changes in liabilities are not netted against changes in assets. Previous studies as Chuhan et al. (1998), Broner et al. (2013) and Forbes and Warnock (2012), among others, have use the concept of gross capital flows to denote these type of capital flow measures. In particular, Brazil, South Africa, Turkey and Chile report monthly data that correspond to the quarterly balance of payments published by the central bank or statistical authority of these countries. In the case of Mexico and India, however, monthly proxies for debt portfolio flows are used, particularly government debt flows and portfolio inflows by non-residents, respectively. These variables are highly correlated with quarterly

[12] For robustness, we also analyzed equity portfolio flows and total equity and debt flows. However, qualitatively, the results were very similar. They are reported in Section 4.

[13] These economies were in turn selected according to the IMF's classification of EMEs. Similarly, a survey conducted by the Emerging Markets Traders Association shows that in the last year the trading volume of Mexican debt securities was the highest among emerging markets (Murno, 2019). Other frequently-traded local instruments were those from Brazil, South Africa and India.

BoP-based debt flows.[14]

The risk aversion index used is calculated by Citigroup. Unlike the VIX index and the US BBB-rated corporate bond spread over US Treasury securities, two of most common proxies for investor risk aversion used in the literature (Koepke, 2019), the risk aversion index is derived from six different markets, particularly the US equity market, the emerging market debt, the interbank lending market, the corporate debt market, the foreign exchange market, and the interest rate market.[15] This allows us to consider financial volatility across a broader set of markets. For robustness, however, we also considered the VIX index as alternative indicator of risk aversion. The results reported in Section 4 are consistent with our baseline specification.

We use the interest rate spread between the domestic monetary policy rate and the Wu and Xia (2016) shadow federal funds rate as a measure of relative returns in EMEs to those in the United States. The analysis of the role of policy interest rate differentials is in turn motivated by the challenges that have faced the monetary authorities in EMEs during the COVID-19 pandemic. Studies, including Herrmann and Mihaljek (2013), Nier et al. (2014), Ahmed and Zlate (2014) and Koepke (2018), have also analyzed the role of interest rate differentials between EMEs and advanced economies as determinants of capital flows. Indeed, in the context of the carry trade investment strategy, a branch of the literature shares the view that the interest rate spreads are important drivers of portfolio flows (Galati et al., 2007). Following Ibarra and Tellez-Leon (2020), we use the shadow interest rate by Wu and Xia (2016), which allows us to account for the unconventional monetary policies implemented by the Federal Reserve after the global financial crisis and, more recently, during the COVID-19 pandemic.[16] In particular, the shadow interest rate tracks closely the movements of the federal funds rate in

[14] In particular, the correlation between government debt flows and BoP debt flows for Mexico is 0.82, while that between portfolio inflows by non-residents and BoP debt flows for India is 0.91.

[15] In particular, the VIX index is derived from the US equity market, while the BBB spread is derived from the US bond market. Thus, these proxies for investor risk aversion may be more closely correlated with portfolio equity flows and credit flows, respectively (Koepke, 2019).

[16] In particular, the Federal Open Market Committee targeted the federal funds rate between 0 to 0.25 percent from December 16, 2008, to December 15, 2015, and, more recently, since March 15, 2020. In these ”zero lower bound” environments, some studies have used shadow rate models to characterize the term structure of interest rates or quantify the stance of monetary policy (Kim and Singleton, 2012; Bauer and Rudebusch, 2016; Bullard, 2012; Krippner, 2013 and Wu and Xia, 2016).

times of conventional monetary policy, but it is not bounded below by 0 percent. In line with part of the literature on this topic, however, we also estimate the model using both interest rates separately as robustness test. Qualitatively, the results, reported in Section 4.3 of the paper, were very similar.

We use the global economic activity indicator (IGAE by its Spanish acronym) as the output variable for Mexico and the monthly indicator of economic activity (IMACEC by its Spanish acronym) for the case of Chile. These indicators employ the methodology and the conceptual framework of the national accounts, in particular, GDP.[17] In the case of Brazil and Turkey, we use the industrial production index, while for India and South Africa, we use the manufacturing production index. Domestic inflation is measured by the consumer price index. The interest rates used are the interbank funding interest rate for Mexico, the Selic rate for Brazil, the monetary policy rate for Chile, the One-Week Repo rate for Turkey and the Repo rate for South Africa and India. The overnight borrowing rate for Turkey is used from January 2009 to April 2010, since the One-Week Repo rate is available from May 2010 onwards. Data for output, inflation, interest rate and exchange rate are obtained from the Federal Reserve Bank of St. Louis and the central bank of each country. Considering that debt flows and other macroeconomic variables reflect developments over the entire month rather than purely at a point in time, we use the monthly average for the interest rate and the exchange rate of each country rather than a point-in-time value such as end of the month value.

2.2 Evolution of Debt Flows and Global Risk Aversion during the COVID-19 Pandemic

The COVID-19 crisis has been characterized by an extreme degree of uncertainty surrounding many dimensions such as: the spread of contagion, the effectiveness of treatments, the sanitary responses from health authorities; as well as the effects of the pandemic on economic activity, profitability and sectoral disruptions. The confluence of all of these aspects trans-

[17] The correlation between these output variables and GDP is 0.99 for both countries.

lated into extreme volatility in financial markets.[18] In particular, the effects of the COVID-19 pandemic led to a sudden increase in risk aversion among international investors, causing a reallocation of investment portfolios towards less risky assets and, thus, a significant reduction in their holding of assets from EMEs (Cakmakli et al., 2020). These adjustments were generalized, and global factors seem to have had a greater relevance than idiosyncratic factors.

Figure 1 shows the behavior of debt portfolio flows and risk aversion from January 2009 to June 2020 at monthly frequency. As can be observed, the behavior observed in March 2020 stands out, when the investment flows had their highest outflow for the entire period and for all economies in our sample, while the risk aversion index reached its highest level after the global financial crisis of 2008-2009. In fact, debt portfolio flows involve transactions that can, in principle, be executed very quickly. Thus, investors may adjust the composition of their portfolios fast in response to economic news and short-term fluctuations on financial markets (Ibarra and Tellez-Leon, 2020; Koepke, 2019). Likewise, other episode stands out in which high risk aversion coincides with capital outflows, particularly the sovereign debt crisis in Europe in September 2011. However, the association between debt flows and risk aversion seems to be greater during the financial shock of the COVID-19 pandemic. It should be noted that, in a context in which risk aversion decreased in April 2020, mainly due to the adoption of monetary, financial and fiscal measures at systematically important economies, there were fewer debt outflows during May and June.[19]

[18] According to Altig et al. (2020), several economic uncertainty indicators presented huge jumps and reached their highest values on record in reaction to the COVID-19 pandemic and its economic fallout. In particular, these authors considered risk indicators such as implied stock market volatility, newspaper-based policy uncertainty, Twitter chatter about economic uncertainty, subjective uncertainty about business growth, forecaster disagreement about future GDP growth, and a model-based measure of macro uncertainty.

[19] Alberola et al. (2020), for instance, document the fiscal response to the COVID-19 crisis in advanced and emerging market economies. According to these authors, the combined policy reaction of governments, central banks and financial regulators aimed both to calm the financial turmoil and to prevent temporary disruptions from inflicting permanent damage to the economy. Likewise, Cavallino and De Fiore (2020) and Arslan et al. (2020) present an overview of recent monetary policy responses in AEs and EMEs, respectively. In particular, Arslan et al. (2020) point out that local currency bond purchase programs in EMEs were successful in restoring investor confidence and did not lead to higher inflation expectations. In tun, Drehmann et al. (2020) analyze the role of prudential policies during the COVID-19 crisis. According to Drehmann et al. (2020), by allowing banks to run down some of their buffers, policymakers sent strong signals about their aim to lessen the economic fallout from the pandemic.

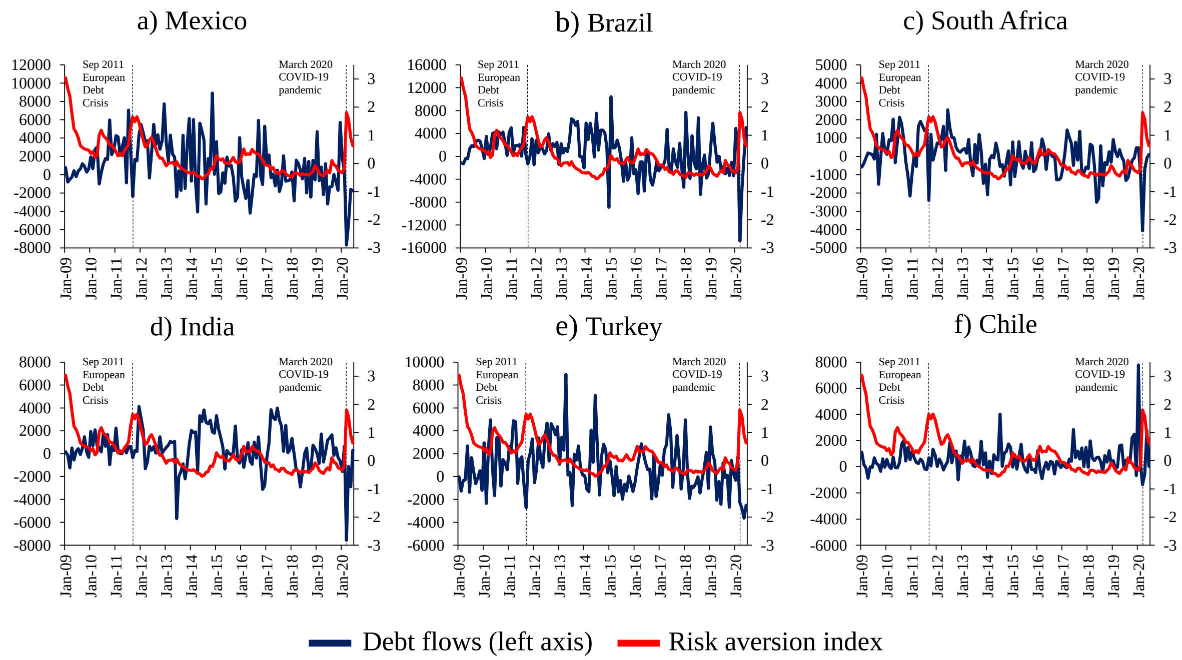

Figure 1: Debt Portfolio Flows and Risk Aversion Index

Source: Koepke and Paetzold (2020) dataset and Citigroup.
Notes: Debt portfolio flows refers to net changes in liabilities. Government debt flows for Mexico and portfolio inflows by non-residents for India are used as monthly proxies for debt flows. The risk aversion index is a measure of financial volatility and is derived from six different markets, particularly the US equity market, the emerging market debt, the interbank lending market, the corporate debt market, the foreign exchange market, and the interest rate market.

The COVID-19 pandemic and the measures adopted to prevent its spread have had a significant impact on global economic activity, which may in turn affect the volume of capital flows to EMEs, as well as the determinants of those.[20] In general terms, global economy fell sharply in March and April 2020, although it began to show some improvement since. The latter seems to be associated with the relaxation of some confinement measures and the aforementioned policy measures.[21]

In this context, inflation in most economies remained at low levels. In particular, infla-

[20] See, e.g., Baek (2006), De Vita and Kyaw (2008), Forbes and Warnock (2012) and Ahmed and Zlate (2014), among others.

[21] More details on the impact of COVID-19 crisis on industrial production in the EU are presented in Eurostat (2020). See Banco de México (2020a; 2020b) for further details about the impact of the COVID-19 pandemic on Mexican economic activity.

tion in advanced economies fell below the targets of their respective central banks.[22] Thus, monetary authorities in these countries kept interest rates at historically low levels and used their balance sheets to foster an orderly functioning of financial markets, strengthen the credit channels and provide liquidity for the sound development of the financial system (Cavallino and De Fiore, 2020). Likewise, several central banks in EMEs cut their policy rates and adopted similar supportive measures (Arslan et al., 2020). These measures combined with the easing of global financial conditions seem to have helped domestic financial markets to exhibit a more stable behavior. However, uncertainty regarding the evolution and duration of the pandemic as well as the shape of economic recovery might intensify the financial shock again.

Figure 2 depicts the behavior of the monetary policy rates for the United States and the six EMEs analyzed.[23] Although the analysis shows that all monetary policy rates decreased as a response to the effects derived from the COVID-19 pandemic, there were cross-country differences according to the evolution of the pandemic and containment measures. Central banks of South Africa and Turkey reduced their reference rates faster than the other EMEs from January to June 2020, but monetary policy rates in Brazil and Chile were those that reached the lowest levels in June 2020.[24] Likewise, monetary policy rate in India showed a relatively small change, while for the case of Mexico and Turkey, their respective central banks reduced the reference rates but kept them at higher level than the others EMEs under analysis.[25] In fact, central banks in EMEs had to consider the effects on inflation associated with the pandemic, as well as the impact of the financial shock, in particular adjustments in investment portfolios and in the exchange rate. The latter implied complex trade-offs considering that, for instance, investors could be more willing to invest in domestic securities

[22] According to Ilzetzki et al. (2020), nearly all high-income economies have inflation rates in the narrow 0 to 2½ percent band.

[23] In particular, we analyze the behavior of the Wu and Xia (2016) shadow federal funds rate for the US, which allows us to account for the unconventional monetary policies implemented after the global financial crisis and more recently during the COVID-19 pandemic. In fact, debt flows appear to react immediately to unconventional monetary policy announcements, particularly if these are considered as bad news by investors (Hernandez-Vega, 2017).

[24] It should be noted that central banks of Brazil, India and Chile began to reduce their reference rates much earlier than the rest of EMEs analyzed.

[25] Mexico, India and Turkey had inflation above target.

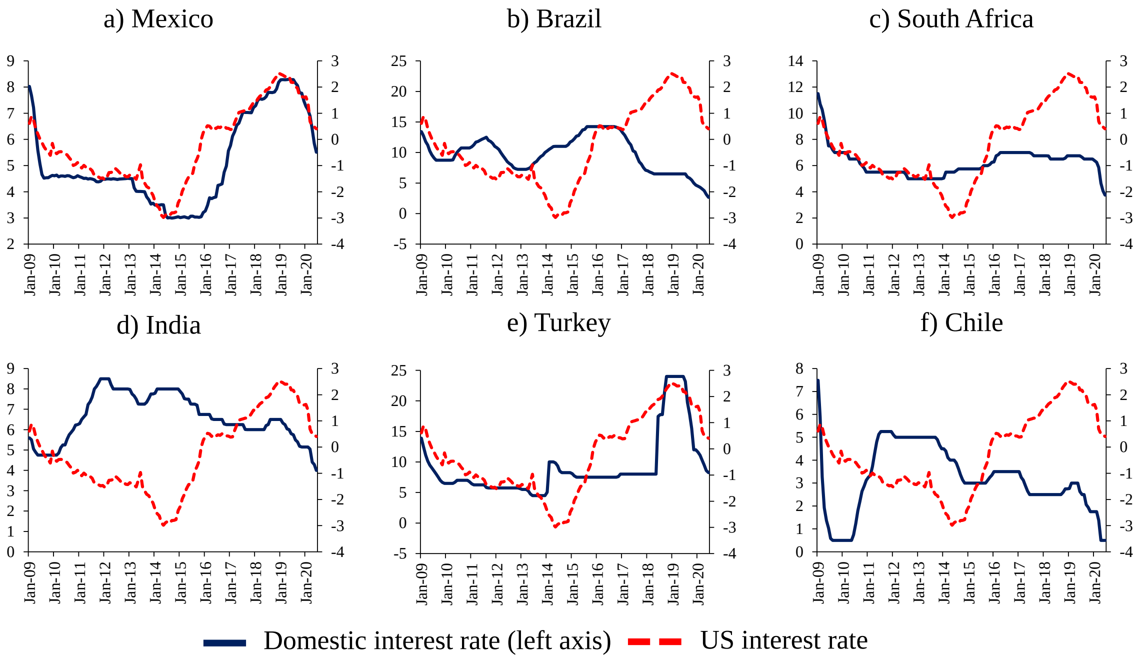

Figure 2: Monetary Policy Rates

Source: Central Bank of Mexico, Central Bank of Brazil, South African Reserve Bank, Reserve Bank of India, Central Bank of the Republic of Turkey, Central Bank of Chile and Federal Reserve Bank of St. Louis.
Notes: Data correspond to monthly averages of the Wu and Xia (2016) shadow federal funds rate for the US, interbank funding interest rate for Mexico, the Selic rate for Brazil, the monetary policy rate for Chile, the One-Week Repo rate for Turkey and the Repo rate for South Africa and India. The overnight borrowing rate for Turkey is used from January 2009 to April 2010, since the One-Week Repo rate is available from May 2010.

when their return, relative to foreign securities, increases.[26]

In sum, EMEs have faced large and simultaneous shocks stemmed from the impact of the COVID-19 pandemic, which have affected economic activity, domestic inflation and financial conditions. In particular, debt portfolio flows declined significantly. Thus, central banks in EMEs have faced a challenging backdrop in at least two dimensions. The first one implies a high degree of uncertainty on the direction and magnitude of the impact on inflation of the policies aimed at containing the spread of the pandemic. The second involves a severe financial shock, in particular a sudden and sharp increase in global risk aversion, affecting the foreign exchange market and causing considerable capital outflows, in particular from fixed

[26] See, e.g., Markovitz (1952), Grubel (1968), Obstfeld and Rogoff (1995), Galati et al. (2007), Herrmann and Mihaljek (2013), Ahmed and Zlate (2014) and Koepke (2018), among others.

income. While global risk aversion has diminished, a number of risks remain. In this context, when assessing the appropriate monetary policy stance, central banks have had to consider both its influence on inflation, as well as the evolution of domestic financial markets.

Motivated by this issues, in the next section we present a VAR model to analyze the determinants of debt flows. In particular, we analyze the role of several factors found in the literature to influence the dynamics of these flows, such as risk aversion and spreads between domestic and foreign interest rates, among others. This approach allows considering the feedback relationships among the variables included in the model and estimating the effects on debt flows from shocks to their determinants. Likewise, we analyze how these effects change when data from 2020 is included into the estimation, when the pandemic had repercussions on financial conditions. Then, through a historical decomposition of debt flows, the contribution of each of the variables included in the model to explain the evolution of these flows is quantified in each month of the sample.

3 Methodology

In order to analyze the determinants of debt portfolio flows to EMEs, a VAR model is estimated for each EME. This model has been widely used in the literature to analyze the impact of various factors on capital flows in EMEs.[27] Both external and internal shocks that affect debt flows are included in this model. In particular, the VAR model includes the risk aversion index as a proxy for global uncertainty, the US industrial production as a proxy for foreign economic activity, domestic output, domestic inflation, the interest rate spread between the monetary policy rate and the Wu and Xia (2016) shadow federal funds rate, the exchange rate

[27] De Vita and Kyaw (2008), for instance, observe that shocks to foreign output and domestic productivity were key determinants of capital flows to developing countries during the period 1976-2001. In the same line, Globan (2015) shows that the response of capital inflows to external shocks significantly increased in some non-eurozone countries after their accession to the European Union. Çulha (2006) finds that, for the case of Turkey, push factors are dominant and, particularly, the role of the foreign interest rate has become more important with respect to other factors. For the specific case of Mexico, Ying and Kim (2001) find that foreign output shocks can explain more than half of capital inflows during the period 1980-1996. More recently, Ibarra and Tellez-Leon (2020) analyze the impact and persistence of global and domestic shocks on each component of the financial account for the Mexican Balance of Payments, at the highest degree of disaggregation. These authors find that foreign interest rates and global risk seem to be important drivers of portfolio investment in Mexico.

and debt portfolio flows. Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2013), Ahmed and Zlate (2014), Ananchotikul and Zhang (2014) and Koepke (2018), among others, have highlighted the importance of global risk as a determinant of capital flows, particularly for portfolio debt. Likewise, Calvo et al. (1993) and Fernandez-Arias (1996) find that interest rates and economic activity in the US are among the main external factors that influence capital flows. Other studies such as Herrmann and Mihaljek (2013), Ahmed and Zlate (2014) and Koepke (2018) have analyzed the role of interest rate differentials between emerging and advanced market economies as determinants of capital flows. We also consider shocks to internal factors, such as shocks to output, inflation and exchange rate. The importance of several of these factors is explained in Koepke (2019).

Unlike a single equation model, the VAR model considers the feedback effects among the variables included in the system, which in turn allow us to address the endogeneity problem between some of the variables included in the analysis.[28] Based on this model, we can obtain the dynamic responses of debt flows to different shocks. An important advantage of using an impulse response analysis, instead of using a Granger causality approach, is that the former allows us to examine the magnitude and direction of the response of debt flows to different shocks; thus, it provides further useful information about the effects of these shocks. In addition, we can analyze the contributions of the structural shocks to the observed series. That is, through a historical decomposition of debt flows, the contribution of each of the variables included in the model to explain the evolution of these flows is quantified in each month of the sample.

3.1 VAR Model

The reduced form representation of the model is:

$$\boldsymbol{A}(L)\boldsymbol{y}_t = \boldsymbol{c} + \boldsymbol{u}_t \tag{1}$$

[28] In particular, since greater foreign capital flows tend to reduce local interest rates, estimations that do not address endogeneity between these variables could obtain coefficients with a downward bias (Koepke, 2018).

where $\boldsymbol{y}_t = [RAI_t, \Delta \log Y_t^*, \Delta \log Y_t, \Delta_{12} \log P_t, i_t - i_t^*, \Delta \log e_t, F_t]$, $\boldsymbol{c}$ is a vector of constants, $\boldsymbol{u}_t$ is a vector of errors whose covariance matrix is $\boldsymbol{\Omega}$, and $\boldsymbol{A}(L)$ denotes a polynomial matrix in the lag operator L. RAI_t is the risk aversion index, while Y_t^* is the US industrial production index. In addition, $Y_t, P_t, i_t - i_t^*, e_t$ and F_t represent domestic output, the consumer price index, the spread between the domestic and US interest rate, the exchange rate and debt portfolio flows, respectively.[29] The variables Y_t and Y_t^* are seasonally adjusted by their respective statistical offices, except for the case of India. For this case, Y_t is seasonally adjusted with the X13-ARIMA method. We take logs and first differences as necessary to achieve stationarity in the VAR model. The Bayesian information criterion (BIC) was used to assess the number of lags to be included in the model, in order to adequately capture the dynamics of the system while remaining parsimonious. The optimal lag length turned out to be one for the case of Mexico, South Africa, Turkey and Chile. Regarding Brazil and India the BIC selects a vector autoregression of second order.

The residuals from the reduced form model are linear combinations of structural shocks. Thus, it is necessary to impose assumptions to identify the structural shocks. To that end, the residuals $\boldsymbol{u}$ are orthogonalized using a Cholesky decomposition of the covariance matrix $\boldsymbol{\Omega}$ to produce structural innovations $\boldsymbol{\epsilon}$, as follows:

$$\boldsymbol{C}\varepsilon_t = u_t \tag{2}$$

where, $\boldsymbol{C}$ is the lower triangular Cholesky matrix, with ones in its main diagonal.[30]

Thus, the mechanism used to identify the shocks is recursive. For the first variable in the VAR, the term of the structural shock is given by $\varepsilon_{1t} = u_{1t}$. For the variable $j > 1$, the corresponding structural shock is given by $\varepsilon_{jt} = u_{jt} - c_{j,1}\varepsilon_{1t} \ldots - c_{j,j-1}\varepsilon_{j-1,t}$, where $c_{j,t}$ corresponds to the elements of the Cholesky matrix $\boldsymbol{C}$. In short, the variables are ordered

[29] Although the US inflation rate may be relevant to explain capital flows, this variable is not included in our benchmark specification as the exchange rate depreciation may already capture the differences between domestic and foreign inflation rates (via the power purchasing parity condition). In addition, we avoid a loss of degrees of freedom by having a lower number of variables in the model. For robustness check, however, we consider this variable in our analysis. The results are consistent with our baseline specification.

[30] The positive definite symmetric matrix $\boldsymbol{\Omega}$ can be decomposed into a lower triangular matrix $\boldsymbol{C}$ and a diagonal $\boldsymbol{D}$ such that $\boldsymbol{\Omega} = \boldsymbol{C}\boldsymbol{D}\boldsymbol{C}'$. This decomposition produces uncorrelated error terms by construction, i.e., $E[\boldsymbol{\epsilon}_t \boldsymbol{\epsilon}_t'] = \boldsymbol{D}$.

according to their degree of exogeneity. Thus, foreign variables RAI_t and Y_t^* are contemporaneously affected only by shocks to foreign variables, while domestic variables are affected by both domestic and foreign shocks. These assumptions allow us to retrieve the structural shocks vector.

In turn, the historical decomposition analysis quantifies the contributions of structural shocks to the observed series. In particular, the historical decomposition reorganizes the structural moving average (MA) representation of $\boldsymbol{y}_t$ such that the jth variable y_{jt} can be represented as:

$$y_{jt} = \sum_{i=0}^{\infty} (\psi_{j1,i}\varepsilon_{1,t-i} + ... + \psi_{jK,i}\varepsilon_{K,t-i}) \tag{3}$$

where $\psi_{jk,i}$ measures the contribution of the kth structural shock ε_k to the variable y_{jt}. Nevertheless, this historical decomposition is not feasible because the structural shocks are not available. Once they are identified, however, we can use an estimated historical decomposition by nothing that by successive substitution, y_{jt} may be decomposed as:

$$y_{jt}^{(k)} = \sum_{i=0}^{t-1} \psi_{jk,i}\varepsilon_{k,t-i} + \alpha_{j1}^{(t)} y_o + ... + \alpha_{jp}^{(t)} y_{-p+1} \tag{4}$$

where $\psi_{jk,i}$ is defined as before and the parameter $\alpha_{ji}^{(t)}$ measures the contribution of the initial state to the variable y_{jt}, which becomes negligible for stationary processes as $t \to \infty$. The series $y_{jt}^{(k)}$ represents the contribution of the kth structural shock to the jth component series of $\boldsymbol{y}_t$, given $y_o, ..., y_{-p+1}$.[31]

4 Results

4.1 Impulse Response Functions

This section presents the impulse-response functions of debt flows to shocks in their determinants. In order to analyze how the effects of the determinants of these flows have changed in

[31] Further details can be found in Lütkepohl (2011).

	External factors		Internal factors			
	Risk aversion level	US industrial production	Domestic output	Inflation	Interest rate spread	Exchange rate
Mexico	0.23	1.16	0.77	0.32	0.19	2.30
Brazil	0.23	1.03	1.81	0.35	0.24	2.85
South Africa	0.23	1.32	2.85	0.33	0.19	3.02
India	0.23	0.93	3.36	0.85	0.17	1.61
Turkey	0.23	1.39	2.50	1.04	0.95	3.17
Chile	0.23	1.32	1.13	0.47	0.32	2.04

Table 1: Size of One Standard Deviation Shocks to External and Internal Factors

Notes: The sample corresponds to the period 2009M01-2020M06. The variables used in the VAR model are: global risk aversion index, US industrial production index, domestic output, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows. Since the variables are expressed in logs (except for the risk aversion index and the interest rate spread), the shocks are measured in percentage points.

the context of the effects derived from the COVID-19 pandemic, the model was estimated for each economy for two samples: 2009M01-2019M12 and 2009M01-2020M06. The estimated VAR models are stable since the inverse roots of the characteristic polynomial have modulus less than one and lie inside the unit circle. Furthermore, the null hypothesis of no serial correlation of the residuals cannot be rejected according to the Portmanteau test statistic for residual correlation up to order 24.[32] In all cases, the size of the shock is one standard deviation. Table 1 presents the magnitude of each shock. Responses are presented for each country for a 12-month horizon with 90 percent confidence intervals. For all figures, the shocks occur at period 1. Since debt flows are expressed in millions of dollars, the units of the impulse response functions are also measured in millions of dollars. The Monte Carlo method is used to estimate the standard errors of the impulse response functions using 10,000 repetitions.

Figure 3 shows the impulse-response functions of debt portfolio flows to a one standard deviation shock in the risk aversion index. Regarding this shock, we would expect higher

[32]The exception is Turkey. However, a robustness exercise shows that serial correlation is removed by considering a vector autoregression of second order. The corresponding impulse-response functions and historical decomposition of debt flows are similar to those obtained by considering a VAR model with 1 lag. The inverse roots of the characteristic polynomial and the Portmanteau test for each country are respectively reported in Figure A.1 and Table A.1 of the Appendix.

uncertainty to be followed by lower debt flows. This may be because, in the face of greater global uncertainty, investors are seeking refuge in lower-risk assets, such as securities issued by the US government. As shown by Figure 3, we find that at impact the response of debt flows to a shock to the risk aversion index, representing an increase in global risk, becomes statistically significant when 2020 data are included in the estimation for all economies except for Turkey. Overall, when these data are included in the estimation, the response of debt flows to the shock in global risk aversion is larger. That is, the importance of global risk aversion to explain the evolution of debt flows seems to have increased during the pandemic period. In fact, the sudden increase in risk aversion among international investors associated to the COVID-19 pandemic seems to have led to a reallocation of investment portfolios towards less risky assets and, thus, a significant reduction in the holding of assets from EMEs. Therefore, in line with Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2013), Ahmed and Zlate (2014), Ananchotikul and Zhang (2014) and Koepke (2018), who interpret the sharp retrenchment in foreign capital flows during the global financial crisis primarily as the result of a strong shock in global risk aversion, our results also seem to highlight the importance of global risk as a determinant of capital flows during periods of high financial volatility.

The second shock analyzed is the US industrial production. As can be seen in Figure 4a), we find that a shock to the output growth rate of US has a positive contemporaneous impact on debt flows in Mexico in the two estimation periods considered. This result, which is probably associated to the high degree of economic integration between Mexico and the United States, is in line with some studies that support the notion that foreign output growth encourages portfolio flows to EMEs.[33] Similarly, excluding the case of South Africa and Chile, our results also seem to support the existence of a positive relationship between external growth

[33] In particular, Baek (2006), De Vita and Kyaw (2008) and Forbes and Warnock (2012) are some of the empirical studies that find a statistically significant positive relationship between external growth and debt flows to EMEs. Other studies such as Chuhan et al. (1998) and Ahmed and Zlate (2014), however, have find a positive or negative but statistically insignificant relationship. In fact, there exists a number of confounding effects that can obscure the relationship between external growth and capital flows to EMEs (Koepke, 2019). As emphasized by Calvo et al. (1996), for instance, lower foreign output growth could make investment into EMEs relatively more profitable.

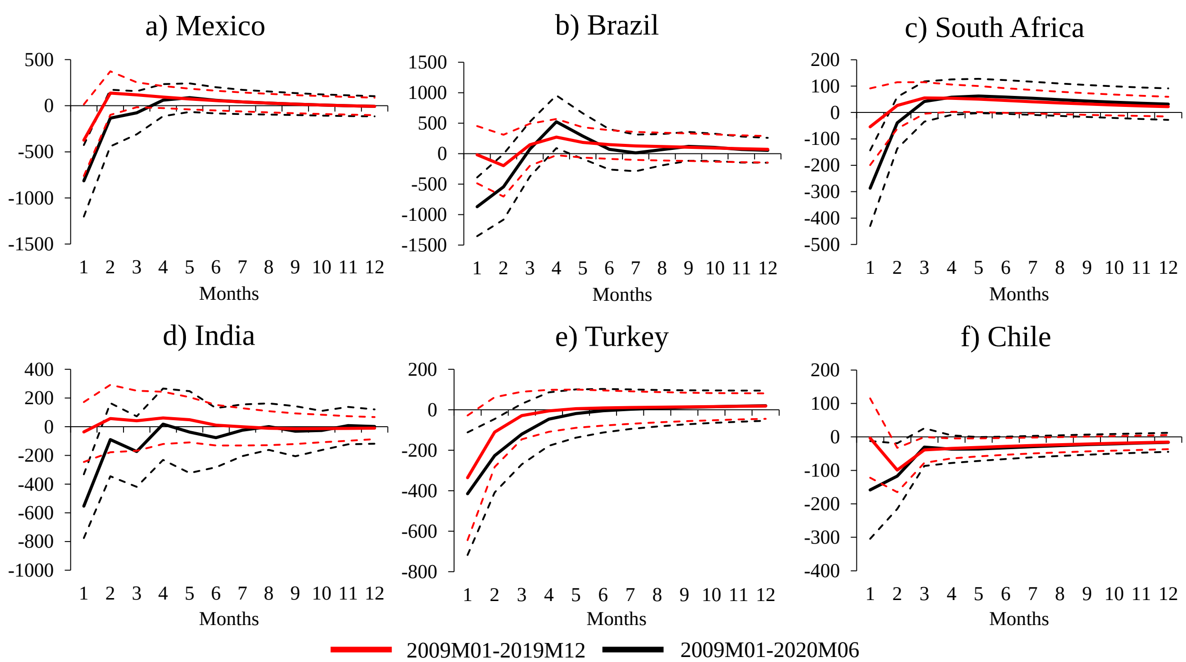

Figure 3: Response of Debt Portfolio Flows to a Shock in the Risk Aversion Index

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: global risk aversion index, US industrial production index, domestic output, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

and debt flows to EMEs. The results for India, for instance, are qualitatively similar to those of Mexico. In the case of Brazil and Turkey, the response of debt flows to the shock in foreign output growth becomes statistically significant when 2020 data are included in the estimation.

The next shock to be analyzed is domestic output. Figure 5 presents the impulse-response functions of debt flows to a one standard deviation shock in domestic output growth. As can be seen in Figure 5a), the response of these flows in Mexico and India seems to depend on the estimation period considered. In particular, the effect of domestic output growth on debt flows becomes not significant when 2020 data are included in the estimation. These findings indicate that global factors, such as risk aversion and foreign growth, seem to have had a greater relevance than idiosyncratic factors in the context of the COVID-19 crisis. On the other hand, in the case of South Africa and Turkey, we find negative responses to the same

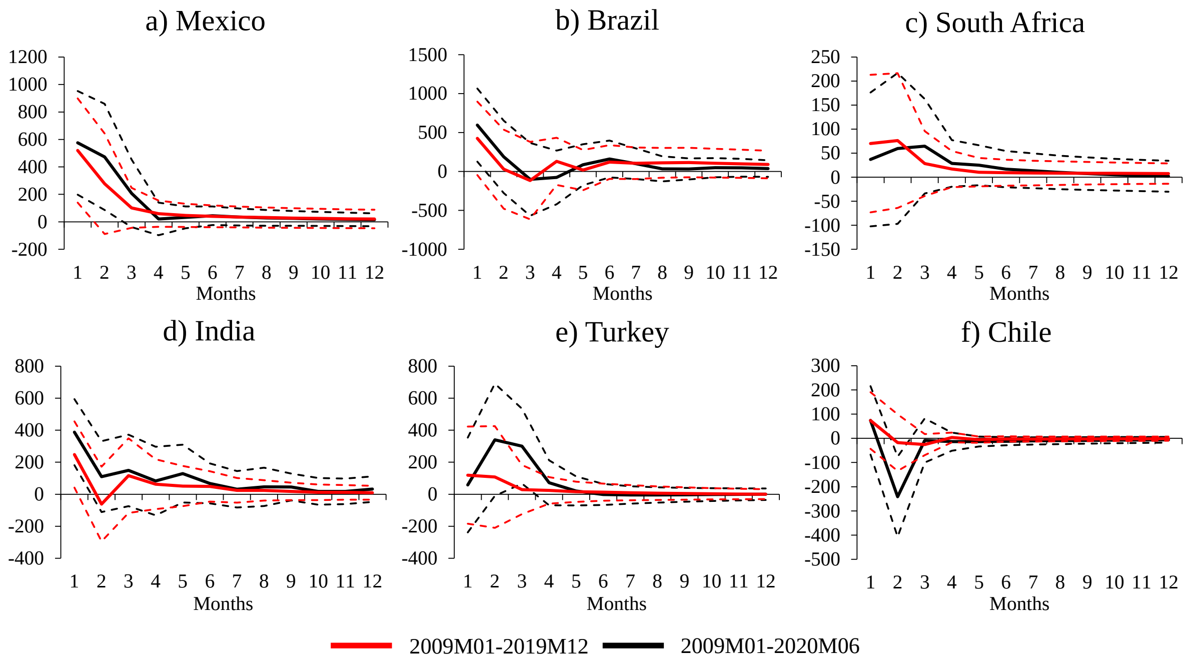

Figure 4: Response of Debt Portfolio Flows to a Shock in Foreign Output Growth

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: global risk aversion index, US industrial production index, domestic output, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

shock in the two estimation periods considered.[34] These results are somewhat consistent with a branch of the literature (Baek, 2006; De Vita and Kyaw, 2008; Fratzscher, 2012: Ahmed and Zlate, 2014 and Koepke, 2014), which finds mixed evidence for the role of domestic output growth as a driver of EMEs portfolio debt flows, particularly for high-frequency data.

Figure 6 presents the impulse-response functions of debt portfolio flows to a one standard

[34] Although the negative effect of domestic output shock on debt flows seems counterintuitive, this result might be associated with a substitution effect from debt to equities. According to Chuhan et al. (1998), domestic output can be thought as a factor that affects the expected return of EMEs assets. In particular, stronger domestic output growth could raise expected returns on equities (Koepke, 2019). Likewise, from a theoretical point of view, the increase in domestic output leads to a decrease in marginal productivity of capital and an increase in asset prices, which could reduce foreign investment. Finally, another possible explanation could be related with the lack of comprehensive measures of output growth on a monthly basis. In fact, monthly data on manufacturing, as we use for the cases of South Africa and India, might be less important for investor decisions (Koepke, 2019). For example, Fratzscher (2012) and Koepke (2018) find only a limited role for domestic macroeconomic variables at high data frequencies, while Baek (2006) and De Vita and Kyaw (2008) find strong evidence for the role of domestic output growth at the quarterly frequency.

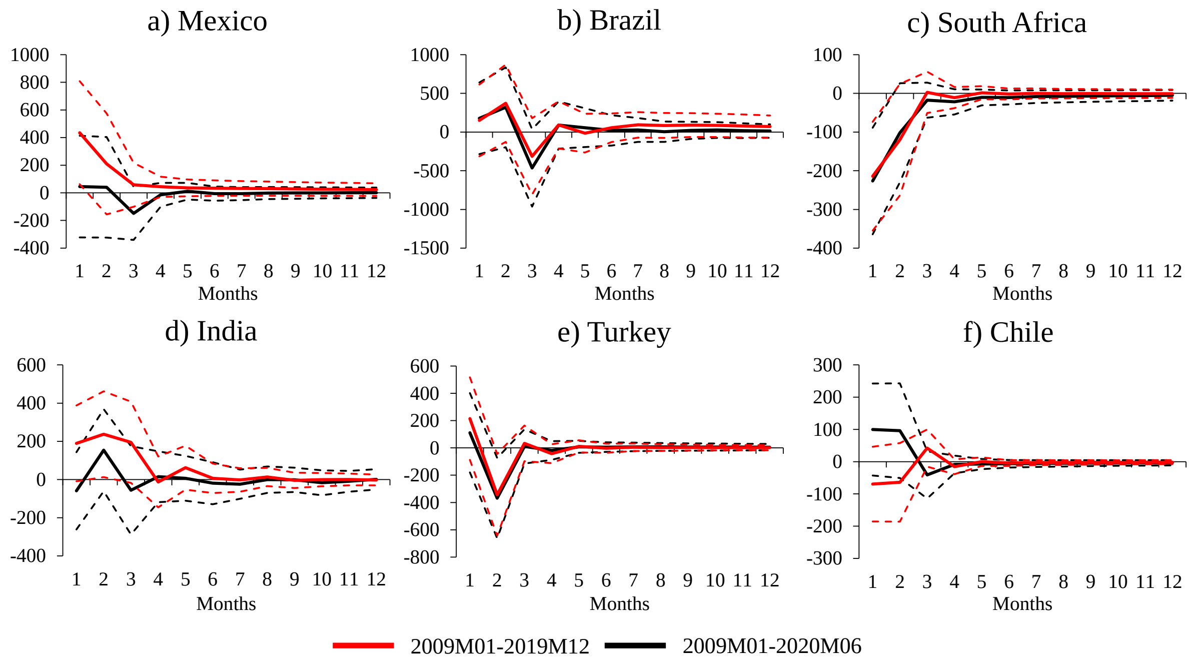

Figure 5: Response of Debt Portfolio Flows to a Shock in Domestic Output Growth

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: global risk aversion index, US industrial production index, domestic output, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

deviation shock in the spread between the domestic and foreign interest rates. As can be seen, an increase in the interest rate spread between Mexico and the US is followed by greater investment flows in Mexican debt securities. In particular, we can see persistent impacts from the second month in the two estimation periods considered. Notice, however, that the effect of this shock on debt flows in Mexico is statistically significant for a shorter period when 2020 data are included in the estimation. On the other hand, in the case of Brazil, the response of debt flows to the shock in the interest rate spread is similar in the two estimation periods considered, particularly we can see statistically significant effects from the first to the fifth periods. In the case of South Africa, an increase in the interest rate spread also has a positive impact on debt flows in the two estimation periods considered. These results may be related with the fact that investors are more willing to invest in domestic securities when their return, relative to foreign securities, increases. Thus, our results seem to be consistent

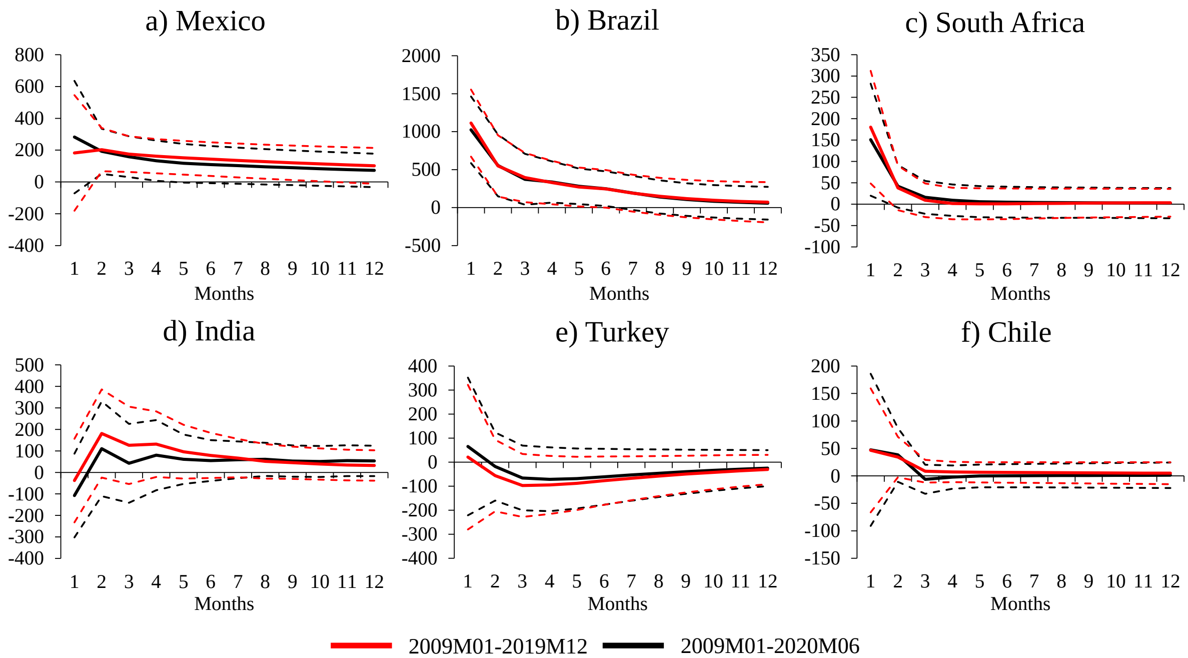

Figure 6: Response of Debt Portfolio Flows to a Shock in the Interest Rate Spread

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

with most of the literature that have analyzed the relation of portfolio flows with foreign and domestic interest rates.[35] In line with Ahmed and Zlate (2014), the interest rate differentials also seem to explain the movements of portfolio flows to some EMEs, particularly of debt flows. Likewise, these results also seem to support the theoretical result of Markovitz (1952) and Grubel (1968), in the context of the modern portfolio theory, that the portfolio share of a particular asset will depend on its expected return and risk relative to other investable assets.[36]

The impulse-response functions of debt flows to shocks in inflation and in the exchange

[35] In particular, Fernandez-Arias (1996), Montiel and Reinhart (1999), Baek (2006), Feroli et al. (2014) and Koepke (2018), among others, find that foreign interest rates are an important driver of portfolio debt flows. On the other hand, Fratzscher (2012), Ahmed and Zlate (2014) and Ibarra and Tellez-Leon (2020) are some of the studies that find evidence for positive relationship between domestic interest rates and portfolio flows.

[36] Obstfeld and Rogoff (1995) also shows in a theoretical model that countries with relatively high returns on capital will receive net capital flows from abroad.

rate are respectively reported in Figure A.2 and Figure A.3 of the Appendix. Regarding the shock to domestic inflation, we would expect that foreign investors decrease their investment in domestic securities when inflation increases, as the real return on domestic assets falls. Indeed, we find that an increase in domestic inflation has a negative effect on debt flows in Mexico and Brazil. Nevertheless, the results seem to depend on the estimation period considered. On the other hand, regarding the last shock analyzed, a depreciation in the exchange rate also seems to decrease debt flows to Mexico, particularly when 2020 data are not included in the estimation. In the case of South Africa, India, Turkey and Chile, the response of debt flows to this shock is negative in the two estimation periods considered.[37] That is, foreign investors decrease their holdings of domestic assets, which could be associated with lower returns in terms of domestic currency due to the depreciation of the currency.

In sum, global risk appears to be an important determinant of debt portfolio flows to EMEs in the context of the effects derived from the COVID-19 pandemic. In particular, our results show that when 2020 data are included in the estimation, the response of debt flows to the shock in global risk aversion is larger and becomes statistically significant. This may be because, in the face of greater global uncertainty, investors are seeking refuge in lower-risk assets, such as securities issued by the US government. In this context, economic activity in the US also seems to acquire greater relevance as a driver of debt flows, particularly for the case of Mexico, Brazil and Turkey. Likewise, an increase in the spread between the domestic and the US interest rates seems to have a positive effect on debt flows in Mexico, Brazil and South Africa. Idiosyncratic factors of EMEs, such as domestic output growth, inflation and exchange rate, appear to acquire lower relevance in the determination of debt flows in the context of the effects derived from the COVID-19 pandemic. Thus, these results seem to indicate that in periods of high uncertainty in international financial markets, such as the recent episode of shocks resulting from the COVID-19 pandemic, global factors tend to be more important in explaining capital flows, while idiosyncratic factors play a relatively less important role. In periods of low volatility, however, idiosyncratic factors influence

[37] This result is consistent with Herrmann and Mihaljek (2013), who find that a weaker currency in the borrower country seems to reduce the flows of cross-border loans.

the dynamics of these flows. Motivated by these issues, in the next section we present a historical decomposition of debt flows. As mentioned above, this approach allows to analyze changes in the relative importance of the determinants of debt flows in EMEs. In particular, this decomposition quantifies, in each month of the sample, the contribution of each variable included in the model to explain the evolution of debt flows.

4.2 Historical Decomposition

Figures 7a and 7b respectively show the historical decomposition of debt flows in the six EMEs analyzed from January 2009 to December 2014 and from January 2015 to June 2020.[38] In particular, the bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows.[39] As can be seen in Figure 7b, adjustments in the investment portfolios in March 2020 seem to have responded mainly to the greater risk aversion among market participants, as well as to the lower economic activity in the US In fact, the effects of the COVID-19 pandemic led to a sudden increase in risk aversion among international investors, causing a reallocation of investment portfolios towards less risky assets and, thus, a significant reduction in their holding of assets from EMEs. Subsequently, in a context in which risk aversion decreased in April 2020, mainly due to the adoption of monetary, financial and fiscal measures at a global level, there were fewer capital outflows during May and June (see Figure 1). Thus, in line with Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2013), Ahmed and Zlate (2014), Ananchotikul and Zhang (2014) and Koepke (2018), who interpret the sharp retrenchment in foreign capital flows during the global financial crisis primarily as the result of a strong shock in global risk aversion, our results also seem to highlight the importance of global risk as a determinant of capital flows during periods of high financial volatility. As shown by Figure 7a, other episodes stand out in which high risk aversion seems to have been an important driver of debt outflows, such as the Greek

[38] This partition was made for presentation purposes.

[39] We omit the base forecast of the analysis (that is, the contribution of the initial state defined in Eq. (4)) because its contribution is relatively small and stable over time.

government-debt crisis in 2010 and the sovereign debt crisis in Europe in 2011. Likewise, both a lower risk aversion among international investors and a higher economic growth in US seem to be linked to debt inflows subsequently recorded. It should be noted that results observed in Figure 7b also show that the contribution of the US industrial production seems to have a larger magnitude for the case of Mexico, which is probably associated to the high degree of economic integration between this country and the US.

In turn, the historical decomposition of debt flows suggests that idiosyncratic factors such as interest rate spreads and economic activity tend to be more important in explaining the significant increase in these flows during the period post global financial crisis (see Figure 7a). In particular, during 2010-2014, the contribution of the interest rate spread to explain debt flows increased, especially for the cases of Mexico, Brazil and South Africa. In fact, this period was characterized by low interest rates in advanced economies and increased liquidity in international markets as well as strong macroeconomic fundamentals and more optimistic growth expectations in EMEs (Hernandez-Vega, 2017; Ibarra and Tellez-Leon, 2020). This in turn increased capital flows to EMEs in general and Mexico in particular, as international investors were searching for high yields in those economies.

In sum, our results seem to highlight that in periods of high uncertainty in international financial markets, global factors tend to be more important in explaining capital flows, while idiosyncratic factors play a relatively less important role. By contrast, in periods of low volatility, however, idiosyncratic factors seem to influence the dynamics of these flows.

4.3 Robustness Exercises

In this subsection, we present some robustness exercises including alternative variables, additional external and domestic factors that affect capital flows, and an alternative identification scheme, among others. In particular, we report the historical decompositions of debt flows from January 2015 to June 2020 in the Appendix for some of these exercises. The impulse-response functions are available from the authors upon request.

As a first robustness check, we estimated the model using alternative measures of capital

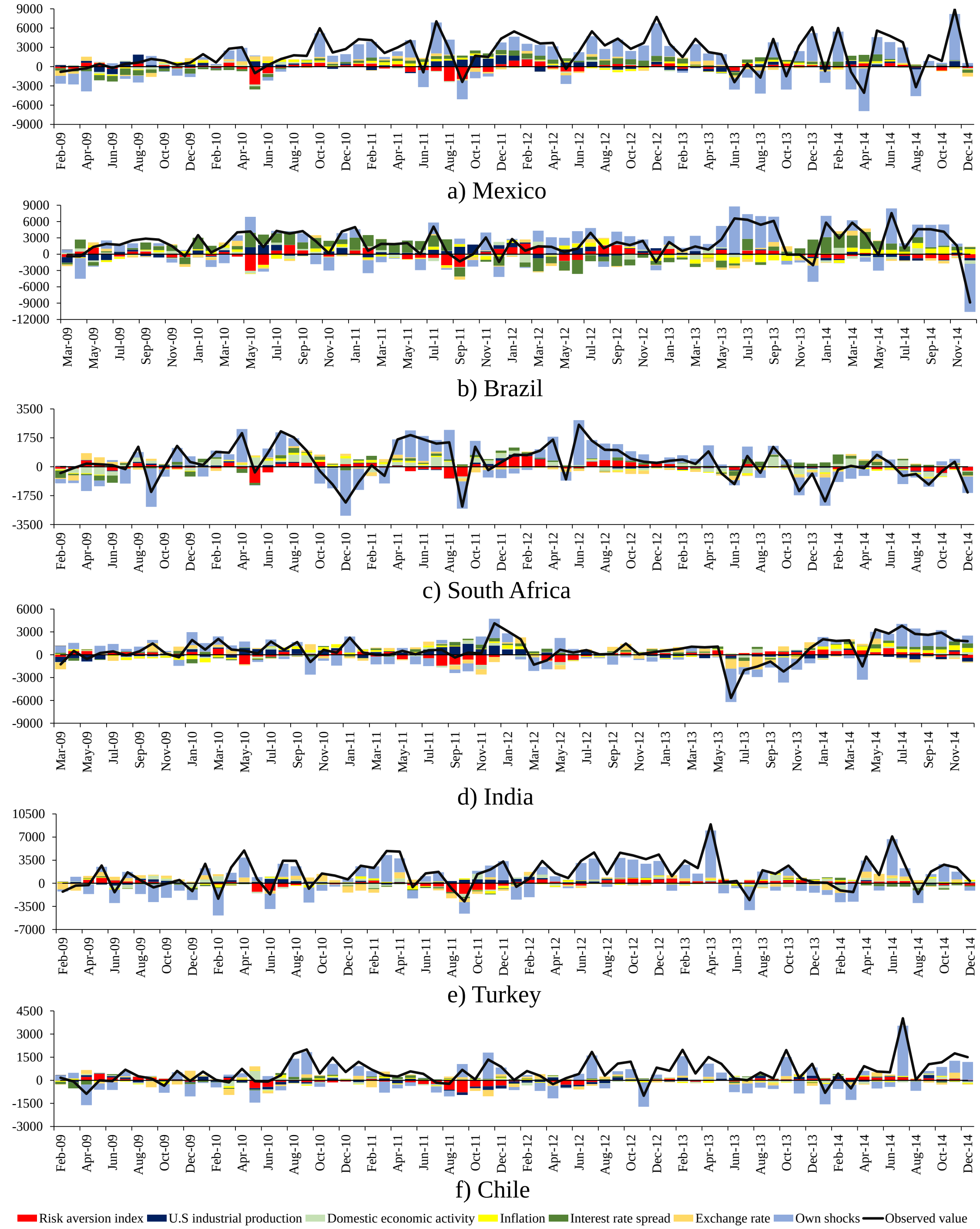

Figure 7a: Historical Decomposition of Debt Flows: 2009M02-2014M12

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

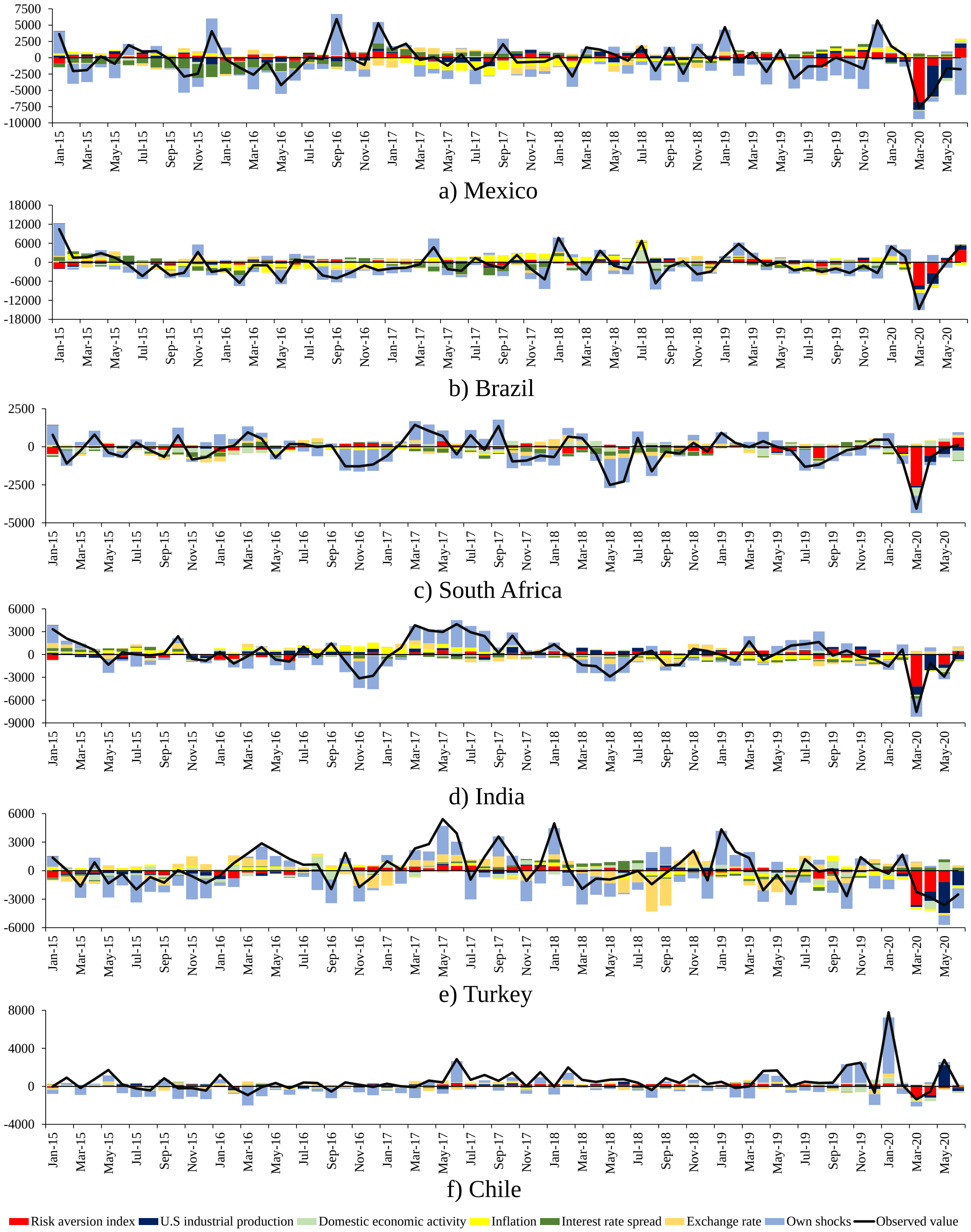

Figure 7b: Historical Decomposition of Debt Flows: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

flows, particularly equity portfolio flows and total equity and debt portfolio flows.[40] Nevertheless, qualitatively, the results were very similar. That is, the contribution of global risk aversion to explain the evolution of debt flows increased during March 2020 compared to the past, although its relative importance has decreased since. The results are reported in Figures A.4 and A.5 of the Appendix.

In turn, we also estimate the model using an alternative global risk indicator, particularly the VIX index.[41] Overall, we find that both the responses to a shock in the VIX index and the historical decompositions of debt flows are qualitatively similar to those using the risk aversion index reported by Citigroup. Results from the historical decomposition of debt flows are reported in Figure A.6 of the Appendix.

In addition, we considered alternative measures of foreign output in our analysis. In particular, we estimated the model by using either the G7 industrial production or the OECD-total industrial production instead of using the US industrial production.[42] The results, reported in Figures A.7 and A.8 of the Appendix, were very similar.

As previously mentioned, in our baseline specification we use the spread between the domestic and the US interest rates. For robustness, we also estimate the model by using both monetary policy rates separately. In general, the results reported in Figure A.9 of the Appendix are consistent with our baseline specification. In the specific case of Mexico, Brazil and India, we also find that an increase in the US interest rate is followed by lower debt flows. Moreover, an increase in the domestic interest rate of Mexico, Brazil and South Africa is followed by greater investment flows in debt securities.

In addition, to take into account potential long-term relationships, we estimate the VAR

[40] Data are obtained from Koepke and Paetzold (2020). These measures also refer to net changes in liabilities. In the case of South Africa and India, however, monthly proxies for equity portfolio flows are used, particularly transactions on national stock exchanges by non-residents and portfolio inflows by non-residents, respectively. The correlation between transactions on national stock exchanges by non-residents and BoP equity flows for South Africa is 0.74, while that between portfolio inflows by non-residents and BoP equity flows for India is 0.94. The sample period starts in June 2009 as equity flows for Mexico are available from this date onwards.

[41] The VIX is a measure of expected financial volatility implied by the S&P 500 index options. In fact, the VIX index has been one of the most common proxies for investor risk aversion used in the literature. Previous studies such as Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Ahmed and Zlate (2014) and Koepke (2018), among others, have also used this indicator as a measure of global risk. Data are provided by Bloomberg.

[42] Data are obtained from OECD.Stat.

model in levels. We find that the results are similar to those reported here. In particular, they indicate that global risk appears to be an important determinant of debt portfolio flows to EMEs in the context of the effects derived from the COVID-19 pandemic. The results are reported in Figure A.10 of the Appendix.

A limitation of VAR models is that adding more variables implies a large number of parameters to estimate, resulting in a loss of degrees of freedom and leading to inefficient estimates. For this reason, our benchmark model only includes those variables deemed more relevant to explain capital flows. However, we have also considered alternative models that include other variables that could be important. In particular, we include the 5-year credit default swap (CDS) and public debt as indicators of country-risk.[43] We find that both higher public debt and higher CDS price leads to lower portfolio investment in debt securities in most of EMEs analyzed. In addition, the results are consistent with our baseline specification. That is, when 2020 data are included in the estimation, the response of debt flows to the shock in global risk aversion is larger. Likewise, the contribution of global risk aversion to explain the evolution of these flows increases during March 2020 compared to the past, although its relative importance decreases since.[44]

In addition, we consider the interest rates in other EMEs to control for returns that could represent alternatives for foreign investors. In particular, we include the interest rate spread between the domestic interest rate and the average of the interest rates in the other EMEs analyzed. In general terms, the results show that the responses of debt flows are not significant. This suggests that debt flows to EMEs are mainly driven by global and domestic conditions rather than conditions in other EMEs.[45]

Moreover, we examine the sensitivity of the results to various orderings. We observe

[43] Data are provided by Bloomberg and the central bank of each country. Due to the lack of data for India, we exclude this country of the analysis that includes the CDS. On the other hand, we use the total net debt of the public sector for Mexico and Brazil. This in turn includes the net debt of the Federal Government, public enterprises and official financial intermediaries (development banks and official trust funds). Due to the lack of information for the other countries at the monthly frequency, we use the total gross loan debt of Central Government for South Africa, the internal debt of public sector for India and Turkey, and the external debt of public sector for Chile.

[44] Results are available from the authors upon request.

[45] The results are available from the authors upon request and are qualitatively similar to those presented in this paper.

that our results are robust to different orderings, which is expected as the contemporaneous correlation between the residuals is small. Finally, as an alternative identification assumption, we also estimate the model using long run restrictions as in Blanchard and Quah (1989). In this way, the accumulated response of foreign variables to a shock on the domestic variables is zero in the long run. In particular, we use a diagonal response matrix as in the Cholesky method explained above, but using long-run instead of short-run restrictions. The results are similar to those presented in this paper and are available from the authors upon request.

5 Conclusion

In the face of the COVID-19 pandemic and the measures adopted to contain its spread, EMEs have been exposed to supply and demand shocks, as well as a financial shock leading to capital outflows. In this article, we studied the determinants of the dynamics of debt flows for six EMEs. The analysis is carried out via the estimation of both impulse-response functions and historical decompositions from a VAR model. Results from the impulse-response functions suggest that global risk seems to be an important determinant of debt portfolio flows to EMEs in the context of the effects derived from the COVID-19 pandemic. In particular, our results show that when 2020 data are included in the estimation, the response of debt flows to the shock in global risk aversion is larger and becomes statistically significant. This may be because, in the face of greater global uncertainty, investors are seeking refuge in lower-risk assets, such as securities issued by the US government. In this context, economic activity in the US also seems to acquire greater relevance as a driver of debt flows, particularly for the case of Mexico, Brazil and Turkey. Likewise, an increase in the spread between the domestic and foreign interest rates seems to have a positive effect on debt flows in Mexico, Brazil and South Africa.

Regarding the historical decomposition analysis, we find that the relative importance of global risk aversion, as well as to economic activity in the US, to explain debt flows during periods of high volatility in financial markets increased during the COVID-19 pandemic, particularly during March 2020. The contribution of the US industrial production seems to be larger for the case of Mexico, which is probably associated to the high degree of economic integration between this country and the US. Subsequently, as monetary, financial and fiscal measures were adopted at the global level to contain the negative effects of the pandemic on economic activity and financial markets, risk aversion among market participants was reduced. Thus, in periods of high uncertainty in international financial markets global factors tend to be more important in explaining capital flows, while idiosyncratic factors play a relatively less important role. In periods of low volatility, however, such as that following the global financial crisis, idiosyncratic factors seem to influence the dynamics of these flows. In this context, it is expected that idiosyncratic factors of emerging economies, that affect the return that investors can expect, such as interest rate spreads, acquire greater relevance in the determination of capital flows. However, given the uncertainty about the economic recovery around the world, which depends on the dynamics of the pandemic, it cannot be ruled out that the financial shock and global risk aversion will intensify again, which could have implications for capital flows.

The analysis presented in this paper has important implications for both policy and theory. In fact, EMEs are particularly exposed to large inflows or outflows of foreign capital (Obstfeld, 2012). When assessing the appropriate monetary policy response to these changes in the availability of foreign capital, central banks have to consider the extent to which capital flows are driven by domestic versus external factors. Thus, from a policy perspective, our findings can be useful to identify the potential drivers of capital flows and analyze how their relative importance change in a context of high financial volatility. Policy makers' decisions could be adapted to consider the possible changes in the relative importance of the determinants of debt flows. Our results also seem to support the evidence presented by several authors about the importance of global risk aversion as a determinant of capital flows during periods of extreme volatility in financial markets.

Further research could examine alternative identification assumptions such as imposing sign restrictions as an alternative strategy to identify the shocks. Another area of research would be to analyze the short-run dynamics of each component of the financial account. Finally, the impact of capital flows on economic growth and stability could also be analyzed.

References

[1] Ahmed, S., and Zlate, A. (2014). Capital flows to emerging market economies: a brave new world? *Journal of International Money and Finance* **48**, 221-248.

[2] Alberola, E., Arslan, Y., Cheng, G., and Moessner, R. (2020). The fiscal response to the COVID-19 crisis in advanced and emerging market economies (No. 23). Bank for International Settlements.

[3] Altig, D., Baker, S., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., and Thwaites, G. (2020). Economic uncertainty before and during the COVID-19 pandemic. *Journal of Public Economics* **191**, 104-274.

[4] Ananchotikul, N., and Zhang, L. (2014). Portfolio flows, global risk aversion and asset prices in emerging markets (No. 14–156). IMF Working Papers.

[5] Arellano, C., Bai, Y., and Mihalache, G. P. (2020). Deadly debt crises: COVID-19 in emerging markets (No. w27275). National Bureau of Economic Research.

[6] Arslan, Y., Drehmann, M., and Hofmann, B. (2020). Central bank bond purchases in emerging market economies (No. 20). Bank for International Settlements.

[7] Arslanalp, S., Drakopoulos, D., Goel, R., Koepke, R., and Helbling, T. F. (2020). Benchmark-driven investments in emerging market bond markets: taking stock (No. 20-192). IMF Working Papers.

[8] Baek, I. M. (2006). Portfolio investment flows to Asia and Latin America: pull, push or market sentiment? *Journal of Asian Economics* **17**(2), 363-373.

[9] Banco de México (2020a). Quarterly inflation report. January-March.

[10] Banco de México (2020b). Quarterly inflation report. April-June.

[11] Bauer, M. D., and Rudebusch, G. D. (2016). Monetary policy expectations at the zero lower bound. *Journal of Money, Credit and Banking*, **48**(7), 1439-1465.

[12] Blanchard, O. J., and Quah D.(1989). The dynamic effects of aggregate demand and supply disturbances. *American Economic Review* **79**(4), 655–673.

[13] Bluedorn, M. J. C., Duttagupta, R., Guajardo, M. J., and Topalova, P. (2013). *Capital flows are fickle: anytime, anywhere*. International Monetary Fund.

[14] Broner, F., Didier, T., Erce, A., and Schmukler, S.L. (2013). Gross capital flows: dynamics and crises. *Journal of Monetary Economics* **60**(1), 113-133.

[15] Bruno, V., and Shin, H. S. (2015). Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics* **71**, 119-132.

[16] Bullard, J. B. (2012). Shadow interest rates and the stance of US monetary policy (No. 206). Federal Reserve Bank of St. Louis.

[17] Calvo, G.A., Leiderman, L., and Reinhart, C.M. (1993). Capital inflows and real exchange rate appreciation in Latin America: the role of external factors. *Staff Papers*, **40**(1), 108-151.

[18] Calvo, G.A., Leiderman, L., and Reinhart, C.M. (1996). Inflows of capital to developing countries in the 1990s. *Journal of Economic Perspectives* **10**(2), 123–139.

[19] Cakmakli, C., Demiralp, S., Kalemli-Ozcan, S., Yesiltas, S., and Yildirim, M. A. (2020). COVID-19 and Emerging Markets: A SIR Model, Demand Shocks and Capital Flows (No. 27191). National Bureau of Economic Research.

[20] Cavallino, P., and De Fiore, F. (2020). Central banks' response to COVID-19 in advanced economies (No. 21). Bank for International Settlements.

[21] Cerdeiro, D., and Komaromi, A. (2021). Financial openness and capital inflows to emerging markets: in search of robust evidence. *International Review of Economics and Finance* **73**, 444-458.

[22] Chuhan, P., Claessens, S., and Mamingi, N. (1998). Equity and bond flows to Latin America and Asia: the role of global and country factors. *Journal of Development Economics* **55**(2), 439-463.

[23] Converse, N., Levy-Yeyati, E., and Williams, T. (2020). How ETFs amplify the global financial cycle in emerging markets (No. 1268). FRB International Finance Discussion Papers.

[24] Çulha, A. (2006). A structural VAR analysis of the determinants of capital flows into Turkey. Central Bank Review, **2**(2), 11-35.

[25] De Vita, G., and Kyaw, K.S. (2008). Determinants of capital flows to developing countries: a structural VAR analysis. *Journal of Economic Studies* **35**(4), 304-322.

[26] Drehmann, M., Farag, M., Tarashev, N., Tsatsaronis, K. (2020). Buffering COVID-19 losses-the role of prudential policy (No. 9). Bank for International Settlements.

[27] Eichengreen, B., and Gupta, P. (2016). *Managing sudden stops*. The World Bank.

[28] ElFayoumi, K., and Hengge, M. (2021). Capital Markets, COVID-19 and Policy Measures (No. 21-33). IMF Working Papers.

[29] Eurostat (2020). Impact of COVID-19 crisis on short-term statistics.

[30] Fernandez-Arias, E. (1996). The new wave of private capital inflows: push or pull? *Journal of Development Economics* **48**(2), 389-418.

[31] Feroli, M., Kashyap, A. K., Schoenholtz, K. L., and Shin, H. S. (2014). Market tantrums and monetary policy (No. 14-09). *Chicago Booth Research Paper*.

[32] Ferrucci, G., Herzberg, V., Soussa, F., and Taylor, A. (2004). Understanding capital flows. Bank of England, Financial Stability Review, June 2004.

[33] Forbes, K.J., and Warnock, F.E. (2012). Capital flow waves: surges, stops, flight, and retrenchment. *Journal of International Economics* **88**(2), 235–251.

[34] Fratzscher, M. (2012). Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics* **88**(2), 341-356.

[35] Galati, G., Heath, A., and McGuire, P. (2007). Evidence of carry trade activity. *BIS Quarterly Review* **3**, 27-41.

[36] Globan, T. (2015). Financial integration, push factors and volatility of capital flows: evidence from EU new member states. *Empirica* **42**(3), 643-672.

[37] Grubel, H.G. (1968). Internationally diversified portfolios: welfare gains and capital flows. *American Economic Review* **58**, 1299-1314.

[38] Hernandez-Vega, M. A. (2017). Portfolio investment response to US monetary policy announcements: An event study analysis using high frequency data from Mexico (No. 2017-02). Banco de México, Working Papers.

[39] Hernandez-Vega, M. A. (2019). Estimating capital flows to emerging market economies with heterogeneous panels. *Macroeconomic Dynamics*, **23**(5), 2068-2088.

[40] Hernandez, L., Mellado, P. and Valdes, R. (2001). Determinants of private capital flows in the 1970s and 1990s: is there evidence of contagion? (No. 01-64). IMF Working Papers.

[41] Herrmann, S., and Mihaljek, D. (2013). The determinants of cross-border bank flows to emerging markets. *Economics of Transition* **21**(3), 479-508.

[42] Ibarra, R., and Tellez-Leon, I. E. (2020). Are all types of capital flows driven by the same factors? Evidence from Mexico. *Empirical Economics*, **59**(1), 1-42.

[43] Ilzetzki, E., Reinhart, C. M., and Rogoff, K. S. (2020). Will the secular decline in exchange rate and inflation volatility survive COVID-19? (No. w28108). National Bureau of Economic Research.

[44] Jeanneau, S., and Micu, M. (2002) Determinants of international bank lending to emerging market countries (No. 112). Bank for International Settlements.

[45] Kim, D. H., and Singleton, K. J. (2012). Term structure models and the zero bound: an empirical investigation of Japanese yields. *Journal of Econometrics*, **170**(1), 32-49.

[46] Koepke, R. (2018). Fed policy expectations and portfolio flows to emerging markets. *Journal of International Financial Markets, Institutions and Money* **55**, 170-94.

[47] Koepke, R. (2019). What drives capital flows to emerging markets? A survey of the empirical literature. *Journal of Economic Surveys* **33**(2), 516-540.

[48] Koepke, R., and Paetzold, S. (2020). Capital flow data–a guide for empirical analysis and real-time tracking (No. 20-171). IMF Working Papers.

[49] Krippner, L. (2013). Measuring the stance of monetary policy in zero lower bound environments. *Economics Letters*, **118**(1), 135-138.

[50] Lütkepohl, H. (2011). Vector autoregressive models. European University Institute, Department of Economics. EUI Working Papers.

[51] Markovitz, H. (1952). Portfolio selection. *Journal of Finance*, **7**(1), 77-91.

[52] Miao, Y., and Pant, M. (2012). Coincident indicators of capital flows (No. 12-55). IMF Working Papers.

[53] Milesi-Ferretti, G. M., and Tille, C. (2011). The great retrenchment: international capital flows during the global financial crisis. *Economic Policy* **26**(66), 289-346.

[54] Montiel, P., and Reinhart, C.M. (1999). Do capital controls and macroeconomic policies influence the volume and composition of capital flows? Evidence from the 1990s. *Journal of International Money and Finance* **18**(4), 619-635.

[55] Murno, J. (2019). EMTA survey: second quarter emerging markets debt trading at US$1.211 trillion. OECD, New York.

[56] Nier, E., Sedik, T. S., and Mondino, T. (2014). *Gross private capital flows to emerging markets: can the global financial cycle be tamed?* International Monetary Fund.

[57] Obstfeld, M. (2012). Financial flows, financial crises, and global imbalances. *Journal of International Money and Finance* **31**(3), 469–480.

[58] Obstfeld, M., and Rogoff, K. (1995). The intertemporal approach to the current account. *Handbook of International Economics* **3**, 1731–1799.

[59] Raddatz, C., Schmukler, S., and Williams, T. (2017). International asset allocations and capital flows: the benchmark effect. *Journal of International Economics* **108**, 413–430.

[60] Rey, H. (2013). Dilemma not trilemma: the global cycle and monetary policy independence (No. w21162). National Bureau of Economic Research.

[61] Taylor, M. P., and Sarno, L. (1997). Capital flows to developing countries: long-and short-term determinants. *The World Bank Economic Review* **11**(3), 451–470

[62] Wu, J. C., and Xia, F. D. (2016). Measuring the macroeconomic impact of monetary policy at the zero lower bound. *Journal of Money, Credit and Banking* **48**(2-3), 253-291.

[63] Ying, Y.H., and Kim, Y. (2001). An empirical analysis on capital flows: the case of Korea and Mexico. *Southern Economic Journal* **67**(4), 954-968.

A Appendix: Supplemental Results

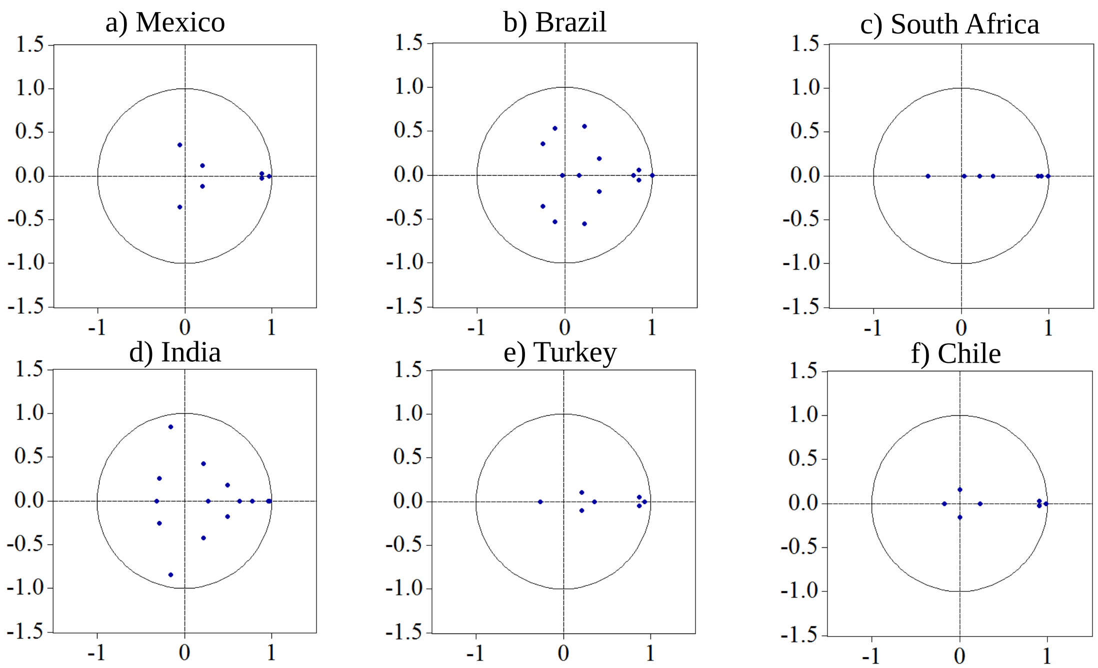

Figure A.1: Inverse Roots of AR Characteristic Polynomial

	Null Hypothesis: No residual autocorrelations up to lag 24		
	Q-stat	P-value	VAR length
Mexico	1099.811	0.71	VAR(1)
Brazil	1092.442	0.37	VAR(2)
South Africa	972.1417	0.99	VAR(1)
India	993.9443	0.97	VAR(2)
Turkey	1233.801	0.01	VAR(1)
Turkey	1059.524	0.65	VAR(2)
Chile	1082.551	0.83	VAR(1)

Table A.1: Portmanteau Test for Autocorrelations

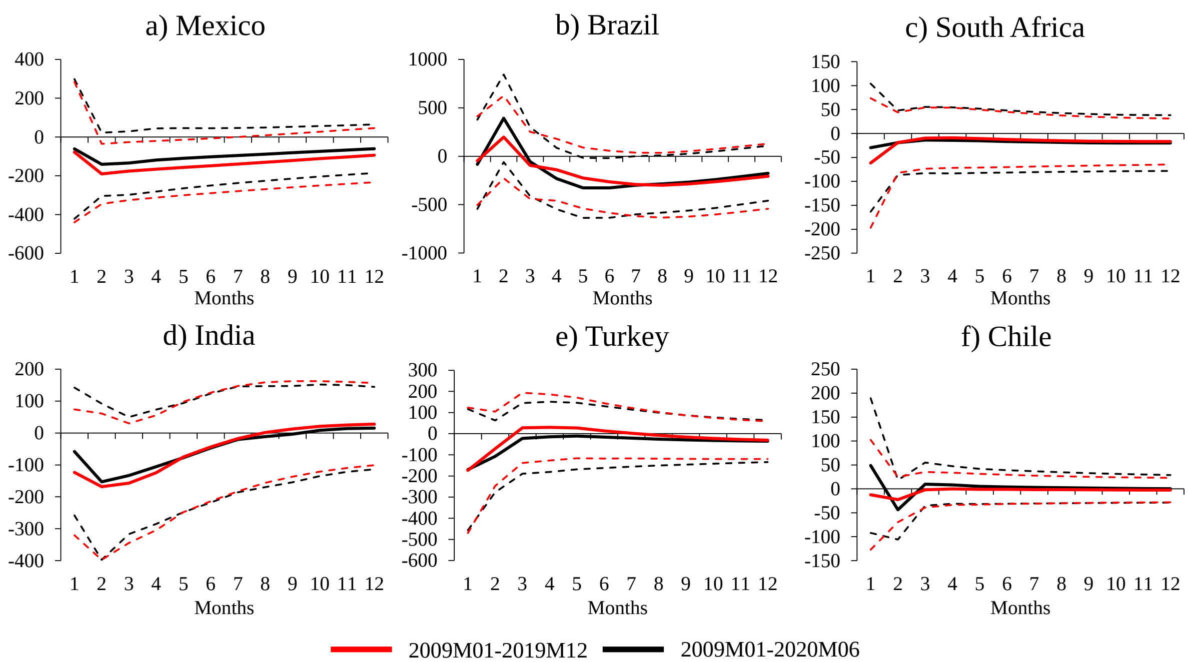

Figure A.2: Response of Debt Portfolio Flows to a Shock in Inflation

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

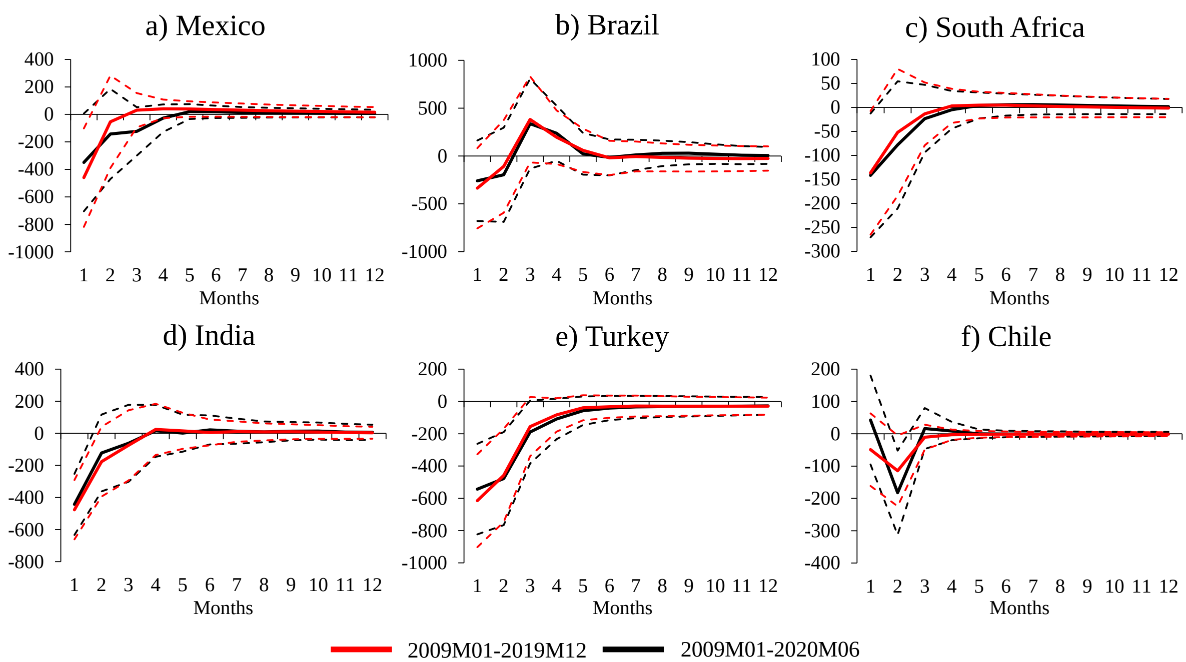

Figure A.3: Response of Debt Portfolio Flows to a Shock in the Exchange Rate

Notes: 90% confidence intervals. Estimations are presented for two samples: 2009M01-2019M12 (red lines), and 2009M01-2020M06 (black lines). The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

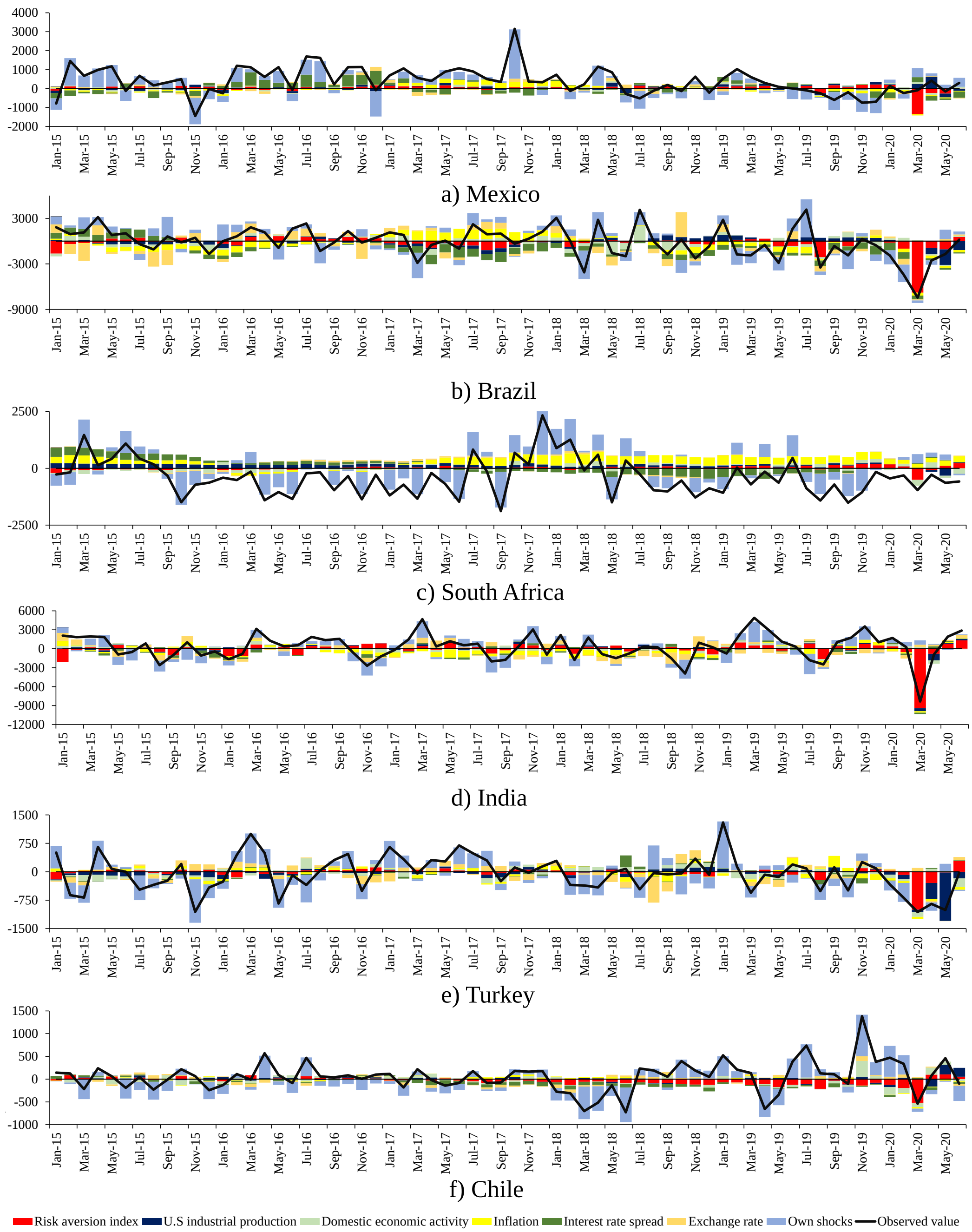

Figure A.4: Historical Decomposition of Equity Flows: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of equity flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, the US interest rate, domestic output growth, domestic inflation, the domestic interest rate, the monthly depreciation of the domestic currency and equity portfolio flows.

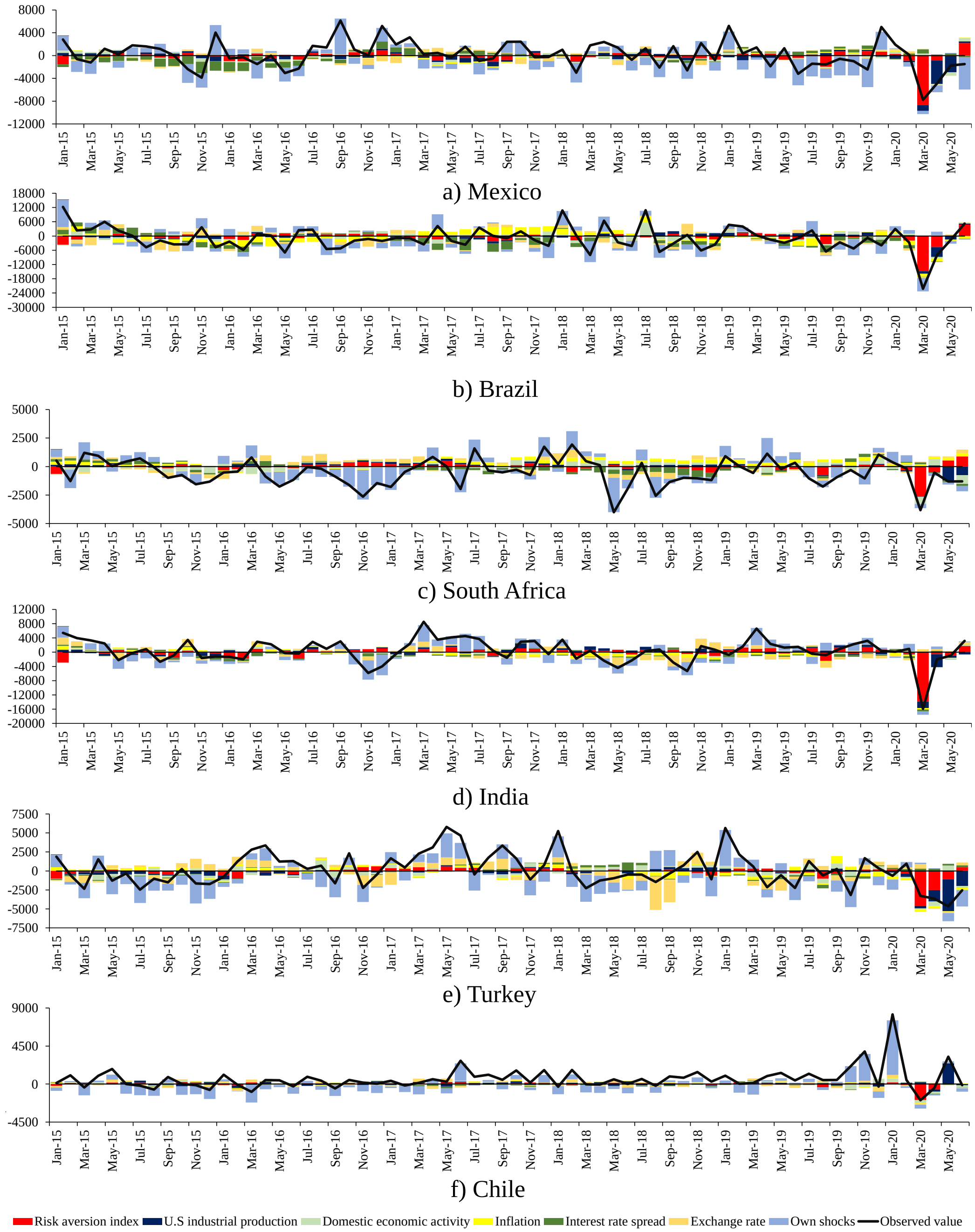

Figure A.5: Historical Decomposition of Total Equity and Debt Flows: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of Total equity and debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, the US interest rate, domestic output growth, domestic inflation, the domestic interest rate, the monthly depreciation of the domestic currency and total equity and debt portfolio flows.

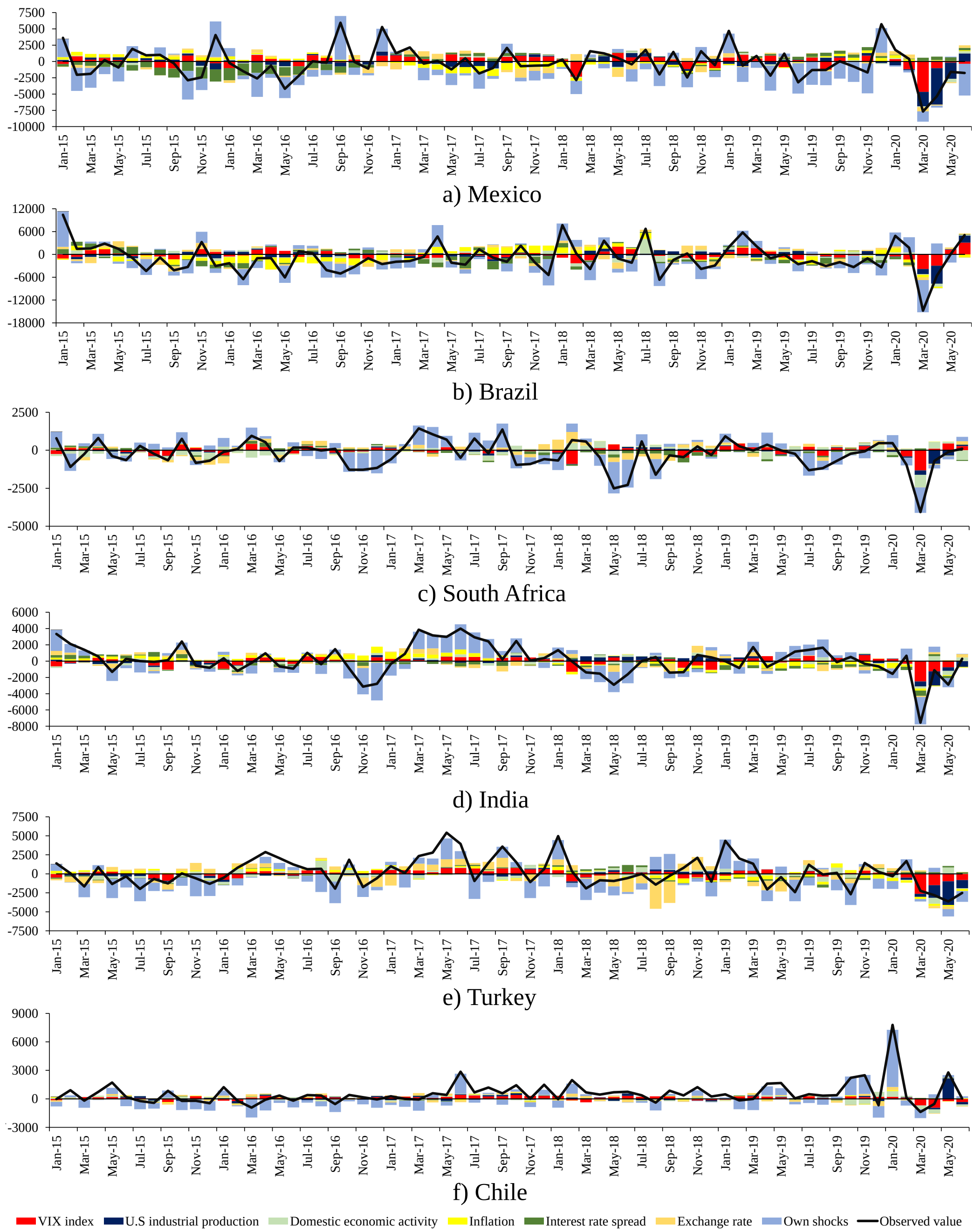

Figure A.6: Historical Decomposition of Debt Flows by using the VIX Index: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the VIX index, the growth rate of the US industrial production, domestic output growth, domestic inflation, the spread between the domestic and US interest rates, the monthly depreciation of the domestic currency and debt portfolio flows.

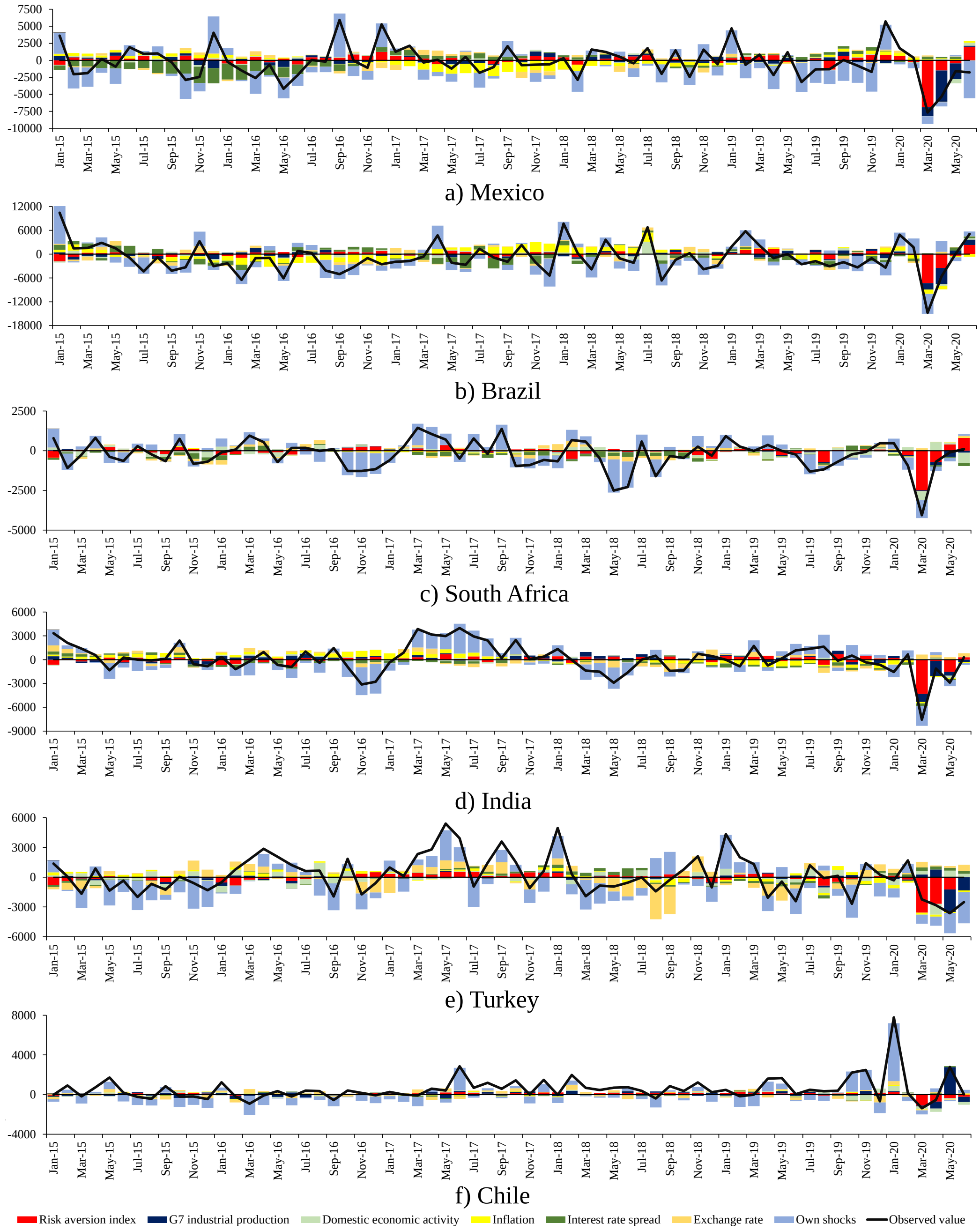

Figure A.7: Historical Decomposition of Debt Flows by using the G7 Industrial Production: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the G7 industrial production, the US interest rate, domestic output growth, domestic inflation, the domestic interest rate, the monthly depreciation of the domestic currency and debt portfolio flows.

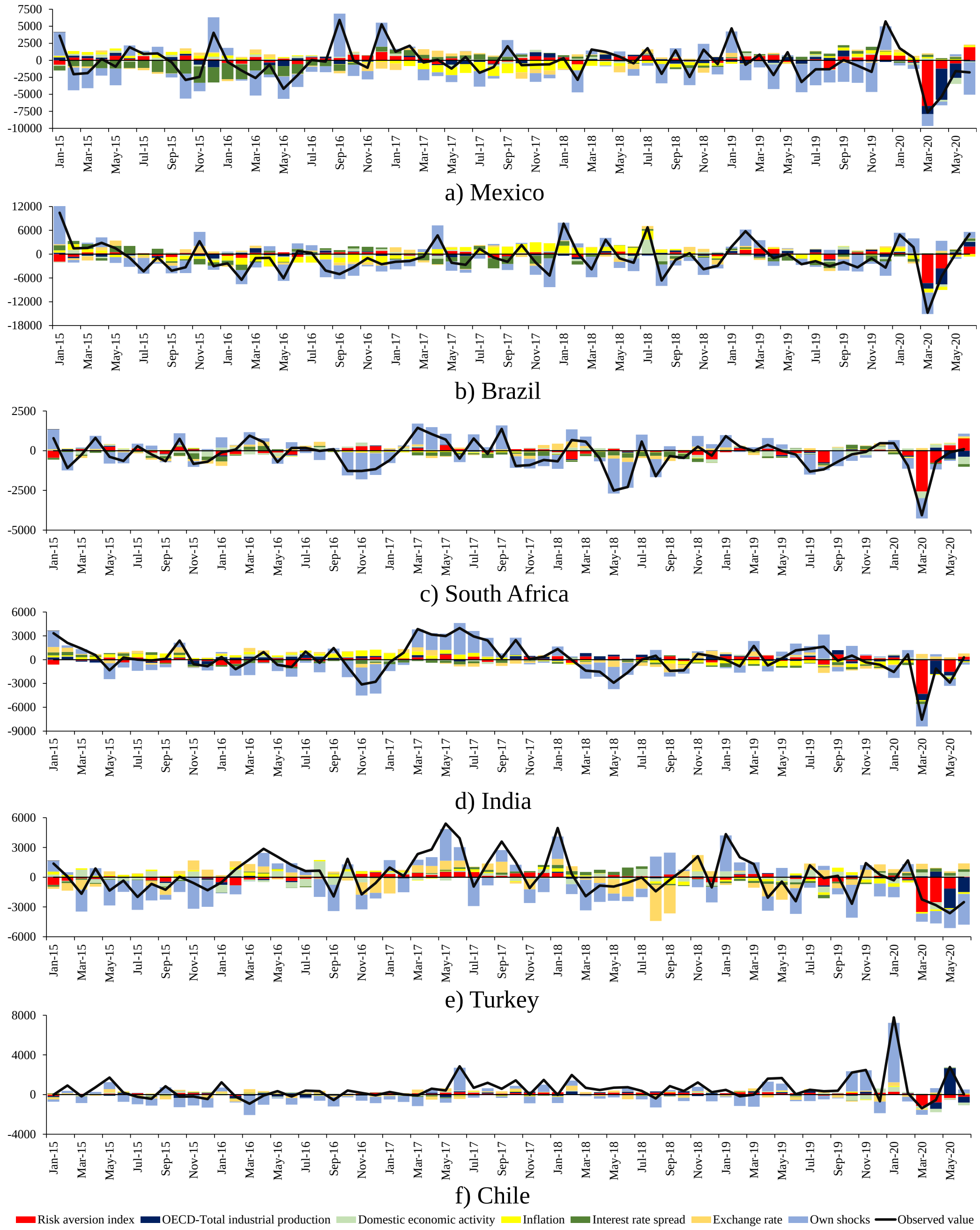

Figure A.8: Historical Decomposition of Debt Flows by using the OECD-Total Industrial Production: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the OECD-Total industrial production, the US interest rate, domestic output growth, domestic inflation, the domestic interest rate, the monthly depreciation of the domestic currency and debt portfolio flows.

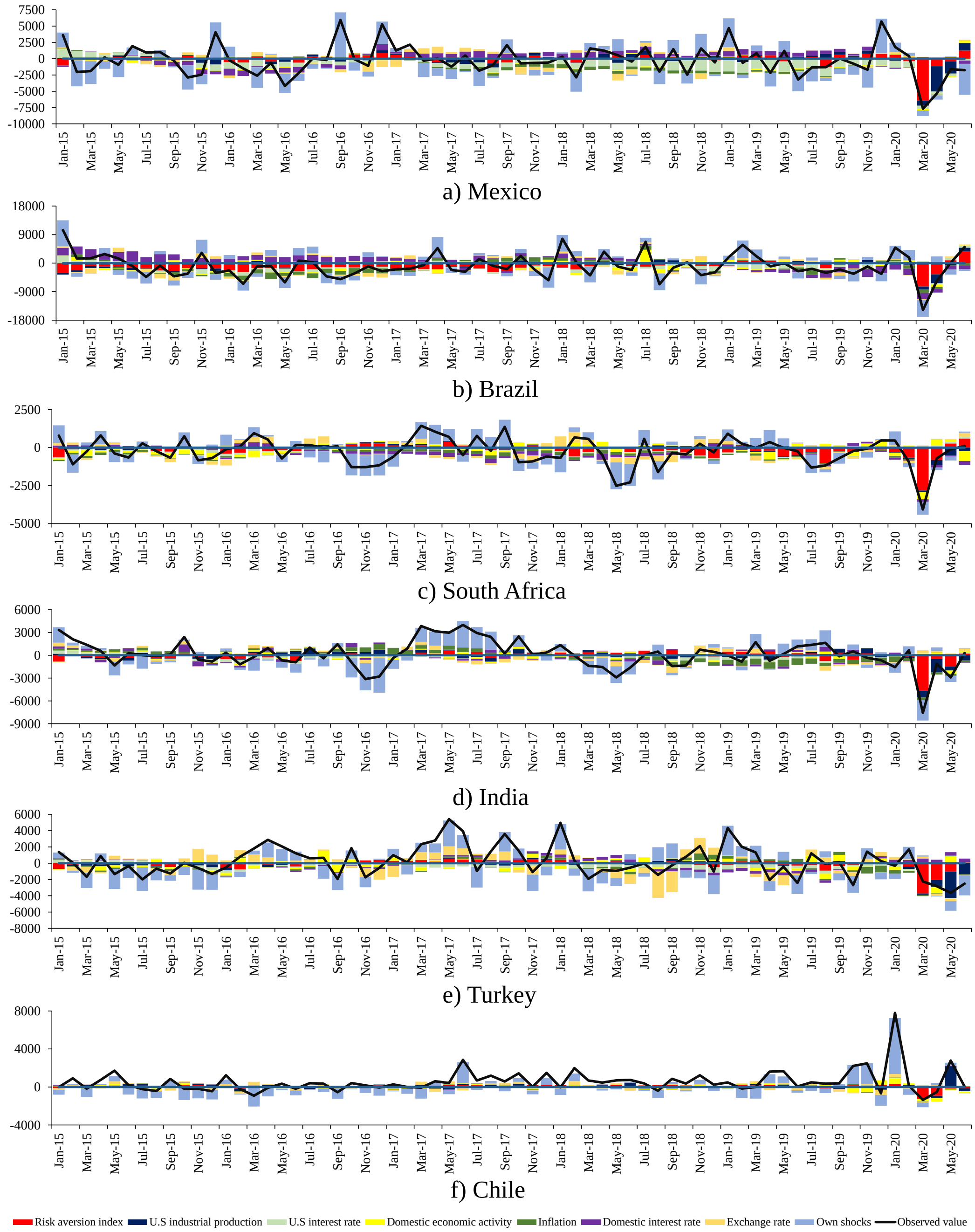

Figure A.9: Historical Decomposition of Debt Flows by using both Monetary Policy Rates Separately: 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, the growth rate of the US industrial production, the US interest rate, domestic output growth, domestic inflation, the domestic interest rate, the monthly depreciation of the domestic currency and debt portfolio flows.

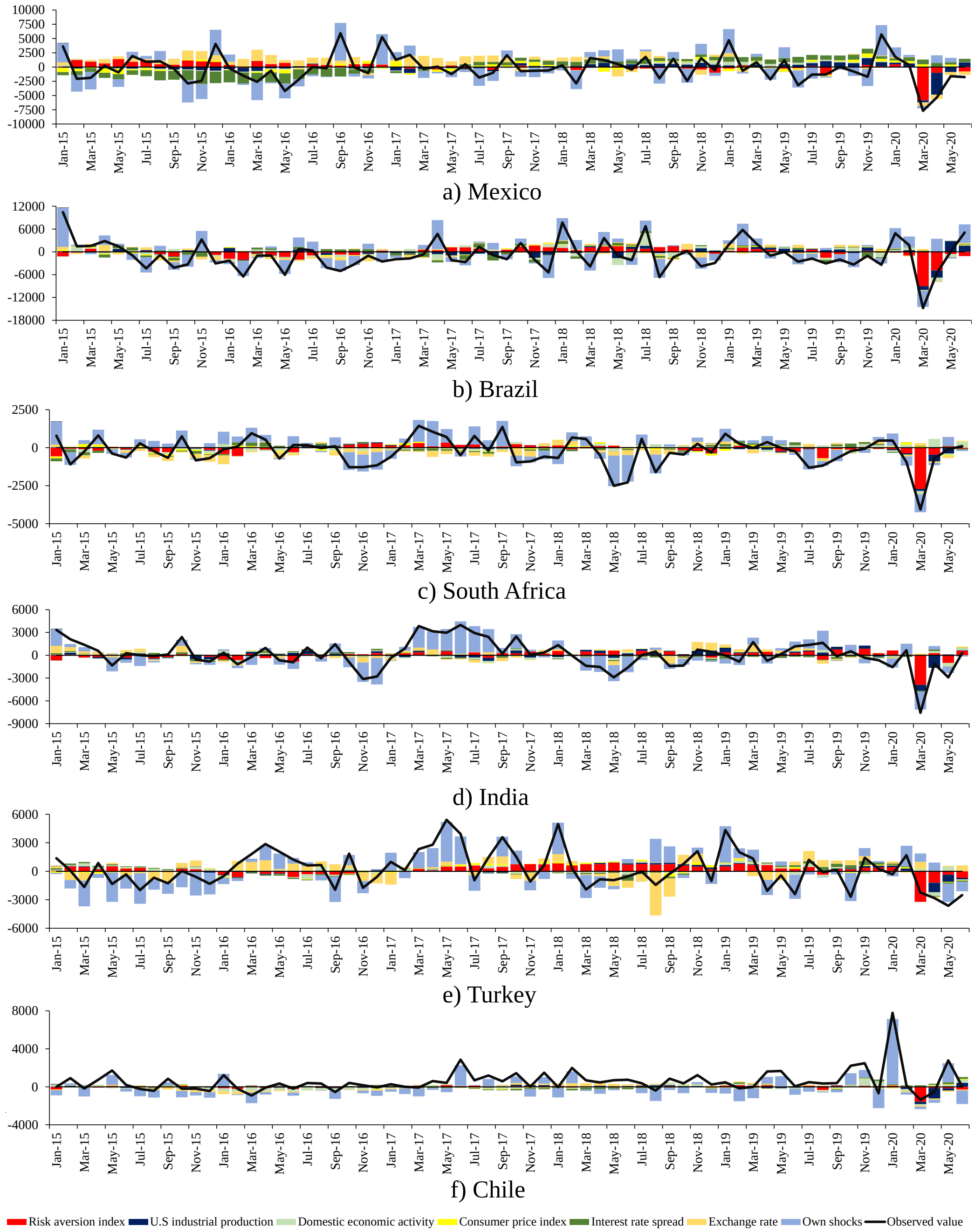

Figure A.10: Historical Decomposition of Debt Flows (VAR Model in Levels): 2015M01-2020M06

Notes: The bars represent the contribution of each of the variables included in the model to explain the evolution of debt flows, while the solid line represents the observed value of these flows. The variables used in the VAR model are: the risk aversion index, US industrial production, domestic output, consumer price index, the spread between the domestic and US interest rates, exchange rate and debt portfolio flows.