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How ETFs Amplify the Global Financial Cycle in Emerging Markets

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We study how the growth of exchange-traded funds (ETFs) affects the sensitivity of international capital flows to the global financial cycle. Using comprehensive fund-level data on investor flows, we show that their sensitivity to global financial conditions for equity (bond) ETFs is 2.5 (2.25) times higher than for equity (bond) mutual funds. This higher sensitivity can be directly linked to ETFs underlying shorter-trading-horizon clientele that trades more often in response to shocks. Using country-level data, we find that where ETFs hold a larger share of financial assets, equity inflows and prices become more sensitive to global risk. (*JEL* F32, G11, G15, G23)

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Changes in global financial conditions, such as U.S. monetary policy and global risk appetite, affect bank and portfolio flows around the world

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simultaneously.[1] This phenomenon of international capital flow synchronization has been labeled the Global Financial Cycle (Rey, 2015). Exposure to this cycle can vary across countries (Cerutti, Claessens, and Rose 2019; Choi et al. 2017) and over time Ahmed and Zlate (2014). This is in fact the case for portfolio capital flows to emerging markets, which have become more sensitive to changes in global financial stress over the past 15 years (as represented by the green line in Figure 1). This increased sensitivity has coincided with the growing importance of exchange-traded funds (ETFs) in the financial markets of emerging economies (as depicted by the blue line in Figure 1).[2] Are these two trends related? And if so, how? Our main contribution in this paper is to provide answers to these questions. Using comprehensive micro and macro data, we show that the rise of ETFs as a conduit for capital flows to emerging markets has indeed amplified the transmission of global financial shocks to those economies. We present evidence that ETFs attract investors that trade more often in response to different shocks and that this underlying investor clientele is directly linked to their role in amplifying the transmission of shocks across countries.

We explore the relationship between the growth of ETFs and the sensitivity of EM capital flows to global factors—also referred to as push factors—in two steps.[3] First, we study fund-level investor flows into ETFs and mutual funds using comprehensive data from EPFR Global over the period 1997 to 2017.[4] The data set contains more than 33,000 mutual funds and more than 6,000 ETFs, with more than US$29 trillion in assets under management at the end of June 2017. Using this data, we find that increases in global financial stress are negatively related to investor flows into dedicated emerging market mutual funds and ETFs, which is consistent with previous research. However, we go on to show that the sensitivity of ETF flows to global financial conditions is significantly larger than for mutual funds, a fact previously undocumented in the literature. Quantitatively, the sensitivity of EM fund flows to push factors is almost 2.5 times bigger for equity ETFs, and 2.25 times larger for bond ETFs, relative to mutual funds.

[1] See Bruno and Shin (2015b,a) for studies related to bank flows. Forbes and Warnock (2012), Fratzscher (2012), and Avdjiev et al. (2022) study portfolio equity and bond flows.

[2] The growing importance of ETFs extends beyond emerging markets. Even as the mutual fund industry has rapidly expanded in recent years, accounting for close to US$50 trillion in assets worldwide (ICI 2017; Khorana, Servaes, and Tufano 2005), the assets of ETFs have increased even faster. The share of fund assets held by ETFs has burgeoned from only 3.5% in 2005 to 14% in 2017 (Figure 2). Nonetheless, the rise of ETFs has been particularly striking for emerging markets (EM) funds, where the ETF asset share reached 20% in 2017.

[3] Throughout the text, we use the terms "push factors" and "global factors" interchangeably when referring to conditions in developed or center countries that might influence capital flows to emerging markets. We use the terms "local factors" and "pull factors" interchangeably when referring to domestic conditions in emerging countries that affect flows to domestic financial markets in emerging countries.

[4] Throughout the paper, we use the term "investor flows" and "fund flows" interchangeably to refer to end investors' purchases and redemptions of shares in mutual funds and ETFs.

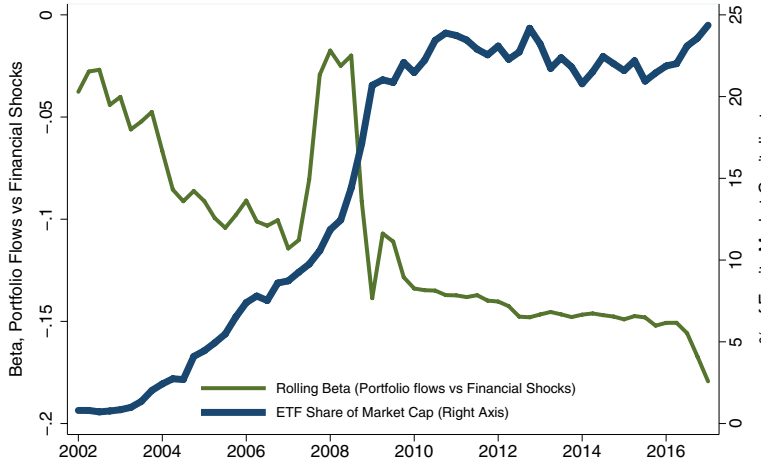

Figure 1
ETF market share and emerging markets' exposure to global financial shocks
This figure shows the portfolio equity liability flows to emerging markets as a share of GDP. Rolling beta is the slope of a 36-month rolling regression of the portfolio equity liability flows over GDP versus the first change in the St. Louis Financial Stress Index. ETF market share (right axis) represents the assets under management held by equity ETF divided by the total assets under management of all emerging market funds expressed as a percentage.

We study in detail why ETF flows exhibit greater sensitivity to global financial conditions. Neither ETFs' size, fees, passive management, nor their multicountry investment scope seems to be able to explain it. We then study their underlying clientele using data from FactSet Onwership. Following arguments in Cella, Ellul, and Giannetti (2013) and Ben-David, Franzoni, and Moussawi (2018), we construct the institutional ownership for ETFs in our sample, together with the average churn ratio of institutions holding each ETF. This churn ratio proxies the extent to which ETFs are held by institutional investors that trade more often, have shorter trading horizons, and thus act more as liquidity traders. We show that this average churn ratio is positively associated with the sensitivity of ETFs flows to global financial conditions, even when we control for the retail ownership of these ETFs. These results suggest that ETFs, due to their continuous intraday trading, attract a particular clientele of investors with a shorter trading horizon relative to mutual funds, which is consistent with the evidence in Dannhauser and Hoseinzade (2022). Different existing theories might explain why this underlying clientele of ETFs could respond more strongly to global financial shocks relative to longer trading horizon investors. For instance, short-horizon traders are also expected to trade more in response to runs on financial markets in coordination failure models, such as Bernardo and Welch (2004) and Morris and Shin (2004). In these models, they sell in anticipation other market participants might sell under stress conditions since they want to avoid being the last

one selling. Additionally, in models with collateral constraints, short-horizon traders might sell more in adverse market conditions as they hit their margin constraints (Brunnermeier and Pedersen, 2005). Alternatively, in limits to arbitrage models, such as Shleifer and Vishny (1997), investors that have a shorter trading horizon, because assets are highly responsive to previous returns, might have to sell in downside markets even if they know the price of a stock is below its fundamental value.

In the second step of our empirical strategy we use country-level data and regress total portfolio equity inflows on our measure of global financial stress, allowing the coefficient to vary with the share of each country's equity market held by foreign ETFs. We find that in countries where this measure of ETF participation is larger, aggregate portfolio equity inflows are more sensitive to global financial conditions. We repeat the exercise using aggregate equity market returns as the dependent variable and find similar results. It follows that, while ETFs may attract new investors to the EM asset class, the benefits of a broader investor base for EM issuers may be partially offset by the fact that the greater sensitivity of ETF flows deepens their exposure to the global financial cycle, raising the volatility of financing conditions in recipient economies.[5]

Throughout the paper, we explicitly address concerns about reverse causality and omitted variable bias in order to ensure that the results do in fact reflect a causal effect of ETFs on the sensitivity of capital flows to global factors. For instance, we estimate our aggregate-level regressions with an exhaustive set of de facto and de jure financial integration measures, and interact those variables with our measure of global financial stress. The estimate of the coefficient measuring the relationship between ETF participation and the sensitivity to global shocks remains virtually unchanged when we do this, indicating that our country-level results are not driven by the level of financial integration of each country. Reverse causality is also a concern in our analysis because financial institutions may create ETFs to cater to investors seeking exposure to volatile or high-beta markets. To deal with this in our fund-level analysis, we include investment scope-time fixed effects, so that we are effectively comparing ETF flows with flows into mutual funds that have *the same investment destination*. This ensures that our fund-level results are not driven by ETFs tending to invest in more volatile markets. In our country-level regressions, we tackle the potential endogeneity of our ETF share variable in two ways. First, we construct a narrower measure of ETF share that excludes single-country ETFs that may have been created to provide access to individual high-beta markets, and obtain results very similar to those in our baseline specification. Second, we identify an event that generated exogenous variation in the presence of ETFs in different countries and show that the event resulted in changes in sensitivity to the global factor at the country level. Specifically, we exploit a decision by

[5] See Converse (2018) for a detailed exploration of the negative effects of capital flow volatility on the real economy in emerging markets.

Vanguard to switch index providers for their ETFs, from MSCI to FTSE. This decision was motivated by cost concerns and is thus unrelated to any country fundamentals. We relate the change in the ETF share around this event to the change in the exposure to the global factor at the country level and find a positive and significant relationship between the two variables.

We also map our fund-level findings to the country-level results to lend further support to our interpretation of the overall findings. In our fund-level results we find that moving US$1 from mutual funds into ETFs increases the dollar flow sensitivity to the global factor (how much a unit increase in the global factor changes dollar flows into funds) by 3.7 units. In our country-level estimations, moving US$1 from mutual fund holdings in a certain country to ETF holdings in the same country increases the dollar flow sensitivity to the global factor by 8.8 units and cannot reject that these two numbers are statistically different from each other. The similarity of these two directly comparable relative marginal effects provide internal consistency between our micro and macro-level estimations. Taken as a whole, our results show that the increasingly popular ETFs attract a clientele that trades more often and with a shorter trading horizon, which amplifies their response to global shocks. This creates an excess sensitivity of ETFs investor flows to global financial conditions, that has an arguably causal effect in the amplification of the transmission of global financial shocks to emerging markets through aggregate capital flows.

In addition to the global financial cycle literature, our paper relates to another three strands of research. First, we contribute to the literature on the drivers of capital flows to emerging markets (Ahmed and Zlate, 2014) and the relative importance of global push factors and local pull factors (Forbes and Warnock 2012; Cerutti, Claessens, and Puy 2019), in particular work using mutual fund data to explore the issue (Fratzscher, 2012). Jotikasthira, Lundblad, and Ramadorai (2012) also study withdrawals and redemptions by end investors and how they affect the transmission of shocks across countries but do not differentiate between types of funds as we do.[6] Raddatz and Schmukler (2012) and Miyajima and Shim (2014) study whether the portfolio decisions of fund managers differ from those of end investors, whereas we analyze the differences in the behavior of end investors in two different types of funds—ETFs and traditional mutual funds.[7] Brandao-Marques et al. (2015) do compare the sensitivity of ETFs and mutual funds in the EPFR data, but study flows to individual countries rather than fund flows, so that they capture the combined responses of fund managers and end-investors. Additionally, Brandao-Marques et al. (2015) restrict their analysis to fund-level data while we also provide

[6] Jotikasthira, Lundblad, and Ramadorai (2012) build evidence at the international level based on a large literature, both theoretical (Shleifer and Vishny 1997) and empirical (Coval and Stafford 2007), on asset fire sales.

[7] In one of the first papers making use of mutual fund data, Borensztein and Gelos (2003) compare capital flows via open-ended funds with those via closed-ended funds.

evidence on aggregate macro financial variables, such as capital inflows and country asset prices.[8]

Second, our paper relates to the rapidly growing literature on the consequences of the growth of ETFs for financial markets and economic activity. To our knowledge, only two previous papers have analyzed the effects of ETFs in an international context. Baltussen, van Bekkum, and Da (2019) show that ETF ownership is associated with greater negative serial correlation in returns, a phenomenon closely related to the volatility we study here. Filippou, Gozluklu, and Rozental (2019) show that U.S. investors' demand for foreign country ETFs comoves significantly with the VIX, but is uncorrelated with analogous implied volatility measures in destination countries. Finally, our findings complement work analyzing the effects of ETFs on U.S. equity markets, which has showed that ETF ownership increases both comovement (Israeli, Lee, and Sridharan 2017; Da and Shive 2018) and volatility (Ben-David, Franzoni, and Moussawi 2018). Our results confirm that equity flows and stock prices are more volatile in *international* markets with greater ETF ownership. Also, we highlight a specific *mechanism* through which ETFs boost volatility and comovement: by increasing the sensitivity of flows to global financial shocks. The evidence we present that ETFs attract investors seeking liquid assets and who are inattentive to local economic conditions in the funds' investment destination is consistent with the findings of several papers analyzing the role of ETFs in U.S. corporate bond markets (Dannhauser 2017, Holden and Nam 2017, Dannhauser and Hoseinzade 2022). We add to this literature by showing that the differences in clientele, and specifically the participation of investors that act as liquidity traders, explain the patterns found in the data. Finally, the amplification mechanisms modeled in Bhattacharya and O'Hara (2017) may help to explain the greater sensitivity of ETF flows that we identify.[9]

1. ETFs and Institutional Details

This section presents a brief description of the structure and functioning of exchange traded funds (ETFs), focusing on the ways in which they differ from traditional mutual funds.[10] Like a mutual fund, an ETF is an investment

[8] More broadly, this study is related to a large literature studying international mutual funds and how these institutional investors affect international financial markets and asset prices. See, among others, Kaminsky, Lyons, and Schmukler (2004), Gelos and Wei (2005), Broner, Gelos, and Reinhart (2006), Gelos (2011), Shek, Shim, and Shin (2017), and Forbes et al. (2016).

[9] Our paper also relates to the literature on the drivers of investor flows into managed funds (for a survey, see Christoffersen, Musto, and Wermers 2014), which has explored in depth the relationship between fund flows and performance. We take on board the insights from this literature by controlling for the past performance of funds in our main specifications, but study how another set of variables (global financial conditions and local economic conditions in the countries where the funds invest) affect flows to different types of funds.

[10] This section is informed by the concise and insightful institutional detail in Ben-David, Franzoni, and Moussawi (2018) and Da and Shive (2018), as well as the comprehensive chapter by Deville (2008).

vehicle which owns a basket of underlying assets, usually stocks or bonds. Often the basket is constructed to track the performance of a particular index. Although actively managed ETFs do exist, they are rare: of more than 700 ETFs in our data set that focus on emerging markets, only seven are actively managed.

When open-ended mutual fund investors buy or sell shares, they enter into a transaction with the fund, and the price at which the transaction happens is determined by the fund's net asset value (NAV) at the end of the trading day on which the buy or sell request is made. By contrast, ETF shares are continuously traded on equity exchanges, allowing investors to buy or sell shares at any time at the current market price. In this sense ETFs are like closed-end mutual funds, which also have exchange-traded shares. The continuous trading of ETF shares not only makes them easy for investors to buy and sell at low cost but also greatly reduces the need for the fund to hold a cash allocation to satisfy redemptions, eliminating the cash drag that is an implicit cost mutual fund investing.

Whereas closed-end mutual funds have a fixed number of shares, set at the fund's initial public offering (IPO), ETF shares can be created or redeemed. Indeed, the creation and redemption of ETF shares ensures that the value of the ETF's shares outstanding closely tracks the basket of underlying assets. The ETF has a number of so-called "authorized participants" (APs), large financial institutions that can create or redeem shares in the fund. To create new ETF shares, an AP buys up the underlying assets and exchanges them for fund shares. When an AP redeems shares, it returns shares to the fund administrators and receives the corresponding quantity of underlying assets.

If the value of ETF shares differs from the value of the underlying basket, there is an arbitrage opportunity for the fund's APs. For example, when an ETF's outstanding shares are more valuable than the underlying, an AP can buy up the underlying, exchange it for fund shares, then sell the fund shares at a profit. These sales will cause the price of the ETF shares to fall until the ETF and the underlying are equal in value. Of course, if the underlying assets are relatively illiquid, there is scope for the price of the ETF to diverge from the underlying since arbitrage will not always be possible.

Importantly, although shares in the emerging market ETFs in our sample are generally traded on exchanges in developed markets, the creation and redemption process nonetheless means that investor flows into these funds can generate cross border capital flows. For example, should end investors' purchases of ETF shares push their price above that of the underlying asset, the ETF's APs will buy the underlying assets and redeem them to make an arbitrage profit. Because the APs are generally large financial institutions in countries with developed financial markets, their purchase of the underlying asset represents a foreign purchase of an emerging market asset, classified as a gross portfolio capital inflow in the balance of payments.

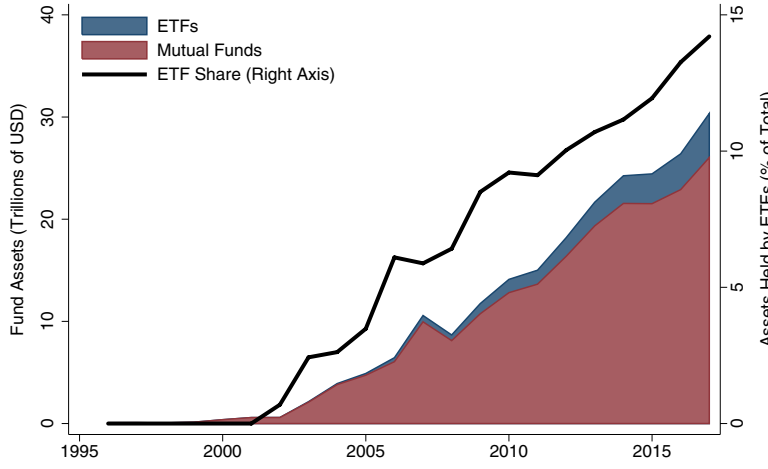

Figure 2
The growth of ETFs
This figure shows the assets under management of ETF and mutual funds in the EPFR data as of year-end. ETF share (right axis) represents the assets under management held by ETFs divided by the total assets under management of all funds expressed as a percentage.

2. Data

2.1 Fund flows data

We obtain monthly fund-level data on mutual funds and ETFs from the commercial data provider EPFR Global.[11] The data set includes both equity and bond funds, with the data on equity funds covering the period January 1997 to August 2017 and the bond fund data running from January 2002 to August 2017. The data are an unbalanced panel with funds both entering and leaving the sample, so that the data do not suffer from survivorship bias. The full EPFR database contains 33,019 mutual funds (of which roughly 65% are equity funds) and 6,431 ETFs (of which 80% are equity funds). At the end of June 2017, EPFR funds held U.S.$26.4 trillion in assets under management, as shown in Figure 2, and accounted for approximately 66 percent of the total worldwide assets of mutual funds and ETFs.[12] Official data on U.S. holdings of foreign assets show that U.S.-domiciled mutual funds held around US$1.7 trillion in emerging market assets, and U.S. funds tracked by EPFR hold roughly 50% of these (TIC, 2017).[13]

Our primary variable of interest is investor flows (F_{it}), defined as the U.S. dollar value of the net purchases or redemptions of shares in fund i in month

[11] For detailed variable definitions and sources, see Table A1 in the Internet Appendix.

[12] According to ICI (2017), the total assets of the fund industry are roughly U.S.$40 trillion.

[13] Here, we compare the holdings of U.S.-domiciled funds with U.S data on overseas holdings because most countries do not yet report the institutional sector of asset holders.

t. We use the fund flows variable generated by EPFR, which is calculated by subtracting the change in the fund's net asset value (NAV) from the change in the fund's total assets: $F_{it} = (A_{it} - A_{it-1}) - A_{it-1} \times (\%\Delta NAV_{it})$. This variable is calculated in the same way for mutual funds and for ETFs. For mutual funds, it will reflect the end investor flow into the mutual fund in dollar terms. For ETFs, this variable will reflect the net creation or redemption of shares in dollar terms by authorized participants.[14] As long as the ETF arbitrage process works well, these newly created/redeemed shares directly reflect the excess demand by end investors and are comparable to the end investor dollar flows to ETFs. Given our focus on ETF flows' excess sensitivity, it is important to note that any limits to arbitrage due to balance sheet constraints on the part of APs or due to illiquidity of the underlying will result in a dampening rather than an amplification of the signals being transmitted via the secondary market.[15] Throughout our analysis, we normalize flows into each fund by its assets under management at the end of the previous month (A_{it-1}) so that our measure of fund flows is $\left(f_{it} = \frac{F_{it}}{A_{it-1}} \right)$.

The EPFR Global data set includes several other variables used in our analysis. Each fund is classified as having what we refer to as an investment scope, meaning the country or group of countries where the fund invests. Example of multicountry investment scope categories include "Global Emerging Markets" and "Latin America Regional." Internet Appendix Table A2 lists the investment scope categories in the data set and how many funds and observations are assigned to each. In addition, EPFR also provides data on each fund's performance, meaning the month-on-month percentage change in the fund's net asset value (NAV). Throughout our analysis, we control for the lagged performance of each fund relative to the average performance of funds with the same investment scope. EPFR also provides a host of other fund characteristics which we use in our analysis, such as each fund's domicile and its declared benchmark.

We clean the EPFR data set using procedures standard in research using fund-level data, dropping funds with less than one year of data and funds with average assets lower than US$10 million. In addition, we drop funds with extreme values of performance and inflows (measured as a share of lagged assets), specifically funds with observations in the top and bottom1% for these variables. Because our analysis is focused on the role of mutual funds and ETFs in international capital flows, we exclude from the data set domestic funds, which invest in the country in which they are domiciled only. We also exclude funds domiciled in a country that is included in the fund's investment scope

[14] This is approximately true as long as the ETFs are liquid and the NAV is close to the market price of the ETFs.

[15] In the Internet Appendix, we acknowledge that this comparability might contaminated by illiquid ETFs and show in Internet Appendix Table B9 that our results do not depend on ETFs' liquidity.

Table 1
Summary statistics, fund flows over initial assets

	Full sample		Developed markets		Emerging markets	
	(1) ETF	(2) Mutual funds	(3) ETF	(4) Mutual funds	(5) ETF	(6) Mutual funds
A. Equity funds						
Mean	0.85	−0.14	0.93	−0.19	0.64	−0.05
SD	9.20	5.97	9.43	5.86	8.54	6.23
10th percentile	−7.07	−4.48	−7.24	−4.38	−6.72	−4.73
25th percentile	−0.77	−1.74	−0.77	−1.71	−0.77	−1.82
Median	0.00	−0.30	0.00	−0.36	0.00	−0.16
75th percentile	2.39	0.98	2.68	0.95	1.45	1.05
90th percentile	10.10	4.48	10.48	4.27	9.03	4.96
Number of funds	1,858	9,150	1,380	6,621	479	2,551
Observations	109,888	657,800	81,050	457,014	28,838	200,786
B. Bond funds						
Mean	1.30	0.02	1.26	−0.05	1.58	0.23
SD	9.85	6.45	9.88	6.19	9.70	7.18
10th percentile	−7.14	−5.01	−7.14	−4.84	−7.13	−5.56
25th percentile	−0.53	−1.93	−0.51	−1.88	−0.63	−2.10
Median	0.00	−0.18	0.00	−0.24	0.00	−0.03
75th percentile	3.66	1.43	3.62	1.34	4.15	1.73
90th percentile	11.82	5.50	11.62	5.11	12.85	6.81
Number of funds	406	3,595	353	2,738	53	859
Observations	20,447	202,285	17,732	151,399	2,715	50,886

This table reports the summary statistics for fund flows over initial assets (expressed as a percentage) for the sample used in the main analysis for the full sample, developed and emerging market funds. The sample is further divided between ETFs and mutual funds. Panel A shows statistics for equity funds and panel B for bond funds. Fund flows over initial assets are winsorized at the 1% and 99% level.

(e.g., a Latin America regional fund domiciled in Brazil). See Table A3 for the number of funds and observations in each domicile in our cleaned data set.

This procedure leaves us with 12,852 mutual funds and 2,525 ETFs in our data set. Table 1 presents summary statistics and provides a first glimpse of our main result. The volatility of fund flows normalized by assets is much larger for ETFs than for mutual funds.[16] The greater volatility of ETF investor flows can be seen even more clearly in Figure 3, where we plot the aggregate fund flows normalized by aggregate initial assets for the two types of funds. Even after the global financial crisis, fund flows for ETFs appear to be much more volatile and less persistent than investor flows for mutual funds.

We combine the data from EPFR with information from the FactSet Ownership database on institutional investors' holdings of the ETFs in our sample. With this data, we are able to calculate the share of each ETF owned by retail investors. We also use the FactSet Ownership data to compute the churn ratio for institutional investors holding shares of the ETFs in our sample. In addition, we use Morningstar Direct to obtain several fund-level characteristics for ETFs not provided by EPFR, including the Morningstar Fee-Level Rank, the Morningstar Rating, and the *R*-squared of the ETFs in the sample. We also use Morningstar Direct to construct an alternative measure of retail ETF

[16] Table A4 in the Internet Appendix contains summary statistics for the assets under management of funds.

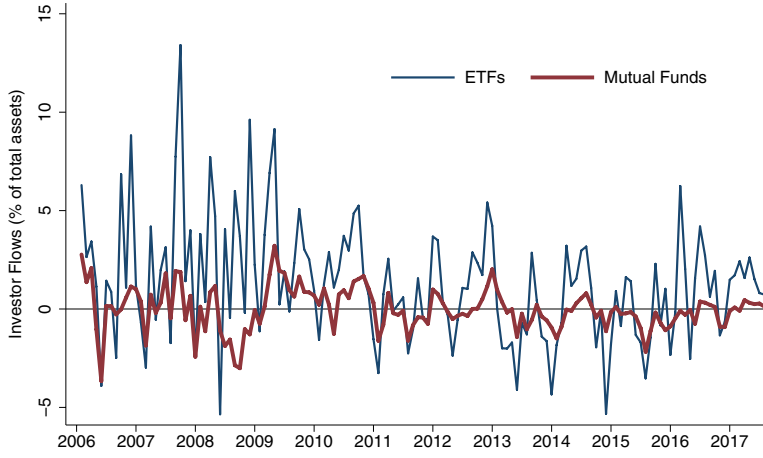

Figure 3
Fund flow volatility, ETFs versus mutual funds
This figure depicts the time evolution of investor flows over initial assets for ETFs and mutual funds. Investor flows are the sum of injections and redemptions at each point in time. Total assets refer to the initial assets under management aggregated at each point in time.

ownership, as a robustness check on that obtained from FactSet Ownership. Finally, we obtain bid-ask spread information for each ETF from Bloomberg, which we use to measure the liquidity of ETFs. We merge the FactSet, Morningstar, and Bloomberg data with EPFR's sample of ETFs by matching on the ETFs' ISINs or tickers.

2.2 Additional variables

We analyze the drivers of fund flows using data on pull and push factors. Our main measure of global push factors is the St. Louis Fed Financial Stress Index, which is the first principal component of 18 mostly U.S. financial variables, including interest rates, spreads, and equity and bond market implied volatility. Putting changes in the financial stress index in context, the index jumped by 1.5 standard deviations following the September 11, 2001, terrorist attacks and during the 2013 Taper Tantrum. During the 2011 peak of the eurozone crisis, and after the 2015 surprise devaluation of the Chinese currency, the index increased by roughly two standard deviations.

In robustness checks, we use a variety of other commonly used measures of risk sentiment and liquidity conditions. As indicators or risk, we employ the Chicago Board Options Exchange Market Volatility Index (VIX), the effective yield of the Bank of America Merrill Lynch U.S. High-Yield Master II Index (US HY), and the spread between 3-month LIBOR and 3-month Treasury bill (TED spread). Following the literature, we also run our analysis using the effective federal funds rate (FF Rate) to measure global financial conditions. Since the U.S. policy rate was at the zero lower bound for a substantial portion

of our sample period, we also make use of the shadow federal funds rate developed by Wu and Xia (2016) (FF Shadow Rate). With the exception of the shadow fed funds rate, which is made available by the Atlanta Fed, our risk and monetary policy variables were obtained from the Federal Reserve Economic Data (FRED) system at the end of each month.[17] Our analysis also takes into account push factors specific to each fund's home country. Specifically, we use monthly stock market returns measured in dollars from MSCI for the domicile country reported by EPFR. For funds domiciled in financial centers, we assign the major stock market most closely associated with the financial center as its home market.[18]

To capture pull factors for fund investors, we use the month-on-month change in country-specific seasonally adjusted industrial production (IP) indexes from the IMF's International Financial Statistics (IFS) database.[19] For multicountry funds, we construct investment scope-level aggregate pull factors by taking the cross-country median value for IP growth for the countries within the fund's scope.[20] Our results are not sensitive to the method used to aggregate across countries in each investment scope; using the mean value of IP growth or taking a weighted average produced quantitatively similar results. In robustness checks, we also include monthly one year ahead forecasts of short-term interest rates in the economies included in each fund scope, obtained from Consensus Economics. We avoid using market interest rates or equity returns as pull factors because of the potential for reverse causality, as these variables are themselves affected by fund flows.

3. Empirical Strategy and Results

3.1 Empirical strategy

The dependent variable in our fund-level regressions is investor flows into each fund, rather than flows to individual countries. We thus avoid constructing estimates of capital flows at the fund-country-time level, as in Raddatz, Schmukler, and Williams (2017), which might introduce measurement error.[21]

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[17] For summary statistics on these global factors, see Table A5 in the Internet Appendix.

[18] Funds domiciled in Ireland, the British Virgin Islands, and the Channel Islands were matched with U.K. stock market returns. Funds domiciled in other Caribbean financial centers were matched with U.S. stock returns. Funds domiciled in Luxembourg were assigned German equity returns.

[19] IP data were seasonally adjusted using the X12-ARIMA method developed by the U.S. Census Bureau. For summary statistics on IP growth, see Table A6 in the Internet Appendix.

[20] Funds to which EPFR has assigned the same investment scope classification may invest in a slightly different set of countries (e.g., not all EM Asia funds invest in Taiwan). In constructing our aggregates, we use the set of countries which MSCI assigns to each country group each period. As a result, the set of countries included in each category varies over time. For example, we include Greece in "Emerging Europe" after November 2013, when it was downgraded from MSCI's developed markets index.

[21] Measurement error occurs because of the need to approximate each fund's country-level returns using a publicly available price index.

We model fund flows as a function of global factors, local factors, and lagged fund returns. More specifically, we use the following baseline specification:

$$f_{it} = \theta_i + \beta GF_t + \gamma (GF_t * ETF_i) \tag{1}$$
$$+ \lambda LF_{it} + \eta (LF_{it} * ETF_i) + \sum_{k=1}^{3} \delta_k R_{it-k} + \varepsilon_{it},$$

where f_{it} is investor flows into fund i during month t, normalized by the fund's assets at the start of month t. The variable GF_t ("Global Factor") is a measure of global financial conditions, LF_{it} ("Local Factor") captures pull factors in the fund's investment destination, ETF_i is a dummy equal to one if the fund is an ETF, and ε_{it} is an error term. This baseline specification includes fixed effects at the fund level θ_i. Since a large body of work has shown that past performance affects fund flows, we include three lags of the fund's returns relative to other funds with the same investment scope (R_{it}).

Throughout the paper, we try to keep the specification parsimonious and therefore include generally only one pull and one push factor in each regression. For GF_t our main variable is the St. Louis Fed Financial Stress Index, a broad measure of global financial conditions. Fund flows f_{it} represent an *adjustment* in end investors' holdings of fund i, which could be due reallocation across funds or to a change in the size of the portfolio of investors who hold fund i. We therefore include the global factor variable in differences, so that β represents the change in investors' holdings of fund i in response to a change in global financial conditions at time t. The sum of $\beta + \gamma$ captures the sensitivity of ETF investor flows to push factors, and the main parameter of interest to us is γ, the difference in sensitivity between ETF flows and mutual fund flows.

The focus of this paper is the change in the responses of ETF and mutual fund investor flows to *global* financial shocks, but we do include a local factor in our regression and allow its coefficient to differ for ETFs for two reasons. First it allows us to verify that our results are in line with other research on the drivers of fund flows. And second, knowing η—the differential response of ETF investor flows to local factors—may help us better understand our results regarding γ. Our main measure of local factors, often referred to as pull factors in the literature on the drivers of capital flows, is month-on-month growth in industrial production (as described in Section 2). We use IP because measures of local returns (equity returns or interest rates) would raise serious concerns about endogeneity bias, since large fund flows can generate price changes (as documented in, e.g., Jotikasthira, Lundblad, and Ramadorai 2012). As discussed in Section 2 our main specifications measure pull factors using the median industrial production growth for the group of countries included in the fund's investment scope, but our results are robust to using either the

simple or the Gross Domestic Product (GDP)-weighted mean of IP growth. The response of ETF investor flows to pull factors is given by $\lambda+\eta$.

Beyond this baseline specification, we use an alternative approach exploiting higher dimensional fixed effects as follows:

$$f_{it}=\theta_i+\theta_{st}+\gamma(GF_t*ETF_i)+\eta(LF_{it}*ETF_i)+\sum_{k=1}^{3}\delta_k R_{it-k}+e_{it}, \qquad (2)$$

where θ_{st} are fixed effects at the investment scope-time level. This set of fixed effects absorbs all time-varying shocks nonparametrically at the investment scope level. Thus, we can more cleanly identify the difference in sensitivities coming from the change in the type of fund. For instance, if financial institutions create ETFs to service country or regions with higher sensitivity to push factors, this would generate a high γ in Equation (1) even if ETF flows *per se* were not more sensitive. The use of scope-time fixed effects addresses this concern because it allows us to compare the sensitivities of ETFs and mutual funds with the same investment scope, controlling for any time-varying factors specific to the investment scope.

3.2 Main results

We begin by estimating Equation (1) for the dedicated emerging market funds in our sample (Table 2).[22] Consistent with previous work, the results show that an increase in global financial stress is associated with a reduction in investor flows to both EM equity (column 1) and EM bond funds (column 4). Columns 2 and 5 present this paper's main results: flows to dedicated EM ETFs are significantly more sensitive to the global push factor than EM mutual fund flows, for both equity and bond funds.[23] Indeed, ETF flows' exposure to our global factor is almost 2.5 times bigger for equity funds and 2.25 times larger for bond funds.[24]

To ensure that our main parameter of interest, γ in Equations (1) and (2), is well identified, we next estimate Equation (2), which includes investment

[22] While all our regressions contain fund performance controls, we do not report the estimated coefficients for compactness. Full results, including our estimates for δ_{it-k} in equations (1) and (2), are presented in Table B1 of the Internet Appendix. We also conduct our baseline estimations with lagged fund flows as controls which do not change our main results (Table B2).

[23] In Internet Appendix Table B3, we show that for developed market (DM) funds the sensitivity of ETF flows to both push and pull factors is not significantly different from that of traditional mutual funds. We then investigate the behavior of flows to developed market ETFs in detail in Internet Appendix Table B4 and find that DM ETF flows do appear more sensitive to global financial conditions than DM mutual fund flows once we modify our data set in two ways. First, we reinclude funds investing in the country where they are domiciled. We do this because in developed markets these funds cater to foreign as well as domestic investors, unlike in EMs where their investor base is largely domestic. Second, we exclude DM funds investing exclusively in German, Japanese, and U.S. government bonds, which are widely considered safe-haven assets. However, since the focus of this paper is on flows to dedicated emerging market funds we leave further exploration of the behavior of investors in developed market funds to future work.

[24] This is calculated as $\frac{\beta+\gamma}{\beta}$, where the numerator is the sensitivity of ETFs flows to the global factor, while the denominator is the sensitivity of mutual fund flows to the global factor.

Table 2
Baseline results: Sensitivity of mutual fund and ETF flows to global shocks

	Equity funds			Bond funds		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Fund flows over initial assets						
Global factor	−2.118***	−1.857***		−3.294***	−3.169***	
	(0.344)	(0.305)		(0.475)	(0.460)	
Local factor	0.170***	0.187***		0.099	0.116	
	(0.047)	(0.045)		(0.127)	(0.123)	
Global factor*ETF		−2.733***	−2.256***		−3.948**	−3.030*
		(0.607)	(0.519)		(1.951)	(1.823)
Local factor*ETF		−0.133	0.030		−0.352	−0.255
		(0.087)	(0.073)		(0.332)	(0.359)
Fund performance controls	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment scope-time FE	No	No	Yes	No	No	Yes
Local factor ETF		0.054			−0.236	
p-value		.584			.524	
Observations	210,392	210,392	209,696	50,510	50,510	50,029
No. of funds	2,908	2,908	2,899	910	910	901
R^2	.064	.064	.138	.092	.092	.177

This table reports the OLS coefficients from a regression of fund flows over initial assets on different explanatory variables and different sets of fixed effects. The left three columns show the results for equity funds and three right-hand-side columns show results for bond funds. Local Factor is the median monthly industrial production growth for the investment scope of each fund. Global Factor is the change in the St. Louis Financial Stress Index. ETF is a dummy indicating whether or not a fund is an ETF. Fund Performance Controls indicates whether the regression includes three lags of the portfolio returns of the fund minus the average fund returns at the investment scope level. Local Factor ETF indicates the sum of the coefficients for Local Factors and Local Factors*ETF. *p*-value shows the significance test for Local Factor ETF=0. Fund flows over initial assets are winsorized at the 1% and 99% level. Driscoll-Kraay robust standard errors in parentheses. $*p<.1$; $**p<.05$; $***p<.01$.

scope-time fixed effects. Including this set of fixed effects allows us to compare ETFs with mutual funds that have the same investment scope and also control for any time-varying determinants specific to that investment scope. Again, this strategy helps us control for the fact that financial institutions may choose to create ETFs specifically to cater to investment scope categories that, for other reasons, exhibit more volatility in fund flows. The resultant point estimates for γ (found in columns 3 and 5) are somewhat smaller in magnitude than those in column 2, which is consistent with endogenous ETF creation generating an upward bias in our estimates of Equation (2). Nonetheless, the coefficients for with the global factor-ETF interaction term do not change dramatically and remain significant.

Our baseline regression results imply that the greater sensitivity of ETF flows has an economically significant effect on the size of flows to dedicated emerging market funds. To illustrate this, we analyze the so-called "Taper Tantrum episode" of 2013 in light of our results. In May 2013, then-Fed-Chair Ben Bernanke discussed the possibility of scaling back the Federal Reserve's asset purchase program during testimony before the U.S. Congress. This prompted a sharp reaction from financial markets, captured in our data by an increase in the St. Louis Fed financial conditions index of 0.63, a 1.5-standard deviation tightening, during May and June. Concurrently, investors withdrew

US$32.6 billion (2.4% of fund assets) from the dedicated EM funds in our data set, of which US$11.5 billion came out of ETFs. The coefficient estimates in columns 2 and 5 of Table 2 imply that approximately US$23.2 billion (1.7% of assets) of the total outflow can be attributed to the increase in financial stress over the period.[25] If we impose on ETF flows the same sensitivity that we estimate for mutual fund flows, the outflow due to financial stress would have been US$18.9 billion (1.4 % of fund assets).[26] This back-of-the-envelope calculation thus implies that the extra sensitivity of ETF flows boosted outflows by US$4.3 billion (0.5% of fund assets), meaning that outflows would have been roughly 23% smaller if ETF flows had the same sensitivity as mutual fund flows. Thus our results suggest that the extra sensitivity of ETF flows is economically important, but at the same time do not imply implausibly large effects.

The difference in sensitivity to global financial shocks between ETF and mutual fund flows that we have found implies that the growth of ETFs as a conduit for international capital flows has contributed to the strengthening of the relationship between global financial conditions and portfolio flows depicted in Figure 1. However, we also find evidence investor flows to ETFs have become more sensitive to our global push factor over time. Figure 4 plots the 36-month rolling slope of a regression of aggregate fund flows on our chosen measure of global financial conditions. Except for a brief period after the 2008 global financial crisis the sensitivity of ETF flows to push factors is greater (in absolute terms) than for traditional mutual funds. Moreover, the sensitivity of investor flows into ETFs has been increasing steadily since 2012, while the sensitivity of mutual fund flows has essentially remained constant over the period. This suggests that the rising sensitivity of aggregate flows to dedicated EM funds that we highlighted in Figure 1 is due not only to the growing use of ETFs as a channel for cross-border investment but also to the increase in the sensitivity of ETF flows.

The focus of our analysis is on how investor flows to ETFs and mutual funds respond differently to global shocks; however, the results presented in Table 2 also reveal differences in how flows to the two types of funds comove with what are often called pull factors in the capital flows literature: economic conditions in the countries where the funds invest. In column 2 of Table 2, we

[25] Using the notation in Equation (1), we calculate this dollar amount as follows:
$\sum_i^{N_{equity}}(\hat{\beta}^{equity}+\hat{\gamma}^{equity}\mathbb{I}[i=ETF])(GF_{May2013}+GF_{June2013})Assets_{i,t-1}$
$+\sum_i^{N_{bonds}}(\hat{\beta}^{bonds}+\hat{\gamma}^{bonds}\mathbb{I}[i=ETF])(GF_{May2013}+GF_{June2013})Assets_{i,t-1}$,
Where N_{equity} is the number of equity funds in the sample and N_{bonds} is defined analogously. Values for $\hat{\beta}^{equity}$ and $\hat{\gamma}^{equity}$ are taken from column 2 of Table 2, while values for $\hat{\beta}^{bonds}$ and $\hat{\gamma}^{bonds}$ are taken from column 5 of the same table. As noted in the text, $(GF_{May2013}+GF_{June2013})=0.63$.

[26] This dollar amount is calculated as follows, again using the notation from Equation (1):
$\sum_i^{N_{equity}}\hat{\beta}^{equity}(GF_{May2013}+GF_{June2013})Assets_{i,t-1}$
$+\sum_i^{N_{bonds}}\hat{\beta}^{bonds}(GF_{May2013}+GF_{June2013})Assets_{i,t-1}$.

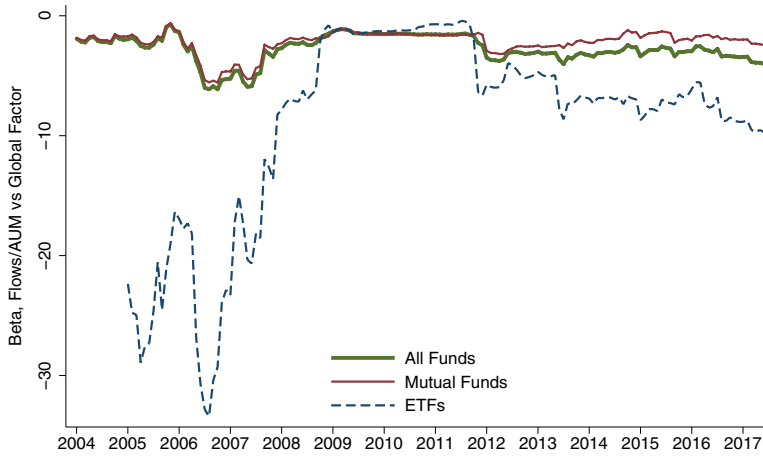

Figure 4
Comparing sensitivity to global factors over time
This figure presents the sensitivity of investor flows to global factors for total flows to all funds, aggregate flows to mutual funds, and aggregate flows to ETFs. The beta flows/AUM to Global Factor is the slope of a 36-month rolling regression of the aggregate investor flows over initial assets versus the change in the St. Louis Financial Stress Index.

see that flows to dedicated EM mutual funds are positively and significantly related to economic conditions in the funds' investment destinations. For bond funds, the coefficient is of a similar magnitude, but not statistically significant, perhaps because our data contain many fewer observations for bond funds. The coefficient for the interaction of the local factor and the ETF dummy (η in Equation (1) is never significant, so we cannot reject the null that ETF and mutual fund flows respond to local factors in the same way. At the same time, it is noteworthy that the sum of the local factor coefficient (again, λ) and the coefficient for its interaction with the ETF dummy (η) is never statistically different from zero. This can be seen in the the row labeled "Local Factor ETF" in the bottom section of Table 2, which gives the ETF-specific coefficient $\lambda+\eta$ and the row below, which gives the p-value from a test of the null that the sum is equal to zero. Because we calculate pull factors for multicountry funds by averaging across the countries in the funds' investment scope, once could be concerned that the lack of a statistically significant response by ETF investors could be the result of attrition bias generated by measurement error in our local factor.

It therefore appears that while ETF investors respond strongly to changes in global financial conditions, they respond little if at all to changes in local economic conditions in the particular countries where the ETF invests. This somewhat surprising finding is in fact consistent with the hypothesis put forward by Holden and Nam (2017) and Dannhauser (2017) that ETFs attract investors who are relatively uninformed about the fundamentals of the assets they trade. Moreover, our results regarding ETF investors' insensitivity to

destination-specific shocks offers a potential explanation for the finding of Israeli, Lee, and Sridharan (2017) that U.S. stock prices respond less to firm-specific information about future earnings when ETFs hold a larger share of the stock.

3.3 Additional results

We conduct several additional tests relative to our baseline specification. First, if our measure of global shocks is more highly correlated with country-specific shocks in places where ETFs are more popular, this could explain our result that ETF investor flows are more sensitive to our measure of global shocks. To determine whether this is the case, we now run a set of regressions in which we control for push factors that are specific to the country where each fund is domiciled. In particular, we add to our baseline specification the stock market returns in each fund's domicile country in order to capture financial conditions at home for the fund's investors. Stock market performance in the developed markets that are home to the vast majority of funds in our sample is correlated with the financial conditions captured by the St. Louis Fed financial stress index that we use to capture the global factor. However, the correlation is around -0.45 for most of these economies, so there is ample independent variation in our measure of local push factors. Table 3 presents the resulting coefficient estimates. As would be expected given the correlation between our measures of global and domicile-specific push factors, estimated sensitivity of fund flows to the global factor is generally lower than was the case in Table 2, for both mutual funds and equity ETFs. Nonetheless, the inclusion of the additional push factor does not alter our main conclusions. ETF flows are still significantly more exposed to the global factor than mutual fund flows (columns 1 and 2), even when we introduce domicile-investment scope-time fixed effects to our estimation (column 3).

Second, we check if our main finding has to do with differences in the growth of ETFs relative to traditional mutual funds across domicile countries. If ETFs have simply grown more quickly in domicile countries where investor flows tend to be more sensitive to global financial shocks, this could explain why we find ETF flows are more sensitive. We therefore run a set of regression where we control for the fact that investor flows to ETFs exhibit different long-term trends than flows to mutual funds. The results of this regression (colums 4 and 5 of Table 3) also verify that our results are not driven by, for example, U.S. investors being more sensitive to global shocks and also more eager to shift to using ETFs as an investment vehicle. The point estimates for the coefficient for the global factor-ETF dummy interaction (γ) is smaller than our baseline estimate, but still implies that ETF flows are more than twice as sensitive to global financial conditions than are mutual fund flows.

Third, we test whether the greater sensitivity of ETF flows reflect the fact that that ETFs are relatively new and thus small during much of our sample. To test this hypothesis directly, we estimate our baseline specification but

Table 3
Domicile-specific controls

	Domicile financial conditions			Domicile-specific time FE	
	(1)	(2)	(3)	(4)	(5)
A. Equity funds					
Dependent variable: Fund flows over initial assets					
Global factor	−1.248***			−1.266***	
	(0.271)			(0.213)	
Global factor*ETF	−2.945***	−2.265***	−2.789***	−1.699***	−1.652***
	(0.740)	(0.646)	(0.762)	(0.470)	(0.417)
Local factor	0.193***			0.044	
	(0.043)			(0.035)	
Local factor*ETF	−0.136	0.028	0.172*	−0.177**	−0.082
	(0.086)	(0.073)	(0.098)	(0.073)	(0.072)
Stk mkt at fund domicile	5.164***	1.573*		4.558***	1.925**
	(1.011)	(0.834)		(0.856)	(0.754)
Stk mkt at fund domicile*ETF	−2.393	0.078	0.165		
	(2.639)	(2.254)	(2.946)		
Fund performance controls	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes
Investment scope*time FE	No	Yes	No	No	Yes
Domicile*inv. scope*time FE	No	No	Yes	No	No
Fund domicile*ETF*year FE	No	No	No	Yes	Yes
Local factor ETF	0.057			−0.133	
p-value	.563			.098	
Observations	210,194	209,498	195,690	210,189	209,493
No. of funds	2,906	2,897	2,750	2,906	2,897
R^2	.066	.138	.216	.091	.148
B. Bond funds					
Dependent variable: Fund flows over initial assets					
Global factor	−2.391***			−2.198***	
	(0.465)			(0.416)	
Global factor*ETF	−5.970***	−4.768**	−7.038***	−2.625**	−2.240**
	(2.276)	(2.132)	(2.363)	(1.206)	(1.130)
Local factor	0.137			0.049	
	(0.119)			(0.091)	
Local factor*ETF	−0.374	−0.267	−0.119	−0.237	−0.212
	(0.322)	(0.354)	(0.396)	(0.287)	(0.313)
Stk mkt at fund domicile	5.943***	4.173**		5.574***	3.771***
	(2.056)	(1.699)		(1.838)	(1.224)
Stk mkt at fund domicile*ETF	−14.464**	−11.459*	−13.875**		
	(5.843)	(6.000)	(6.766)		
Fund performance controls	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes
Investment scope*time FE	No	Yes	No	No	Yes
Domicile*inv. scope*time FE	No	No	Yes	No	No
Fund domicile*ETF*year FE	No	No	No	Yes	Yes
Local factor ETF	−0.237			−0.188	
p-value	.517			.571	
Observations	50,510	50,029	48,254	50,509	50,028
No. of funds	910	901	870	910	901
R^2	.094	.177	.226	.129	.19

This table reports the OLS coefficients from a regression of fund flows over initial assets on different explanatory variables and different sets of fixed effects for emerging market funds. Local Factor is the median monthly industrial production growth for the investment scope of each fund. Global Factor is the change in the St. Louis Financial Stress Index. ETF is a dummy indicating whether or not a fund is an ETF . Fund Controls indicates whether the regression includes fund control variables. These variables are the three lags of the portfolio returns of the fund minus the average fund returns at the investment scope level and the difference in logs of the MSCI stock market index in the domicile of each fund. Local Factor ETF indicates the sum of the coefficients for Local Factors and Local Factors*ETF. *p*-value shows the significance test for Local Factor ETF=0. Fund flows over initial assets are winsorized at the 1% and 99% level. Driscoll-Kraay robust standard errors in parentheses. *p <.1; **p <.05; ***p <.01.

Table 4
ETF size

	100M		250M	
	(1) Large ETFs	(2) Small ETFs	(3) Large ETFs	(4) Small ETFs
A. Equity funds				
Dependent variable: Fund flows over initial assets				
Global factor	−1.856***	−1.855***	−1.856***	−1.856***
	(0.305)	(0.306)	(0.306)	(0.306)
Global factor*ETF	−3.763***	−1.381*	−3.617***	−2.110***
	(0.760)	(0.788)	(0.871)	(0.671)
Local factor	0.187***	0.187***	0.187***	0.187***
	(0.045)	(0.045)	(0.045)	(0.045)
Local factor*ETF	−0.009	−0.273**	0.103	−0.257**
	(0.088)	(0.115)	(0.117)	(0.100)
Fund performance controls	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes
Local factor ETF	0.178	−0.086	0.291	−0.070
p-value	.09	.471	.03	.502
Observations	197,422	198,127	193,487	202,062
No. of funds	2,631	2,734	2,559	2,806
R^2	.066	.063	.066	.063

This table reports the OLS coefficients from a regression of fund flows over initial assets on different explanatory variables. Panel A shows the results for equity funds and panel B for bond funds. The sample in every regression includes all mutual funds and either large (columns 1 and 3) or small (columns 2 and 4) ETFs. Two different thesholds for assets are consider to separate the sample of ETFs into small and large. Columns 1 and 2 (3 and 4) consider large ETFs as those with average assets larger or equal than US$100 (US$250) million. Local Factor is the median monthly industrial production growth for the investment scope of each fund. Global Factor is the change in the St. Louis Financial Stress Index. ETF is a dummy indicating whether or not a fund is an ETF. Fund Performance Controls indicates whether the regression includes three lags of the portfolio returns of the fund minus the average fund returns at the investment scope level. Local Factor ETF indicates the sum of the coefficients for Local Factors and Local Factors*ETF. *p*-value shows the significance test for Local Factor ETF = 0. Fund flows over initial assets are winsorized at the 1% and 99% level level. Driscoll-Kraay robust standard errors in parentheses. $*p < .1$; $**p < .05$; $***p < .01$.

separately for small and large ETFs (Table 4). Overall, the larger sensitivity of ETF flows to the global factor does not seem to be explained by small ETFs. If anything large ETFs have a higher sensitivity both for equity (panel A) and for bond funds (panel B).[27] The evolution over time of the sensitivity of mutual funds and ETFs to the global factor also suggests that the excess sensitivity of ETF flows is not driven by the sector's relative novelty. Figure 4, which we discussed in the previous subsection, plots the 36-month rolling slope coefficient for aggregate flows into all EM funds (the green line), for aggregate EM mutual fund flows (the red line), and for total EM ETF flows (the blue dashed line) with respect to our measure of global financial stress. The sensitivity of flows to both mutual funds and ETFs, and thus total flows, spiked

[27] Our results on the liquidity of ETF shares and excess the sensitivity of ETF flows, also shed light on the issue of whether the relative novelty of ETFs explains that greater sensitivity. Newly introduced products are likely to have lower liquidity, while more mature offerings offer greater liquidity. In Internet Appendix Table B9, we test whether the liquidity of ETFs could be mechanichally driving the large sensitivity of ETF flows to the global factor. We divide the sample into liquid and illiquid ETFs based on the median bid-ask spread. Our results, especially for equity funds, remain very similar across these two samples of ETFs suggesting that it is not the liquidity of ETFs that explain the differential flow behavior.

during the financial crisis, fell back to its precrisis value relatively quickly, and jumped again during the 2011 eurozone crisis. Since then, the sensitivity of traditional mutual funds flows to global financial conditions has trended back toward its precrisis average. But the sensitivity of ETF flows to global financial conditions has not reverted to its pre-crisis level. Rather, it has remained more than 30% higher than its precrisis average. Thus, Figure 4 demonstrates that the sensitivity of ETFs to the global factor has not declined as the sector matured. Rather, the growing importance of ETFs in the fund industry combined with the rise in ETF flows' sensitivity over the last several years appears to have made fund flows overall more sensitive to changes in global financial conditions.

We now determine whether the greater sensitivity that we have identified is related to fund characteristics which in turn are positively correlated with ETF status, but which can also be features of mutual funds. The average emerging market ETF in our sample is around 50% larger than the average mutual fund, so we test whether it is in fact large funds that are more sensitive to changes in global financial conditions (Table 5, columns 1 and 2). We allow the coefficient for the global factor to vary according to the size of the mutual fund by interacting the global factor with a dummy variable equal to one if the mutual fund is large, defined as having more than $250 million in assets.[28] Large equity mutual funds do not seem to have a significantly higher sensitivity to global factors (Table 5, panel A). While flows into large bond mutual funds do have a higher exposure to our measure of global push factors than flows to small bond mutual funds, the large funds are nonetheless significantly less sensitive than ETFs (panel B). Because larger mutual funds tend to have lower fees, our results regarding large funds also suggest that it is not the relatively low cost of investing via ETFs that motivates investors to behave differently.

Another key characteristic of ETFs is their passive management strategy.[29] We examine whether passively managed mutual funds are more sensitive to changes in global financial conditions than are actively managed mutual funds. The results in columns 3 and 4 of Table 5 show that passive equity and bond mutual funds are not significantly different from other mutual funds, and further that the change in specification does not alter the estimated coefficients for the global factor-ETF interaction. We therefore conclude that it is not ETFs' passive management that sets them apart from mutual funds in terms of their sensitivity to global shocks.

Because country-specific ETFs are much less common than country-specific mutual funds, one could be concerned that our results may reflect differences in the sensitivity of flows to multicountry (global and regional) funds relative to that of single-country funds, rather than any feature specific to ETFs. This is

[28] In Table B10 of the Internet Appendix, we experiment with alternative thresholds for what constitutes a large fund, and obtain very similar results.

[29] While active ETFs do exist, there are very few. Our data set includes more than 500 ETFs investing in emerging markets, of which only seven are actively managed.

Table 5
Exploring alternative hypotheses

	ETFs vs. large funds		ETFs vs. passive		ETFs vs. global funds	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Equity funds						
Dependent Variable: Fund flows over initial assets						
Global factor	−1.174***		−1.271***		−1.135***	
	(0.264)		(0.277)		(0.252)	
GF*ETF	−2.705***	−2.341***	−2.608***	−2.274***	−3.018***	−2.655***
	(0.652)	(0.534)	(0.620)	(0.522)	(0.825)	(0.737)
Local factor	0.192***		0.192***		0.192***	
	(0.043)		(0.043)		(0.043)	
LF*ETF	−0.134	0.028	−0.134	0.028	−0.133	0.029
	(0.086)	(0.073)	(0.086)	(0.073)	(0.085)	(0.073)
GF*>250M	−0.260	−0.175				
	(0.185)	(0.158)				
GF*passive			−0.195	0.098		
			(0.661)	(0.689)		
GF*country fund					−0.496	
					(0.333)	
GF*country fund*ETF					1.022	0.824
					(0.831)	(0.854)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment scope*time FE	No	Yes	No	Yes	No	Yes
Local factor ETF	0.058		0.058		0.059	
p-value	.547		.547		.541	
Observations	210,194	209,498	210,194	209,498	210,194	209,498
No. of funds	2,906	2,897	2,906	2,897	2,906	2,897
R^2	.066	.138	.066	.138	.066	.138
B. Bond funds						
Dependent variable: Fund flows over initial assets						
Global factor	−2.020***		−2.453***		−2.481***	
	(0.467)		(0.476)		(0.488)	
GF*ETF	−4.300**	−3.571*	−3.877**	−3.116*	−4.109*	−3.109*
	(2.013)	(1.915)	(1.948)	(1.836)	(2.157)	(1.834)
Local factor	0.135		0.135		0.136	
	(0.119)		(0.119)		(0.119)	
LF*ETF	−0.372	−0.264	−0.372	−0.265	−0.375	−0.265
	(0.331)	(0.360)	(0.331)	(0.360)	(0.332)	(0.360)
GF*>250M	−0.886***	−0.991***				
	(0.328)	(0.296)				
GF*passive			−3.733	−2.464		
			(2.522)	(2.457)		
GF*country fund					0.591	0.000
					(0.874)	(.)
GF*country fund*ETF					2.893	
					(5.124)	

This table reports the OLS coefficients from a regression of fund flows over initial assets on different explanatory variables and different sets of fixed effects for emerging market funds. Panel A shows the results for equity funds and panel B for bond funds. Local Factor (LF) is the median monthly industrial production growth for the investment scope of each fund. Global Factor (GF) is the change in the St. Louis Financial Stress Index. ETF is a dummy indicating whether or not a fund is an ETF. >250M is a dummy variable that equals one when the assets under management in a fund at a given point in time are larger than US$250 million. Fund controls indicates whether the regression includes fund control variables. These variables are the three lags of the portfolio returns of the fund minus the average fund returns at the investment scope level and the difference in logs of the MSCI stock market index in the domicile of each fund. Local Factor ETF indicates the sum of the coefficients for Local Factors and Local Factors*ETF. *p*-value shows the significance test for Local Factor ETF=0. Fund flows over initial assets are winsorized at the 1% and 99% level level. Driscoll-Kraay robust standard errors in parentheses. *p <.1; **p <.05; ***p <.01.

Table 5
(Continued)

	ETFs vs. large funds		ETFs vs. passive		ETFs vs. global funds	
	(1)	(2)	(3)	(4)	(5)	(6)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment scope*time FE	No	Yes	No	Yes	No	Yes
Local factor ETF	−0.237		−0.237		−0.239	
p-value	.526		.526		.521	
Observations	50,510	50,029	50,510	50,029	50,510	50,029
No. of funds	910	901	910	901	910	901
R^2	.094	.177	.093	.177	.093	.177

a particularly important concern given that global and regional funds may cater to less specialized, possibly less sophisticated, investors who are more sensitive to changes global financial conditions. However, these concerns are dispelled in columns 5 and 6 of Table 5, where we test whether the sensitivity of flows to country-specific mutual finds differs significantly from that of multicountry funds.[30] We fail to reject the null that the sensitivity of flows to single-country mutual funds differs from that of flows to multicountry mutual funds, and also fail to reject the null that flows to county-specific ETFs have a different sensitivity than flows to multicountry ETFs.

We have now ruled out a number of competing explanations for our baseline results. Neither the size, the passive management strategy, nor the multicountry investment scope of ETFs explains their greater sensitivity to changes in global financial conditions relative to traditional mutual funds. Taken together, the findings in this section also suggest that it is not the case that ETFs' low fees explain their greater sensitivity. This is because the lowest cost mutual funds are large, passively managed, or both, and we have confirmed that these characteristics on their own do not induce higher responsiveness to global shocks. By process of elimination, our results suggest that the enhanced liquidity that ETF provide might be important in explaining the exposure of these funds to the global factor. We will test this in a more direct way in the next section.

3.4 Direct test for the mechanism behind ETF flows' sensitivity to the global factor

In principle, our findings appear consistent with ETF flows being dominated by investors with a preference for liquidity. The notion of a liquidity clientele

[30] In Table B8 of the Internet Appendix, we also estimate Equations (1) and (2) separately for, on the one hand, global and regional funds and on the other hand country funds. For equity funds, results for the two groups are qualitatively and quantitatively similar (panel A). In the case of bond funds, we cannot reject the null that flows to country-specific ETFs have the same sensitivity to global financial conditions as country-specific mutual funds, but this is likely because the small number of country-specific bond funds in our sample. Our data set contains 98 country-specific EM bond funds, of which only eight are ETFs.

was first introduced by Amihud and Mendelson (1986). More recently, Ben-David, Franzoni, and Moussawi (2018) have shown that ETFs tend to attract investors with a preference for liquidity, relative to common stocks with data from the S&P 500. They show two pieces of evidence. First, that institutional investors holding ETFs trade more frequently (have a higher churn ratio) that institutional investors that hold common stocks. Additionally, they show that ETFs are held less by institutional investors, which reflect a higher ownership of retail investors. This type of investors could also present an additional layer of liquidity trading for ETFs as suggested by Stambaugh (2014). In this section, we directly investigate whether the greater sensitivity of ETFs to global risk is due to differences in the investor base, or to a particular preference for liquidity of investors holding ETFs.

To identify which of the two alternative explanations is consistent with the data, and to provide a more granular characterization of the link between the differential sensitivity to the global factor of ETFs and their particular investor clientele, we use the FactSet Ownership data set. This data includes details of fund ownership that allow us to design a test of both hypotheses at once.[31] With it, we construct two measures that reflect the characteristics of the underlying investors in ETFs. First, we construct a measure of retail investor ownership of ETFs. For each ETF in the sample, we compute the sum of all institutional holdings and divide it by the ETF's shares outstanding for each year in the sample. We then take the median across years for each ETF. To obtain the retail ownership share, we subtract the institutional ownership share from 100%. Second, we construct an average churn ratio for each ETF that is the ownership-weighted average churn ratio of the institutions that hold each ETF. For each institution, we follow Cella, Ellul, and Giannetti (2013) and Ben-David, Franzoni, and Moussawi (2018) and compute the churn ratio as the sum of the absolute value of the yearly change in dollar holdings divided by the institution's assets under management.[32] We then assess whether these two measures are related to the excess sensitivity of investor flows to the global factor for each ETF. To construct an ETF-specific excess sensitivity measure, we run our baseline specification one ETF at a time. More specifically, we estimate Equation (1) using a sample that includes all mutual funds but only one ETF. This gives us a coefficient γ_i for each ETF, which measures its

[31] In the Internet Appendix, we present alternative tests using data on separate accounts and institutional accounts from Morningstar Direct. The evidence from those tests suggest that retail ownership plays a role. However, the Morningstar Direct data do not allow us to measure the preference for liquidity of investors holding ETFs, which could be an important omitted variable in those estimations. Another potential concern with Morningstar Data is that it might not be representative of the ownership of ETFs. Table A7, which includes summary statistics for the Morningstar Data on ownership separate accounts, shows several ETFs with no presence of separate account owners. Because of these concerns we place greater weight on evidence from FactSet Ownership data.

[32] In the calculation of the churn ratio we exclude ETFs from the portfolio that might itself be related to the sensitivity of ETF flows.

Table 6
Using ETF characteristics to test the mechanism: FactSet data

	(1)	(2)	(3)	(4)	(5)
Dependent variable: Betas flows over GF for ETFs					
ETF retail ownership measure	−3.209	−6.392	−7.089	−4.581	−3.444
	(5.032)	(4.129)	(4.826)	(4.229)	(4.762)
ETF average churn ratio		−5.480***	−6.017***	−6.133***	−3.007**
		(0.829)	(0.942)	(1.447)	(1.053)
log(Assets)					−0.906
					(0.523)
Equity funds					−0.470
					(3.401)
Leveraged funds					2.970***
					(0.880)
Fund domicile FE	No	No	Yes	Yes	Yes
Investment scope FE	No	No	No	Yes	Yes
Observations	385	385	385	375	375
R^2	1.7e-03	.046	.094	.151	.16

This table reports the OLS coefficients from a regression of the sensitivity of individual ETFs to the global factor relative to mutual funds on different explanatory variables. ETF Retail Ownership Measure is computed using FactSet Ownership data. We first compute the sum of all the holdings for each ETF in the sample and divide it by the shares outstanding of that same ETF for each year in the sample. Then, we take the median across years for each ETF. And then we take the residual from this measure relative to 100% to obtain the retail ownership. ETF Average churn ratio is the ownership-weighted average churn ratio of the institutions that hold each ETF. For each institution we compute the churn ratio as the sum of the absolute value of the yearly change in dollar holdings divided by the Assets Under Management. Clustered standard errors at the fund-domicile level in parentheses. *p <.1; **p <.05; ***p <.01.

sensitivity to the global factor relative to the average mutual fund in the sample.

In Table 6, we relate the retail ownership and churn ratio measures to the γ_i for each ETF. These results provide additional insight into the link between excess sensitivity of flows and the characteristics of the clientele of investors holding ETFs. Notice that while retail ownership is negatively associated with ETFs γ_i the coefficient is not statistically different from zero. However, the average churn ratio of institutional investors holding ETFs is always negatively associated with γ_i and statistically significant. These results suggest that ETFs that are held more by investors that trade more often and have a shorter trading horizon—in other words, those ressembling liquidity traders—have flows that are significantly more sensitive to the global factor, even when controlling for the retail ownership of ETFs. In conclusion, both our indirect and direct tests of the mechanism strongly suggest that the presence of investors that act more as liquidity traders in ETFs is a significant factor explaining the higher sensitivity of ETF flows to the global factor relative to mutual funds.

4. Aggregate Implications: ETFs and the Global Financial Cycle in Emerging Markets

Having presented evidence that investor flows into dedicated emerging market ETFs are more sensitive to changes in global conditions than flows into EM mutual funds, in this section we ask whether this greater sensitivity

affects countries' exposure to the global financial cycle at the aggregate level.[33]

4.1 Baseline macro results

To formally explore the macro-level implications of our fund-level results, we construct a measure of ETFs' market penetration in each country, defined as the share of the country's equity market capitalization held by ETFs:

$$\text{ETF Share}_{ct} = \frac{\sum_{i \in ETF} w_{ict} A_{it}}{\text{Mcap}_{ct}}, \tag{3}$$

where w_{ict} is the share of ETF i's assets invested in country c at time t, and A_{it} is the ETF's total assets under management measured in U.S. dollars. In using share of outstanding held by ETFs to measure their importance, we follow previous work analyzing the effects of ETF ownership on the behavior of U.S. stock returns (Glosten, Nallareddy, and Zou 2021, Israeli, Lee, and Sridharan 2017, Ben-David, Franzoni, and Moussawi 2018). Both w_{ict} and A_{it} are obtained from EPFR.[34] The numerator thus captures the dollar value of ETFs' assets in country c at time t, while the denominator is the stock market capitalization of country c (Mcap_{ct}, also measured in U.S. dollars). In Figure 5, we examine how our measure of ETF market penetration relates to the sensitivity of capital flows and equity returns. On the horizontal axis, we plot the average share of assets held by ETFs for each country during the period 2010-2017. And on the vertical axis we plot the cross-sectional betas for portfolio equity inflows (the top panel) and stock market returns (the bottom panel) over the same period. The significant and negative slope coefficients indicate a statistically significant relationship for both variables. In the remainder of this section we present evidence that this relationship is in fact causal.

We formally test whether capital flows and asset prices are more exposed to global factors in countries with a greater ETF presence using the following specification:

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[33] Throughout this section we focus on portfolio equity flows and equity prices. We do this because both portfolio capital flows and bonds prices are much more diverse and more difficult to aggregate. For instance, portfolio debt liability flows in the balance of payments include purchases of both sovereign and corporate securities, both of which may be denominated in either domestic or foreign currencies. Accordingly, there are separate price indexes for sovereign and corporate debt in domestic and foreign currency. We therefore restrict our analysis to the aggregate implications for equity.

[34] We obtain both variables from the EPFR Asset Allocation database, which is different from the one that we use for our fund-level estimations. More specifically, the Asset Allocation database tends to have a smaller coverage of funds because fewer funds report cross-country allocations than report flows. Overall, the share of assets covered by the allocations data set is larger for ETFs relative to Mutual funds. Mutual funds assets in the Asset Allocation database are on average 6.45% of those in the Fund Flows database, while the share for ETFs is 18%. This percentages change across the type of fund and also across time in substantial ways. As such, we prefer not adjusting the A_{it} variable for this potential issue in most of our empirical exercises as it would involve making strong assumptions. In Section 4.4, we do provide reestimations of our results trying to adjust for this potential concern and show that our main results are qualitatively unchanged.

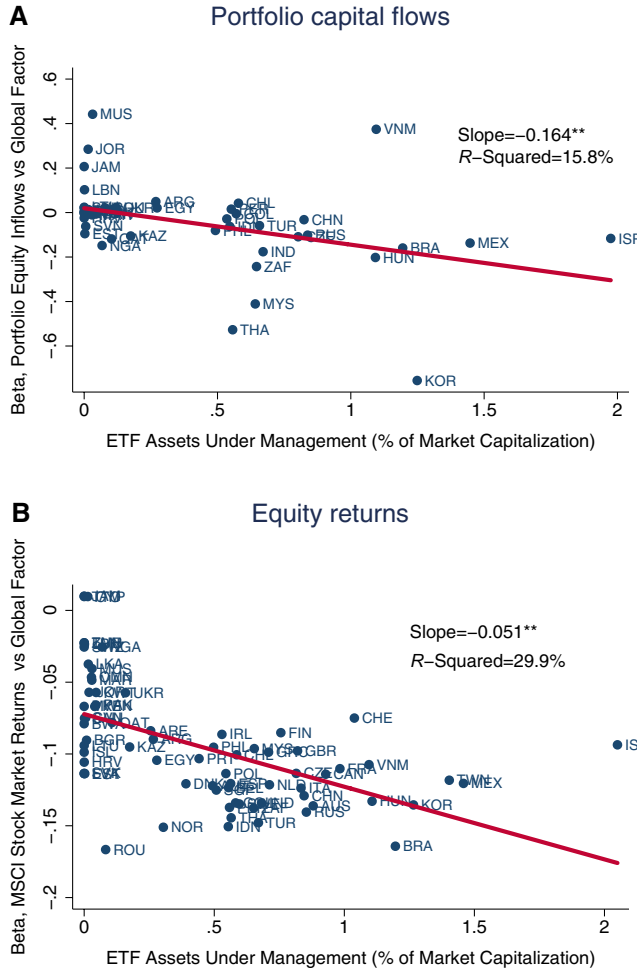

Figure 5
Country betas and ETF share of market capitalization
This figure depicts the exposure to global factors and its relationship with the presence of ETFs in each emerging market. In panel A, the vertical axis plots the coefficient of a regression of portfolio equity inflows (obtained from IMF Balance of Payments Statistics) on the change in the St. Louis Financial Stress Index. In panel B, the vertical axis plots the coefficient of a regression of MSCI stock market returns for each country on the change in the St. Louis Financial Stress Index. These regressions are for the period 2010-2017. The horizontal axis for both panels indicates the equity assets held by ETFs in each country divided by the total stock market capitalization. Slope and *R*-squared refer to the corresponding statistics for the linear fit of the scatter plot.

$$y_{ct} = \alpha_c + \eta GF_t + \mu^{ETF}(GF_t * \text{Share ETF}_{ct-1}) \quad (4)$$
$$+ \delta^{ETF}(\text{Share ETF}_{ct-1}) + \theta_t + \nu_{ct},$$

where y_{ct} is the aggregate variable of interest, either quarterly portfolio equity liability flows from the balance of payments (normalized by GDP) or monthly

MSCI country stock market returns. The global factor GF_t is defined as before. We lag the ETF share variable one period to avoid reverse causality, since large capital inflows in period t could mechanically boost the ETF share for the same period. We also include a set of country fixed effects (α_c) and in some specifications add time fixed effects (θ_t) as well. In Equation (4), μ^{ETF} captures how the sensitivity of capital flows and asset prices to global factors varies with the presence of ETFs.[35]

The results of our macro-level regressions, presented in Table 7, suggest that a greater ETF share is associated with a higher aggregate exposure to global financial shocks for both equity flows (panel A) and stock returns (panel B). We first confirm that, as one would expect, portfolio equity inflows and local equity returns are negatively related to increases the global financial stress index that we use to measure global financial conditions (column 1). Then in column 2 we interact our measure of global conditions with the ETF share in order to test whether the greater sensitivity we found at the fund level generates macro-level effects. The negative and significant coefficient for the interaction term indicates that the association between global shocks and equity flows and returns is indeed larger (in absolute value) when the ETF share of the local equity market is greater. The result holds even when we add time fixed effects, which strip out among other things any time trend in the ETF share (column 3). The coefficient estimates in columns 2 and 3 thus constitute the core result of our macro-level regressions, implying that our findings at the micro level have implications for aggregate financial variables.

How large is the effect? With the ETF share of equity assets at its mean (ETF share$_{ct}$ = 0.43 percentage points), the country's inflows beta with respect to the global financial conditions is −0.27; for a country with an ETF share one-standard-deviation higher (ETF share$_{ct}$ = 1.16 percentage points), this beta increases to −0.79, which implies an exposure 2.9 times higher.[36] The conclusions are qualitatively similar when looking at aggregate stock market returns (panel B). Increasing the ETF share by one standard deviation relative to the average ETF share, the beta associated with the global factor is 1.2 times higher. Thus the effects are economically as well as statistically significant.

4.2 Robustness and identification

One potential concern about these estimates is that of omitted variable bias. For instance, greater financial integration may lead to an increase in both the ETF share and the equity market comovement with global factors. We perform two additional exercises in order to demonstrate that our core results are not driven by a correlation between the ETF share and financial integration.

[35] Table A8 of the Internet Appendix presents summary statistics for the relevant macroeconomic variables.

[36] As noted below, there could be an omitted variable bias that could lead to this quantitative estimate being larger than its true value.

Table 7
Aggregate economic significance: ETF assets and country betas

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Dependent variable: Balance of payments gross portfolio equity inflows (% of GDP)							
Global factor	−0.201**	0.031		0.031		0.028	
	(0.090)	(0.110)		(0.109)		(0.128)	
GF*ETF share		−0.712***	−0.724***	−0.711***	−0.730***	−0.722***	−0.715***
		(0.097)	(0.071)	(0.108)	(0.081)	(0.101)	(0.072)
ETF share		−0.127**	−0.027	−0.127**	−0.026	−0.137**	0.001
		(0.055)	(0.051)	(0.054)	(0.050)	(0.055)	(0.051)
GF*MF share				−0.000	0.004		
				(0.013)	(0.012)		
Mutual fund share				−0.008	−0.015		
				(0.014)	(0.015)		
GF*Fin. integration						0.009	0.016
						(0.024)	(0.023)
Financial integration						0.051***	0.059***
						(0.008)	(0.008)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	Yes	No	Yes	No	Yes
Observations	2,035	2,035	2,032	2,035	2,032	2,035	2,032
No. of countries	43	43	43	43	43	43	43
R^2	.136	.155	.222	.155	.222	.183	.257
B. Dependent variable: MSCI country stock markets returns (basis points)							
Global factor	−9.09***	−7.49***		−7.00***		−7.42***	
	(1.57)	(1.53)		(1.40)		(1.55)	
GF*ETF share		−5.13***	−4.28***	−4.36***	−3.11***	−5.14***	−4.16***
		(0.88)	(0.77)	(0.96)	(0.72)	(0.88)	(0.73)
ETF share		−0.73***	−0.02	−0.73***	−0.36**	−0.72**	−0.38**
		(0.28)	(0.10)	(0.28)	(0.15)	(0.28)	(0.15)
GF*MF share				−0.41*	−0.51**		
				(0.24)	(0.24)		
Mutual fund share				0.11*	0.05		
				(0.06)	(0.05)		
GF*Fin. Integration						−0.03	0.02
						(0.04)	(0.04)
Financial integration						−0.03*	−0.02
						(0.02)	(0.01)
Country FE	Yes	Yes	No	Yes	Yes	Yes	Yes
Time FE	No	No	Yes	No	Yes	No	Yes
Observations	7,613	7,613	7,606	7,613	7,606	7,613	7,606
No. of countries	49	49	49	49	49	49	49
R^2	.112	.124	.354	.125	.361	.124	.359

This table reports the OLS coefficients from a regression of balance of payments portfolio equity liability flows over GDP (panel A) or MSCI country stock market returns (panel B) on different explanatory variables and different sets of fixed effects for emerging markets at the quarterly frequency. Global Factor (GF) is the change in the St. Louis Financial Stress Index. ETF Share is the assets under management of equity ETFs divided by the total equity market capitalization. Mutual Fund Share is the assets under management of equity of funds that are not ETFs divided by the total equity market capitalization. Financial Integration is total financial assets plus liabilities divided by GDP from Lane and Milesi-Ferretti (2018). All the estimations are for the period 2000-2017. Panel A estimations are at the quarterly frequency and panel B at the monthly frequency. The dependent variable is winsorized at the 1% and 99% level. Driscoll-Kraay robust standard errors in parentheses. *p <.1; **p <.05; ***p <.01.

First, in columns 4 and 5 of Table 7, we include alongside the ETF share the share of assets held by mutual funds (Mutual Fund Share) and interact this variable with the global factor. More formally, we estimate

$$y_{ct} = \alpha_c + \eta GF_t + \mu^{ETF}(GF_t * \text{Share ETF}_{ct-1}) \quad (5)$$
$$+ \delta^{ETF}(\text{Share ETF}_{ct-1}) + \mu^{MF}(GF_t * \text{Share MF}_{ct-1})$$
$$+ \delta^{MF}(\text{Share MF}_{ct-1}) + \theta_t + \nu_{ct},$$

where MF indicates the corresponding variable or coefficient is related to the mutual fund share. If our results on the ETF share were merely reflecting the fact that ETFs own more stocks in countries that are more financially integrated, and that, in turn, more financially integrated countries are more sensitive, then we would expect to find the same result for the mutual fund share that we do for ETFs. But we do not. The interaction with the mutual fund share is not statistically different from zero, with a small point estimate. Furthermore, when we add the variables capturing the mutual fund share, the coefficient for the ETF share interacted with the global factor is not affected.

The second exercise we perform is to explicitly control for countries' general degree of international financial integration. To this end, in columns 6 and 7 of Table 7 we include as a control the ratio of each country's gross financial assets and liabilities measured as a share of its GDP.[37] This is a measure of de facto international financial integration widely used in the literature. In Table 8 we experiment with alternative measures of financial integration, including de jure and other defacto measures. The other de facto measures that we use are the sum of equity external assets and liabilities divided by GDP (columns 1 and 2) and the sum of FDI external assets and liabilities over GDP (columns 3 and 4).[38] As a de jure measures of integration, we use the Chinn and Ito (2006) index of financial account openness, which is a broad index for the whole financial account (columns 5 and 6). For a more specific de jure measure of controls on cross-border equity flows, we use the equity inflows index developed by Fernandez et al. (2016) (columns 7 and 8). We interact these alternative measures of financial integration with our global financial stress measure in order to assess whether it is in fact general international financial integration that renders capital flows to emerging markets more sensitive to global conditions. In all these tests the estimated coefficient for the interaction between the ETF share and global financial conditions changes very little when we control for general financial integration.

Reverse causality is also a concern in our country-level regressions. For example, if there are investors who would like to quickly move in and out of risky assets, asset managers will likely set up ETFs that provide exposure to

[37] We obtain data on cross-border assets and liabilities from Lane and Milesi-Ferretti (2018).

[38] We use FDI assets and liabilities to measure openness because these are correlated with general financial openness, but do not directly depend on the equity liabilities of which ETF and mutual fund holdings are a component. We thank an anonymous referee for suggesting this measure.

Table 8
Aggregate economic significance: Controlling for alternate measures of financial integration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Dependent variable: balance of payments gross portfolio equity inflows (% of GDP)								
Global factor	0.038		0.020		0.044		−0.169	
	(0.110)		(0.130)		(0.093)		(0.193)	
GF*ETF share	−0.716***	−0.729***	−0.727***	−0.714***	−0.687***	−0.718***	−0.708***	−0.711***
	(0.097)	(0.069)	(0.099)	(0.070)	(0.101)	(0.077)	(0.101)	(0.073)
ETF share	−0.129**	−0.026	−0.132**	−0.006	−0.112**	−0.038	−0.120**	−0.018
	(0.056)	(0.050)	(0.055)	(0.051)	(0.055)	(0.050)	(0.057)	(0.053)
GF*Equity integration	−0.015	−0.014						
	(0.051)	(0.052)						
Equity integration	0.050	0.066						
	(0.077)	(0.081)						
GF*FDI integration			0.054	0.068				
			(0.090)	(0.085)				
FDI integration			0.133***	0.148***				
			(0.021)	(0.021)				
GF*Eq. inflow controls					−0.087	−0.058		
					(0.173)	(0.195)		
Eq. inflow controls					−0.309**	−0.231		
					(0.130)	(0.168)		
GF*Chinn-Ito FO							0.334*	0.334*
							(0.183)	(0.182)
Chinn-Ito FO							−0.279	−0.283
							(0.280)	(0.276)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,035	2,032	2,035	2,032	1,745	1,743	2,030	2,028
No. of countries	43	43	43	43	37	37	43	43
R^2	.156	.223	.186	.258	.165	.235	.155	.22
B. Dependent variable: MSCI country stock market returns (basis points)								
Global factor	−7.58***		−7.34***		−7.69***		−8.10***	
	(1.53)		(1.56)		(1.91)		(1.76)	
GF*ETF share	−5.09***	−4.15***	−5.15***	−4.17***	−5.34***	−3.93***	−5.26***	−4.31***
	(0.88)	(0.73)	(0.89)	(0.73)	(0.94)	(0.75)	(0.89)	(0.74)
ETF share	−0.73***	−0.36**	−0.72**	−0.38**	−0.75***	−0.42***	−0.77***	−0.44***
	(0.28)	(0.15)	(0.28)	(0.15)	(0.27)	(0.16)	(0.29)	(0.15)
GF*Equity integration	0.15	0.14		0.17				
	(0.14)	(0.12)		(0.12)				
Equity Integration	0.06	0.16						
	(0.16)	(0.10)						
GF*FDI integration			−0.27	−0.12				
			(0.16)	(0.15)				
FDI integration			−0.12**	−0.05				
			(0.05)	(0.04)				
GF*Eq. inflow controls					0.61	1.38*		
					(0.80)	(0.70)		
Eq. inflow controls					−0.41	0.28		
					(0.73)	(0.55)		
GF*Chinn-Ito FO							0.97	0.18
							(1.20)	(1.14)
Chinn-Ito FO							0.40	0.64
							(1.24)	(0.72)

This table reports the OLS coefficients from a regression of Balance of Payments Portfolio Equity Liability Flows over GDP (panel A) or MSCI Country Stock Market Returns (panel B) on different explanatory variables and different sets of fixed effects for emerging markets at the quarterly frequency. Global Factor is the change in the St. Louis Financial Stress Index. ETF Share is the assets under management of equity ETFs divided by the total equity market capitalization. Equity (FDI) Integration is total equity (FDI) assets plus equity (FDI) liabilities divided by GDP from Lane and Milesi-Ferretti (2018). Equity Inflows Controls is the equity infows capital controls measure in Fernandez et al. (2016). Chinn-Ito FO is the financial openness from Chinn and Ito (2006). All the estimations are for the period 2000-2017. Panel A estimations are at the quarterly frequency and panel B at the monthly frequency. The dependent variable is winsorized at the 1% and 99% level. Driscoll-Kraay robust standard errors in parentheses. $*p < .1$; $**p < .05$; $***p < .01$.

Table 8
(Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	7,613	7,606	7,613	7,606	6,625	6,621	7,442	7,438
N. of countries	49	49	49	49	42	42	48	48
R^2	.124	.359	.125	.359	.121	.368	.121	.355

those assets. To test whether the creation of ETFs to provide access to already volatile or high-beta markets does not drive our results, in Table 9 we focus the relationship between ETF holdings which are arguably more *exogenously* determined and sensitivity to global financial shocks. Specifically, we construct an ETF share measure which includes only the emerging market assets held by global and regional ETFs, as opposed to country specific funds. Because these funds' holdings are diversified across countries, it is less likely that their holdings are endogenously determined by a desire to access high-beta emerging markets. When when redo our analysis using this measure of ETF holdings in Table 9, we find results very similar to those in Table 7. Once again, both flows and returns respond more to changes in global financial conditions in markets where ETFs own a larger share of the equity market capitalization.[39]

4.3 Additional evidence from Vanguard ETFs index change

We conduct an additional test linking ETF share and the betas to the global factor, using an event that provides us with arguably exogenous variation in ETF share. In October 2012, one of the largest investment management companies, Vanguard, announced that their index funds and ETFs would transition from tracking MSCI indexes to FTSE indexes. This change implied that several important index mutual funds and ETFs would adjust the country weights in their portfolios to match the those of new index. To the extent that the affected funds are large enough to affect the overall country investments, this generates variation in the mutual fund and ETF shares. This variation is arguably unrelated to a country's fundamentals as Vanguard's motivation for the index change was the lower fees charged by FTSE for the use of its indexes.[40] Figure 6 depicts the change in the share of the local market capitalization held by Vanguard ETFs from before the start of the transition (2012q3) through its completion (2013q3). The South Korea's ETF share decreased very substantial becasue MSCI indexes classified South Korea as an emerging market (with a large benchmark weight in their MSCI Emerging Markets Index), while FTSE classifies South Korea as an developed market (with only a small weight in these indexes).

[39] In the Internet Appendix, we do a more stringent version of this test in Table B16, where we construct the mutual fund and ETF share using global funds. Once again, results remain very similar to our baseline specification.

[40] Vanguard publicly stated that cost wat the motive for the move. See for example, Pressman (2012).

Table 9
Aggregate economic significance: No country funds

	BoP equity inflows			Stock market returns	
	(1)	(2)	(3)	(4)	(5)
Dependent variable above each column					
Global factor	−0.006		−0.014	−6.549***	
	(0.191)		(0.182)	(1.375)	
GF*ETF share (excl. country funds)	−0.646***	−0.754***	−0.487***	−6.165***	−4.429***
	(0.156)	(0.163)	(0.105)	(2.212)	(1.483)
ETF share (excl. country funds)	−0.320**	−0.079	−0.327***	−1.645**	−1.403***
	(0.134)	(0.187)	(0.110)	(0.661)	(0.418)
GF*MF share (excl. country funds)	−0.138**	−0.130*	−0.057*	−1.078**	−1.207***
	(0.067)	(0.073)	(0.030)	(0.458)	(0.370)
MF share (excl. country funds)	0.005	−0.020	−0.007	0.335***	0.119
	(0.018)	(0.019)	(0.008)	(0.127)	(0.082)
Country FE	Yes	Yes	Yes	Yes	Yes
Time (monthly frequency) FE	No	No	No	No	Yes
Time (quarterly frequency) FE	No	Yes	No	No	No
Observations	2,089	2,087	2,028	7,613	7,606
No. of countries	43	43	43	49	49
R^2	.111	.173	.112	.129	.364

This table reports the OLS coefficients from a regression of Balance of Payments Portfolio Equity Liability Flows over GDP (columns 1-3) or MSCI Country Stock Market Returns (columns 4 and 5) on different explanatory variables and different sets of fixed effects for emerging markets at the quarterly frequency. Global Factor is the change in the St. Louis Financial Stress Index. ETF Share is the assets under management of equity ETFs divided by the total equity market capitalization. Mutual Fund Share is the assets under management of equity of funds that are not ETFs divided by the total equity market capitalization. ETF and Mutual Fund Share are computed by using only global or regional funds (i.e., excluding country funds). Column 3 uses the ETF and Mutual Fund Share adjusted by the ratio of AUM in the EPFR Fund Flows data set to the EPFR Asset Allocation data set for each moment of time. All the estimations are for the period 2000-2017. Columns 1-3 estimations are at the quarterly frequency and columns 4 and 5 at the monthly frequency. The dependent variable is winsorized at the 1% and 99% level. Driscoll-Kraay robust standard errors in parentheses. *p <.1; **p <.05; ***p <.01.

We examine how this plausibly exogenous variation in ETF share relates to the sensitivity of total portfolio equity inflows to the global factor. More specifically, for each country c we estimate two βs:

$$y_{ct} = \alpha + \beta_c^{Pre} GF_t + \nu_{ct} \quad if \quad t \in Pre, \tag{6}$$

$$y_{ct} = \alpha + \beta_c^{Post} GF_t + \nu_{ct} \quad if \quad t \in Post, \tag{7}$$

where Pre and $Post$ denote time periods before the start and after the completion of the transition of Vanguard funds from MSCI to FTSE indexes. For each country we then compute the difference between coefficients ($\Delta\beta_c = \beta_c^{Post} - \beta_c^{Pre}$). This captures how much the exposure of capital inflows to the global factor changes before and after the Vanguard index change. The more negative $\Delta\beta$, the larger the increase in the exposure to the global factor.

To analyze whether the ETF share has a causal effect on the exposure to the global factor, we run cross-sectional bivariate regressions of $\Delta\beta_c$ on the change in ETF share before and after the Vanguard index change. When calculating the ETF and MF shares for this exercise, we use global and regional funds, alleviating concerns that this is driven by particular country funds. Table 10, panel A, presents the results of this exercise. Column 1 shows ordinary least squares (OLS) estimations of these $\Delta\beta_c$ on the change in ETF and MF shares

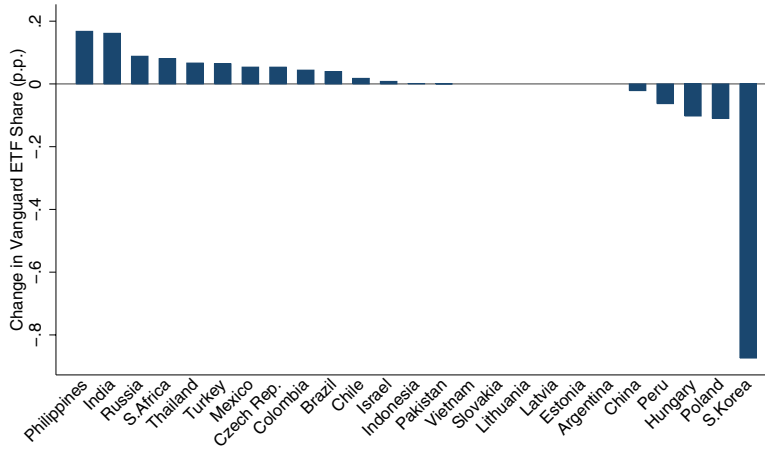

Figure 6
Change in Vanguard country ETF share
This figure depicts the change in the ETF share computed using Vanguard funds only for different emerging markets. Difference Vanguard ETF share is the difference in ETF share computed using only Vanguard multicountry funds from 2013q3 to 2012q3, measured in percentage points.

when we include only Vanguard funds to calculate these shares. The Difference ETF Vanguard Share variable shows a negative and significant relationship with $\Delta\beta_c$, implying an increase in ETF share for Vanguard funds is associated with a more negative beta (a higher exposure to the global factor). We find no statistically significant relationship for the change in the Vanguard MF Share. In column 2 we conduct the same estimation but using the change in the aggregate ETF and MF shares, where we find a similar result to column 1. Then, in columns 3 and 4 we instrument the aggregate Difference ETF Share variable with the Difference ETF Vanguard Share variable, obtaining similar results, with even very similar coefficients to column 2. And in column 5 we instrument both aggregate differences in ETF and MF shares with the difference in ETF and MF Vanguard shares. In this case we lose some precision in the estimation but results are qualitatively similar. For robustness, in Table 10, panel B, we estimate a difference-in-differences specification around the Vanguard change, where we obtain very similar results. Overall then, pattern of change around Vanguard's change of index provider provides additional evidence on the causal effect of ETF presence on the exposure of capital inflows to the global factor.

4.4 Linking fund-level to country-level estimates

We conclude the discussion of our country-level estimates by examining how they relate to the estimates we obtained in Section 3 using fund-level data.[41]

[41] We want to thank an anonymous referee for providing very insightful comments that helped us to back out the comparisons between our fund- and country-level estimates that we use in this section.

Table 10
Change in betas and change in ETF share around the Vanguard index change

	(1) OLS	(2) OLS	(3) IV 2SLS	(4) IV 2SLS	(5) IV 2SLS
A. 4-quarter betas					
Dependent variable: Difference betas to the global factor					
Difference Vanguard ETF share	−2.503***				
	(0.320)				
Difference Vanguard MF share	−0.517				
	(0.590)				
Difference ETF share		−1.256***	−1.389***	−1.451***	−1.579*
		(0.282)	(0.193)	(0.115)	(0.916)
Difference MF share		0.349		0.364*	1.109
		(0.207)		(0.209)	(5.299)
Observations	25	25	25	25	25
R^2	.481	.453	.372	.443	.105
B. Difference-in-differences					
Dependent variable: 4-quarter rolling betas					
Post	0.075				
	(0.054)				
Difference Vanguard ETF share	1.394***	1.394***		1.365***	
	(0.246)	(0.250)		(0.247)	
Difference Vanguard ETF share*Post	−0.593***	−0.593***	−0.593***	−0.583***	−0.583***
	(0.138)	(0.140)	(0.140)	(0.143)	(0.142)
Difference Vanguard MF share				−0.634**	
				(0.274)	
Difference Vanguard MF share*Post				0.215	0.215
				(0.250)	(0.249)
Time FE	No	Yes	Yes	Yes	Yes
Country FE	No	No	Yes	No	Yes
Observations	250	250	250	250	250
R^2	.206	.232	.669	.257	.67

This table reports coefficients from regressions of betas to the global factor on different explanatory variables. Difference Vanguard ETF (MF) Share is the difference in ETF (MF) Share computed using only Vanguard multicountry funds from 2013q3 to 2012q3. Difference ETF (MF) Share is the difference in ETF (MF) Share computed using multicountry ETF (MF) funds from 2013q3 to 2012q3. Panel A uses as the dependent variable the difference in betas to the global factor computed as follows. For each country, we regress the Balance of Payments Portfolio Equity Liability Flows over GDP on the change in the St. Louis Financial Stress Index for two different periods. The before period, which is before the Vanguard Index Change started to be implemented (2013q1). The after period starts one quarter after the move is fully completed (2013q4). For each period we compute the beta using a window of four quarters. Columns 1 and 2 use OLS estimation. Columns 3 and 4 use two-stage least squares instrumental variables where the Difference ETF Share variable is instrumented with the Difference Vanguard ETF Share. Column 5 uses two-stage least squares instrumental variables where the Difference ETF Share and Difference MF Share variables are instrumented with the Difference Vanguard ETF Share and Difference Vanguard MF Share variables. Robust standard errors in parentheses. Panel B is a difference-in-differences specification that uses four-quarter rolling betas as the dependent variable. The sample period is from 2012q3 until 2014q4. Post is a dummy variable that indicates the post period after the Vanguard change is fully complete (2013q4 onward). Clustered standard errors at the country level in parentheses. *p <.1; **p <.05; ***p <.01.

Overall, we want to analyze whether our results in both sections are internally consistent. For that, we compare how much the dollar flow sensitivity increases when one replaces US$1 into a mutual fund with US$1 into an ETF for both the fund-level and country-level regressions. At the fund level, the dollar flow sensitivity to the global factor is[42]

[42] To derive this, we take as a starting point our fund-level estimation in Equation (1) and multiply everything by A_{it-1}.

$$\frac{\partial F_{it}}{\partial GF_t} = \beta A_{it-1} + \gamma ETF_i A_{it-1}. \quad (8)$$

From Equation (8) we can obtain how much the dollar flow sensitivity changes at the fund-level if we move US$1 from a mutual fund into an ETF (the marginal effect), which is $\frac{\beta+\gamma}{\beta}$. Next, we find this relative marginal effect at the country-level estimations. In this case, the dollar flow sensitivity to the global factor is[43]

$$\frac{\partial F_{ct}}{\partial GF_t} = \eta GDP_{ct} + \mu^{ETF} GDP_{ct}\left(\frac{A_{ct}^{ETF}}{Mcap_{ct}}\right) + \mu^{MF} GDP_{ct}\left(\frac{A_{ct}^{MF}}{Mcap_{ct}}\right), \quad (9)$$

where F_{ct} are the dollar inflows from the balance of payments for country c at time t, $A_{ct}^{ETF} = \sum_{i \in ETF} w_{ict} A_{it}$ and $A_{ct}^{MF} = \sum_{i \in MF} w_{ict} A_{it}$. We can then use our country-level results to calculate how much moving US$1 from mutual funds into ETFs for a given country would change the dollar flow sensitivity, which is given by $\frac{\mu^{ETF}}{\mu^{MF}}$. Notice that one test regarding the internal consistency of our fund- and country-level results is whether these relative marginal effects are similar, that is, $\frac{\beta+\gamma}{\beta} = \frac{\mu^{ETF}}{\mu^{MF}}$.

To more formally compare these two ratios, we first compare point estimates from our micro and macro estimations and then conduct a statistical test of the equality of these two ratios. Throughout this exercise, we use estimates generated using a sample of funds that excludes single-country funds, since this helps to limit omitted variable bias and concerns about reverse causality. To calculate how much the dollar flow sensitivity to the global factor changes when we move US$1 from a mutual fund into an ETF with our micro estimates, we use the coefficients presented in column 5 of Table 5. In there, notice that $\hat{\beta} = -1.135$ and $\hat{\beta} + \hat{\gamma} = -4.153$. Then, $\frac{\hat{\beta}+\hat{\gamma}}{\hat{\beta}} = 3.66$.

To compute the marginal effects with our country-level estimation, we first do an adjustment to account for potential differences in coverage between the EPFR Fund Flows database (used in the fund-level estimations) and the EPFR Asset Allocation database (used in the macro-level regressions). For each month in our sample, we compute the ratio of total AUM in the Fund Flows database to the AUM in the Asset Allocation database. We do this separately for ETFs and mutual and exclude country funds. Then, we multiply this ratio in each moment of time by the ETF and mutual fund share. With these new adjusted variables we reestimate the specification in column 1 of Table 9, and show the results in column 3 of the same table. Qualitatively our results remain unchanged, though the point estimates vary with respect to our main estimation. According to the coverage-adjusted estimates, moving

[43] To derive this, we take as a starting point our country-level estimation in Equation (5) and multiply everything by GDP_{ct}.

US$1 from mutual funds into ETFs for a certain country increases the dollar flow sensitivity by $\frac{\hat{\mu}^{ETF}}{\hat{\mu}^{MF}} = \frac{-0.487}{-0.057} = 8.5$. This point estimate is larger than that based on the fund-level estimates, but the numbers are of a similar magnitude. Furthermore, we perform a statistical test on the equality of these two ratios and we cannot reject the null hypothesis that these two numbers are equal at conventional significance levels. Overall, this comparison provides evidence of a close mapping between our fund-level and country-level estimations.

5. Conclusion

Since the early 2000s, the asset management industry has undergone a significant change as the assets under management of ETFs have expanded rapidly. In this paper, we present evidence that the growing role of ETFs as a channel for cross-border capital flows has increased the exposure of emerging markets to the global financial cycle. We use detailed micro data at the fund level from 1997 until 2017 to document that investor flows into dedicated emerging market ETFs are more sensitive to global factors than flows into emerging market mutual funds. This difference is economically large, with betas to global factors almost 2.5 times bigger for equity ETFs, and 2.25 time bigger for bond ETFs, relative to non-ETFs.

We study the underlying mechanism behind this result and find that ETFs, due to their continuous intraday trading, attracts a clientele of investors that trade more often and have a shorter trading horizon. Existing theories of limits to arbitrage, coordination failure models in financial markets, and collateral constraints explain why these types of investors might respond more strongly to global financial conditions relative to investors with longer trading horizons. While it is outside of the scope of this paper to test which one of these theories might explain the behavior of the investors holding ETFs, we think it would be a promising area for future research.

In addition, we demonstrate that our findings at the micro-level have important implications for aggregate cross-border capital flows: we find that greater holdings of equity by foreign ETFs is associated with a higher exposure to global financial conditions both for aggregate portfolio equity flows and for stock market returns. These results are not only statistically significant, but also of economic importance. A one-standard-deviation increase in the percentage of local assets held by ETFs implies a sensitivity to global financial shocks that is 2.5 times in terms of portfolio equity flows and almost 1.4 times larger for prices. Overall, our results suggest that greater use of ETFs as a conduit for capital flows to emerging markets has increased the exposure of these economies to the global financial cycle. Our findings also present one example of how the rising popularity of passively managed, benchmarked instruments contributes to market comovement and capital flows synchronicity at the expense of local fundamentals.

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