MICHAEL LEE-CHIN & FAMILY INSTITUTE
FOR STRATEGIC BUSINESS STUDIES

Firm Foreign Activity and Exchange Rate Risk

Working Paper Series in Strategic Business Valuation
WP 2022-02

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Acknowledgements

The authors thank George Allayannis, Joon Woo Bae, Ron Balvers, Lilian Ng, Takeshi Yamada, Le Zhang, and seminar participants at the College of Business and Economics at Australian National University for their helpful comments. Amir Akbari is an Assistant Professor of Finance at the DeGroote School of Business, McMaster University. Francesca Carrieri is an Associate Professor of Finance at the Desautels Faculty of Management, McGill University.

February, 2022

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Abstract

Globally focused firms are the drivers of foreign exchange rate (FX) risk. Among the risk of the G10 currencies, the comovements with the largest currencies are the most important of the postulated risk factors. Firms' exposure to FX risk is time-varying, is larger with respect to the home currency, and responds to fluctuations in the home FX. Firms are more sensitive to the currency risk of their geographical region, in line with a gravity effect, are more exposed in countries with a large export sector and when located in the peripheries of the global trade network. The extent of firms' foreign activity most strongly matters in explaining their FX risk exposure, controlling for other firm-level characteristics such as size, leverage, and liquidity. Overall, our results point to the importance of the trade channel over the investment channel for FX risk pricing.

Keywords: International Finance, Foreign Exchange Rate Risk, Currency Exposure, Multinationals, Corporate Foreign Sales

JEL classification: F31, F23, G12, G15.

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1 Introduction

What links asset prices and international economic activity? Different measures of the real economy are shown to play a role in explaining relative changes in international equity versus industry correlations (Carrieri, Errunza, & Sarkissian, 2012), diversification benefits from investing abroad (Bae, Elkamhi, & Simutin, 2019), currency carry trades' returns (Richmond, 2019) and increases in financial market integration (Akbari, Ng, & Solnik, 2020). The goal of this paper is to explore the role of corporate foreign activity in driving international asset prices in the presence of foreign exchange rate risk (FX risk).

Global financial risk can stem from a host of real-economy events, ranging from shocks to foreign supply and demand of goods and services, shifts in their relative prices, and disruptions to supply chains around the world. These sources of risk intensely affect globally-focused companies operating in open economies, both directly or indirectly. We show that a set of firms with direct exposure to the international business activity, those with a significant percentage of sales in foreign countries, are important drivers of the pricing of global risk, which has been shown to be elusive in previous literature. What is more, aggregate measures of international trade also explain the systematic exposure to FX risk of these globally-focused firms.

A number of studies have revealed the importance of foreign sales for stocks and their prices. Doidge, Griffin, & Williamson (2006) find that firm-level characteristics such as foreign sales are consistent with international stocks' exchange rate exposure. Amihud, Bartov, & Wang (2013) provide some evidence that corporate foreign trade risk is part of the systematic risk in the cross-section of U.S. companies. More recently, Hoberg & Moon (2019) show that U.S. companies exposed to offshore activities earn a risk premium. Looking at the holdings of mutual funds, Demirci, Ferreira, Matos, & Sialm (2021) document that domestic firms with high foreign sales provide international diversification and help indirectly diversify risk internationally. These papers, however, do not directly exploit the extent of the international economic activity for global asset pricing.

We posit that country-level portfolios built only from globally-focused companies help capture dynamic risk stemming from latent global state variables in international equity markets. The international trade linkages of these firms expose them to shocks from the changing economic activity and relative aggregate prices around the world. These linkages mirror the global shocks in relative competitiveness into local stock prices. As a result, the equity returns of these portfolios comove more strongly with global risk factors, which alleviates the challenges in the empirical identification of the risk sources.

Our main test assets are the aggregation of companies with a high foreign sales ratio (H-FSR firms). We construct country portfolios for 41 markets from 24,072 H-FSR firms, which we identify based on an exhaustive set of data cleaning filters for the period of 1996 to 2019. The literature on foreign exchange exposure also examines H-FSR firms and focuses on the impact of exchange rate fluctuations on firms' valuation through firms' future (anticipated) cash flow. This research, however, pays less attention to the study of systematic risk factors that contribute to the firms' cost of equity capital. Our paper intends to fill this gap. In our framework, purchasing power parity (PPP) deviations that likely have effects on the volatility of expected future cash flows also impact firms' discount rate through a risk premium.[1]

Our paper deviates from the standard international asset pricing research, which largely focuses either on the cross-section of stocks in single-country studies or on marketwide portfolios, like broad country indices, in a small cross-section of countries. Single-country studies fail to capture the heterogeneity across countries, and the analysis of multi-country index studies is muddled by the effect of domestically focused firms. In fact, while index aggregation helps reduce the noise and other microstructure effects from single stock prices, it also masks crucial cross-sectional variations in the test assets needed to identify global sources of risk. We find that the H-FSR portfolios provide richer information with respect to the global risk factors and their dynamics than the broader country indices. These portfolios have higher Sharpe ratios,

[1] See Choi (1986) who examines exposure to exchange rate changes in relation to firm value and discusses the need of a formal unified model to combine the effects of exchange rates changes with the effects on the cost of capital.

correlate more strongly with global risk proxies, and have a more complex factor structure, as shown by their principal components.

Our empirical strategy includes a host of unconditional and conditional estimation approaches to measure covariances, correlations, and exposures to global risk factors for a large cross-section of portfolios. We then rely on panel regressions and exploit the time-varying quantities of risk to show how common sensitivity to foreign activity matters for global asset pricing. The results can be summarised as follows. First, we establish that the H-FSR portfolios contribute significantly to pricing the FX risk. Studying the G10 currencies (nine exchange rate risk measures versus the U.S. dollar), we observe that the comovements with larger currencies, such as the euro, the British pound, and the Swiss franc, significantly explain the returns of the H-FSR firms, consistent with theoretical predictions. The estimated prices for the exchange rate risk factors have more statistical significance and are economically larger than the measures obtained through broad country index portfolios. This suggests that these companies, which are identified from the underlying characteristics linked to the real economic activity, are more sensitive to global shocks. Indeed, we fail to observe such a relationship studying the portfolios built from low foreign sales ratio firms (L-FSR portfolios). We also observe that some exchange rate factors have a negative price of risk, representing a hedging component for investors. Thus global risk linked to shocks like PPP deviations is not necessarily value-reducing for internationally-oriented firms.

Second, we show that the time-varying sensitivity to the exchange rate risk for the H-FSR firms is generally the largest with respect to their home currency but is also substantial with respect to the risk of other currencies. In addition, this sensitivity is inversely related to home currency depreciations and increasing in the level of firms' foreign activity. In these periods, the cash flow of the H-FSR firms is shielded by means of income from foreign connections, making these firms relatively more attractive from the perspective of global (dollar-based) investors, despite the depreciation in their home currency.

Third, we find that the time-varying exposures of the H-FSR portfolios are associated with the real global economy through measures of aggregate export intensity and trade centrality, controlling for a range of country and time variables. The strong association with the trade variables is consistent with our finding that the average exchange rate sensitivity of firms within a geographical region is generally higher with respect to currencies of that region, which points to a trade gravity effect. This sensitivity is stronger for firms in countries with a larger export sector, and interestingly, it is weaker for firms in countries that are central to the global trade network. The negative association with trade centrality is in line with the findings of Richmond (2019), who documents that countries which are more central in the network have lower interest rates and FX risk premia. These links are instead not noticed when we study the sensitivities for the L-FSR portfolios. Analyzing firm characteristics across our sample countries, we also observe that higher FX risk sensitivity is explained by the extent of the foreign activity measured by the size of firms' exports and foreign sales. On the other hand, we find no evidence that relates the risk sensitivities to aggregate measures of capital flows, measured by foreign portfolio investment or foreign direct investment. Overall, our results indicate an important role for the trade channel in pricing the international equity markets.[2]

We run several robustness checks for our asset pricing analysis with respect to the composition of the H-FSR portfolios, for example, by excluding the U.S. or countries with a low number of FSR firms. We also consider other model specifications to check for segmentation and for a country-specific risk that instead would manifest itself as home currency risk, and find that our results are confirmed.

In sum, the evidence suggests a strong link between global asset prices and the real economy in an international finance and business context. Swings in PPP, which are important to explain countries' global trade patterns and companies' foreign sales scope, are also related to investors' portfolio choice and, therefore, asset prices. Hence this paper contributes to the existing literature demonstrating that FX risk is priced through a plausible channel, exposure to foreign trade activity.

As global investors care about exchange rate risk, by extension, so do corporate managers, who will be interested in what asset pricing model best to use to estimate discount rates and how to develop projects'

[2] All throughout, we refer to the trade channel to broadly indicate real economy activities recorded in the flows of the current account, such as sales from exports (from the trade balance) and sales from foreign operations (from the distributed profits in the primary income balance).

sensitivities to the risk factors. By showing the pricing of additional systematic global risk, we also provide support for corporate hedging activities, such as foreign exchange rate hedging, in the presence of frictions. Indeed investors' information asymmetry is likely to be more acute across countries due to very different institutions, governance, and culture around the world (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998; Fauver, Houston, & Naranjo, 2003; Kwok & Tadesse, 2006; Shao, Kwok, & Guedhami, 2010).[3] Our results are thus important for both investors and companies that need to understand the sources of systematic risk in the global economy.

The remainder of the paper is organized as follows. We cover the related literature in Section 2. Section 3 presents the testable hypotheses, explains the methodology, and covers the data. Results from the asset pricing tests are in Section 4, while those about the risk sensitivities are in Section 5. Section 6 concludes.

2 Related Literature

Our interest in the role of companies' foreign activity on global risk pricing places this paper primarily within the international asset pricing literature, while creating a bridge with the one on the firms' cash flow exposure to exchange rate fluctuations.

The seminal paper by Adler & Dumas (1983) tackles both asset pricing theory and corporation finance within an international framework, and gives empirical insights on the role of FX exposure.[4] The evidence of currency exposure and its pricing has been conflicting, as shown in two parallel papers by Jorion (1990, 1991). The first paper finds significant exposure to exchange rate changes for U.S. multinational companies (MNCs) as a function of companies' foreign sales and shows that such exposure varies over sub-periods. The follow-up paper, however, is inconclusive on whether FX risk is priced using portfolios of U.S.

[3] In a complete, perfect, and unified international capital market, corporate hedging is irrelevant. See Adler & Dumas (1983) for a discussion of the challenges in measuring exposures and of when hedging decisions may matter.
[4] The FX risk has also been supported in other theoretical models, starting with Solnik (1974), Sercu (1980), and Stulz (1981, 1984). More recently papers have explored alternative dimensions of FX risk together with market risk. For instance, Chaieb & Errunza (2007) develop a model of partially segmented markets with PPP deviations for securities accessible and not accessible to foreign investors and show that they command a segflation premium.

industries with different FX exposure. Indeed, it could be the case that some companies' cash flows are affected by exchange rate variability and, at the same time, that FX risk is not systematic.

Overall, the literature has argued that FX exposure is quite complex and thus difficult to identify.[5] For example, Amihud (1994) finds no significant exposure for a sample of the largest U.S. exporting firms. Bartov, Bodnar, & Kaul (1996) show that change from fixed to floating exchange rate regime, and thus in the volatility of exchange rates, impact the systematic risk of the stock market portfolio. Dominguez & Tesar (2006) find that exchange rate movements do matter for a significant fraction of non-U.S. firms, although for the vast majority, the determinants of exposure, such as foreign sales, are difficult to uncover. Doidge et al. (2006) re-examine the evidence with a portfolio approach. They find economic exposure linked to portfolios of firms with high international sales during periods of large currency appreciation and depreciation, but they fail to document such a link at the level of country portfolios.

To take stock of the weak and conflicting results on exposure, Bartram & Bodnar (2007) review the approaches taken from the literature, with different test assets (stocks versus industry portfolios), frequency (weekly, monthly, quarterly), exchange rate measures (bilateral or indices), and cross-sections (single or multi-country studies). Their interpretation of the limited statistical evidence and the resulting discrepancy between theory and empirical research rests upon the endogeneity of operative and financial hedging by corporations. Subsequently, Bartram, Brown, & Minton (2010) show that firms also pass through part of currency changes to customers while using operational and financial hedges.

Hedging can be justified in the context of priced risk and market frictions (Massa & Zhang, 2018), which can affect MNC's cost of capital (Gande, Schenzler, & Senbet, 2009; Jordan, 2012; Mihov & Naranjo, 2019; Qian, Li, Li, & Qian, 2008). However, using unconditional empirical tests, researchers continued to find weak empirical support for exchange rate pricing. For example, the evidence in unconditional studies, such as Choi & Rajan (1997) or Carrieri & Majerbi (2006), is quite fragmentary. More convincing and

[5] Economic exposure to exchange rates has presented challenges also for research in international strategy that relates intra-industry heterogeneity and corporate strategy. See, for example, the discussion on the conflicting effects of exchange rates on firms' competitive position in Miller & Reuer (1998).

consistent results have been reported by papers that adopt a conditional approach. With the same small cross-section of the G4 stock markets but with different methodologies, Dumas & Solnik (1995) and De Santis & Gerard (1998) show that securities command premia for PPP violations. More recent work with conditional approaches such as Francis, Hasan, & Hunter (2008) and Balvers & Klein (2014) also find a significant currency premium with a larger cross-section of U.S. industries and country equities, respectively. Taken together, this line of research provides support to the notion that the weakness of earlier results is primarily driven by the averaging of the exchange rate information underlying unconditional studies, rather than companies' hedging activities.

A stream of research on international asset pricing has recently focused on portfolios sorted on company characteristics used in domestic asset pricing. For example, with portfolios sorted on size and value or size and momentum, Fama & French (2012) find support for a local four-factor model. Hou, Karolyi, & Kho (2011) also include a global cash-flow-to-price factor, while Karolyi & Wu (2018) favor a partial segmentation multifactor model over one that is either purely global (i.e., perfectly integrated) or purely local (i.e., perfectly segmented). Karolyi & Wu (2020) show that a carry trade risk factor is priced in the cross-section but find a dollar risk factor, a measure of currency returns in the forward market, less reliable.[6] Rather than studying such portfolio sorts, we investigate portfolios constructed based on fundamental economic characteristics, namely the extent of firms' foreign sales.

Our paper also provides insight into the link between aggregate global economic activity and asset prices. The literature has long been interested in connecting currency volatility and global uncertainty with fundamentals like output, trade, and investment flows. Very recently, a few papers have attempted to explain expected returns from exposure to global risk linked to foreign trade activity. Richmond (2019), examining the cross-section of currency returns, finds that differences in trade network centrality significantly determine countries' unconditional FX risk premia. Hoberg & Moon (2019) show that

[6] Brusa, Ramadorai, & Verdelhan (2015) argue that to summarize risk unrelated to equity risk, global assets need a carry trade and a dollar factor, obtained from recent research on the cross-section of the currency markets.

companies exposed to offshore activities, including sales of output, have higher expected returns which are explained by an offshore premium that is stronger for countries central in the trade network. This paper does not find that changes in exchange rates are significant for their cross-section of U.S. stocks, which is consistent with many single-country earlier studies. The importance of the economic source of exposure to global trade motivates us to focus on a stock attribute, like foreign sales, and explore its asset pricing implications across international portfolios.

3 Testable Hypotheses and Empirical Methodology

3.1 Hypothesis Development

Theoretical models show that international investors who face differences in purchasing power require an additional premium to take on FX risk, along with the premium for the global market risk. Therefore, the expected return of global stocks should be linearly related to the exposure to a world equity market portfolio hedged against the exchange rate fluctuations. The FX risk is thus capturing a portion of the risk linked to contemporaneous and future shocks in relative prices among different countries.

Our empirical model follows this framework and combines the theoretical insights of Merton (1973) and Adler & Dumas (1983) to explore the role of corporate foreign activity in driving international asset prices. We employ a conditional approach and investigate the asset pricing relationship through time-varying estimates of covariances, correlations, and risk exposures to global factors. Indeed Zhang (2006) finds that the conditional International CAPM with FX risk performs the best among several global pricing kernels. The relationship between conditional expected excess returns $E_{t-1}[\boldsymbol{r_t}]$ and risk is formalized as follows:

$$E_{t-1}[\boldsymbol{r_t}] = \lambda Cov_{t-1}\left(\boldsymbol{r}_t, r_{m,t}\right) + \boldsymbol{\gamma}' \, Cov_{t-1}(\boldsymbol{r_t}, \boldsymbol{X}_t) \tag{1}$$

where $Cov_{t-1}(r,\cdot)$ denotes the conditional covariance between asset returns and risk factors given the information available at time $t-1$, λ is the price of market covariance risk, and $\boldsymbol{\gamma}$ is the vector of the prices of FX covariance risk. We use currency investments as proxies for the state variables that help anticipate unexpected changes in relative prices.

Papers like Dominguez & Tesar (2006) and Doidge et al. (2006) show that exchange rate changes affect the stock returns of companies around the world and that their cash flow exposure increases with corporate foreign activity. We conjecture that the extent of such fundamental characteristics of a firm also helps capture priced risk linked to exchange rates. In this context, we test the hypothesis:

H1: Globally-focused companies drive the significance of FX risk.

To this aim, we perform asset pricing tests for different sets of portfolios composed of stocks with high and low foreign sales aggregated in each country, stocks in the same global industry, and those with high investability ratios as well as countrywide portfolios. Given the mounting evidence that FX risk is systematic, and holding the cost of capital constant, we posit that the pricing relationship has stronger statistical significance for globally-focused companies whose cash flows are more affected by global shocks.

We study a large number of candidate proxies for FX risk, but we keep the risk prices constant, imposing a higher hurdle on our asset pricing tests compared to the previously documented evidence.[7] Constant prices of risk allow a direct assessment across specifications, without large parameter proliferation and with no loss in the interpretation of the economic role of the estimated coefficients. While finance theory has established that there should be a positive tradeoff between expected returns and systematic market risk, i.e., the λ coefficient should be significantly positive, the sign of the prices linked to currency premia cannot be determined ex-ante. The γ coefficient will be positive when investors require a premium, as the global assets are positively correlated to the sources of global risk, and will be negative when investors earn hedging benefits from the correlation with the factors.

[7] Akbari & Carrieri (2015) estimate a full conditional model for the three main currencies in a two-step approach, similar to the one in this paper, but with risk prices time-varying as a function of common global financial variables. They find that FX risk is priced in a large cross-section of country indices.

Our exercise needs some clarifications. We work from a theory that tells us what the common risk factors are, and in equilibrium, these factors should consistently price any international asset. In other words, in an integrated world, the value of the risk premia should be the same, irrespective of what asset or what subset of assets we use for the test. However, the choice of test assets determines how well different factor risk premia can be identified: if only some assets are less exposed to a factor, that factor is weak, which makes standard estimation and inference incorrect (Giglio, Xiu, & Zhang, 2021). Thus in our hypothesis, we do not intend to make definite statements on the magnitude of the estimate of a factor premium. Rather, we want to verify that also a smaller cross-section organized from some firm characteristics can be particularly informative about the factor. In the result section, we first show that the strength in the factor structure of H-FSR firms helps us in capturing exposure to the FX risk factors.

The cash flow exposure of firms that adjust their behavior in response to exchange rate fluctuations might vary over time. This complicates the statistical analysis using constant exposure metrics and is possibly the root cause of the weak empirical evidence on FX exposure. Our conditional approach adds more insights on the time variation of the risk exposure in light of the conflicting evidence starting with the two papers from Jorion (1990, 1991). Based on our expectations for risk pricing, as laid out in H1, we also expect that:

H2: The exposure to FX risk is time-varying, and its inverse relationship with home currency depreciations is increasing in firms' foreign activity level.

Exchange rate fluctuations differently affect firms' value. We postulate that the cash flows of firms with exports and foreign income benefit from a home currency depreciation as their improved competitiveness expand profits. Not taking into account the effect of firms' importing activities, the future home currency payoff rises and is increasing in the level of firms' foreign sales. Therefore, from a dollar perspective, which is customary in the international asset pricing literature, the total effect of the home currency depreciation on H-FSR firms' stock prices will be smaller compared to the effect for the L-FSR firms. In other words, the favorable impact from the home currency depreciation on the firms' foreign activities could be large enough to offset the effect from the conversion into dollars.

To test this hypothesis, we construct conditional time-varying exposure to FX risk (*FX Beta*) from the conditional variance-covariance matrix that we estimate for our asset pricing tests. We compute the conditional *FX Betas* for the H-FSR firms, as well as for the L-FSR firms and for the broad market index, and study them in a set of time-series regressions. We expect that the sensitivity to FX risk of H-FSR firms fluctuates over time as a function of home currency variation, volatility of portfolio returns and risk factors, as well as unknown state variables. Furthermore, we study the difference in the sensitivity to home currency risk between H-FSR firms and L-FSR firms, which allows us to isolate state variables that similarly affect the sensitivities of both types of firms. We expect to see that this spread is inversely related to home currency depreciation and increasing in the level of firms' foreign activities.

In addition to the importance of firms' own activities, we expect firms' exposure to FX risk to be linked to the extent of foreign activities at the aggregate level. Cassel's body of work on international trade, starting with Cassel (1918), is in support of our underlying assumption that PPP deviations are linked to trade flows, their volumes, and patterns. Thus our third testable hypothesis is:

H3: The globally-focused companies' exposure to FX risk increases with countries' export intensity and decreases with the countries' importance in the global trade network.

The larger the role of the export sector for a country's economy, the higher the sensitivity of its globally-focused firms to systematic FX risk.[8] As these firms are likely to be affected by the shifts in countries' competitiveness as a result of currency swings, they have to offer higher compensation to global investors. At the same time, the foreign revenues of firms that belong to a country that trades with multiple countries are likely more diversified across currencies and thus less exposed to each of the FX risk factors. These firms are located in the center of the global trade network, whereas firms that trade in a single currency belong to countries located in the periphery.

[8] The literature has also studied other variables that might drive cross-country differences, such as culture (Kwok & Tadesse, 2006), individualism (An, Chen, Li, & Lu, 2018), investor protection (Huang, Wu, Yu, & Zhang, 2020), investment horizon (Döring, Drobetz, El Ghoul, Guedhami, & Schröder, 2021), political risk (Beaulieu, Cosset, & Essaddam, 2005) and (Brockman, Rui, & Zou, 2013) that we do not explore.

To test this hypothesis, we study the association of the H-FSR portfolios' time-varying *FX Betas* with the trade channel in a panel regression framework, where we control for a host of country- and time-specific variables. We expect the H-FSR firms' sensitivity to FX risk to be positively related to the aggregate export sector and negatively related to the measure of trade centrality. Given the previous evidence on cash flow FX exposure, we also validate how the extent of the companies' foreign sales and other firm-level characteristics are associated with the H-FSR firms' FX risk exposure.

3.2 Methodology

Applying a fully parameterized conditional setting for asset pricing tests in a large cross-section of assets and with many risk factors has presented estimation challenges. In this paper, we overcome these obstacles by adopting the approach of Bali & Engle (2010) that allows us to exploit the time-varying information of multiple sources of risk as well as the cross-sectional variation of many portfolios. Our empirical analysis of the asset pricing relationship involves two steps. First, we implement the corrected Dynamic Conditional Correlation (cDCC) proposed by Aielli (2013) to estimate the time-varying variances of the different sets of test assets, as well as their pairwise covariances with respect to several risk factors. In the second step, we use these conditional covariances as regressors and estimate the prices of risk in a panel regression setting. We implement a Generalized Least Square estimator that not only corrects for heteroskedasticity and autocorrelation but also takes into account the cross-correlations in the error terms (see Bali & Engle (2010) for more details). In the analysis of the sensitivity to the FX risk, we first compute the time-varying betas using the conditional covariances that we estimate in step one. Then we implement time-series and period-by-period cross-sectional regressions, where we adjust for cross-asset correlation and time-series dependence in the residuals, as advised in Petersen (2009).

In our approach, there might be concerns about using regressors estimated in a first step. We are not aware of measurement errors in second moments, but Bali & Engle (2010) ease such concerns and show that a one-step estimation with a GARCH-in-Mean specification delivers a common market slope parameter that is similar in magnitude and statistical significance to the estimate obtained in their two-step estimation.

3.3 Data

We study returns of several portfolios at the country level for 41 countries from January 1996 through December 2019. Based on the FTSE group's classification, we cover 22 Developed Markets (DMs) and 19 Emerging Markets (EMs). Data availability in Datastream for the local market interest rates and the firm-level stock prices dictates the starting point of our time sample and the cross-section of countries. The list of countries in DM and EM groups and their statistics are tabulated in Table A1 in the Online Appendix.

3.3.1 Test Assets

We access the universe of stocks in major stock exchanges in countries for which DataStream provides a total market index. Out of this universe of 138,827 securities, we select 69,043 non-financial, common stocks to construct portfolios of globally exposed firms.[9] We collect weekly closing, U.S. dollar-denominated, return index data, and market capitalization. For each firm, we also collect the international sales, exports, and net sales or revenues from WorldScope, available at the annual frequency.[10] We follow Doidge et al. (2006), and for each firm, we construct the foreign sales ratio (FSR) as the ratio of the sum of the international sales and exports of that firm to its net sales or revenue, in percentage. In each country and year, we cluster firms into two mutually exclusive groups: (a) H-FSR, those with at least 10 percent foreign sales ratio, and (b) L-FSR, those with less than 10 percent foreign sales ratio. Firms with missing foreign sales data are excluded to ensure working with companies with known FSR status. Then we compute the equally-weighted average returns of firms in each country to construct the H-FSR and L-FSR portfolio excess returns.[11] We use the weekly Euro-dollar one-month deposit rate, obtained from DataStream, as the risk-free rate of return to calculate excess returns.

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[9] For this selection we follow an exhaustive list of filters introduced in Ince & Porter (2006) and Griffin, Kelly, & Nardari (2010). Please refer to Appendix A for the details of the filters and selection criteria in our sample.

[10] Exports represent the revenues generated from the shipment of merchandise to another country for sale, whereas international sales represent sales generated from operations in foreign countries.

[11] Note that due to the cleaning step in the firm selection, the union of H-FSR and L-FSR firms will not cover all firms in a country. Similar to Dominguez & Tesar (2006) we construct equally-weighted portfolios not to bias the results given that larger companies are also those with larger share of global business activity.

The H-FSR group is closely related to multinational enterprises (MNE) in international business studies. Verbeke, Coeurderoy, & Matt (2018) define internationalized corporations as those with (1) "non-location-bound" firm-specific advantages, (2) both significant geographic breadth and depth of international involvement, (3) wide scope of value chain activities. Due to data limitations, it is challenging to identify firms with all three characteristics, especially in international markets. Therefore, for the non-U.S. firms, the finance literature uses the broadly accessible foreign sales ratio and the 10 percent threshold for consistency with the accounting rules on segment reporting that identify MNEs among U.S. firms. Our premise is that, as a result of large foreign sales, the firms in the H-FSR group have higher exposure to global shocks and a higher risk sensitivity to currency movements compared to the firms in the L-FSR group. We acknowledge that importing firms and those with fixed assets abroad derived from foreign direct investments are also highly exposed to global risk factors. However, in the absence of comprehensive data for these metrics, we only use firms globally exposed due to their foreign sales, i.e., sales activities from exports and foreign operations.

For the countrywide market portfolios, we follow Pukthuanthong & Roll (2009) and collect DataStream weekly closing, U.S. dollar-denominated, total return index data (DS-INDEX).[12] As an alternative, we consider the MSCI Investable Market Indices (INVESTABLE), widely used as benchmarks in asset management, since they allow us to take into account firms with high visibility to foreigners. To further understand global risk exposure across different test assets, we construct two other sets of portfolios. For the first, we pool all H-FSR firms and randomly assign them to 41 pseudo-country portfolios (RANDOM). For the second set, we assign H-FSR firms to 34 industry portfolios based on their ICB sector classifications (INDUSTRY).[13] All the firms in these portfolios have high exposure to global risk factors because of their

[12] These indexes include the common stocks for which the DataStream's data requirements are met and that have passed its liquidity test. For more details on the index construction please refer to Thomson Reuters global equity index methodology, available at https://www.thomsonreuters.com/content/dam/openweb/documents/pdf/tr-com-financial/methodology/global-equity-index-methodology-oct-2015.pdf.

[13] DataStream provides 44 ICB sector indexes. We exclude firms in eight financial and two real estate related sectors.

sales characteristics, yet their headquarter country and thus base currency differ. Therefore, portfolio aggregation is unlikely to result in a unidirectional exposure to the FX risk factors.

Summary statistics on the H-FSR firms are in the Appendix. Table A1 reports the average and standard deviation of the firms' weekly returns (annualized, in percentage), the number of H-FSR firms in each country, as well as their total market capitalization as of the last week of our sample. There are, on average, 763 H-FSR firms in DMs (68% of the local market's capitalization). On the other hand, EMs have fewer H-FSR firms (384 on average and 62% of local market capitalization). However, exporter countries such as India, South Korea, Taiwan, Malaysia host significantly more. At the end of our sample, the H-FSR firms in DMs are, on average, two times larger than their EM counterparts.

Table 1 presents summary statistics for the test portfolios in our study. Our sample spans over 24 years and includes 51,291 week-country observations over 1,251 weeks. Rows 1 and 2 of Table 1 report the cross-sectional averages for the time-series mean and standard deviation (annualized, in percentage) for each set of portfolios. We observe that the H-FSR firms have on average higher returns than the L-FSR firms, and not surprisingly, the mean of the total local market portfolio is close to the average of the two groups. The volatilities of the portfolios are comparable between series; however, randomly assigning H-FSR firms in pseudo-country portfolios diversifies out some of their risk. Higher mean and lower volatility are mirrored in the high cross-sectional average of the Sharpe ratios for the H-FSR portfolios.

[Place Table 1 about here]

3.3.2 Foreign Exchange Rate Risk Factors

We use the excess returns earned from currency investments as proxies for the FX risk factors. In the context of the theoretical model, Equation (1), all currency pairs vis-à-vis the currency of denomination should be included, with the price of the FX risk for currency j, γ_j, proportional to the wealth share of its country in the world. To reduce dimensionality, most empirical asset pricing research focuses on a few currencies linked to the national markets with the largest capitalization; the German marc, the British pound, and the

Japanese yen are the most commonly chosen ones as separate factors. On the other hand, the cash flow exposure literature, for practical reasons, has studied mostly the aggregated, trade-weighted exchange rate changes or the country's bilateral vis-à-vis the U.S. dollar. Our methodology allows us to expand the analysis to more FX risk factors, focusing on the so-called G10 currencies that are gaining more attention in recent research on currencies without locking into pre-determined weights. These include the U.S. dollar (USD), Euro (EUR), Japanese Yen (JPY), and British Pound (GBP), as well as the Australian dollar (AUD), Canadian dollar (CAD), New Zealand dollar (NZD), Norwegian krona (NOK), Swiss Franc (CHF), and Swedish krona (SEK) which are the most traded currencies around the world in our time sample.[14,15] We consider the changes vis-a-vis the USD for each currency and substitute the relative price changes of the theoretical model with the differential in short-term interest rates, since we can reasonably assume that for the G10 currencies, inflation at the weekly frequency is not stochastic.[16] These assets are thus nominally riskless deposits in domestic currency that are risky in dollar terms and provide a readily available hedge for the exposure to the FX risk, when priced. We collect the weekly local interest rate and exchange rates from DataStream. Table 1 also presents the cross-sectional averages for correlations of each portfolio in our sample with these FX risk factors. JPY has negative and smaller correlations, whereas the commodity currencies such as AUD, CAD, and NZD have higher correlations with our test asset portfolios.

3.3.3 Risk Exposure Determinants

To study what explains the cross-sectional differences in the FX risk sensitivity, we focus on measures of global trade, international investment, and firms' scope of foreign activities, while we control for measures related to both the domestic and the global economy and to firms' characteristics. For our main hypothesis on the trade channel, we collect the export of goods and services scaled by a country's gross domestic product (GDP) from the World Bank's World Development Indicator (WDI) dataset to measure the export

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[14] See, for instance, Mueller, Stathopoulos, & Vedolin, (2017), Mueller, Tahbaz-Salehi, & Vedolin (2017), Opie & Riddiough (2020), Panayotov (2020), Sandulescu, Trojani, & Vedolin (2021) and the triannual surveys of the Bank of International Settlements (2015). Major banks also have dedicated G10 foreign exchange strategy teams.

[15] Before the inception of the Euro, we use the German mark and splice it into the Euro series.

[16] While a relevant state variable in our framework, inflation is also not available at higher frequency.

intensity of a country (EXP_INTENSITY). We also collect the measure of trade centrality (TR_CENTRALITY) from Richmond (2019), which is computed from pairwise bilateral trade normalized by pairwise total GDP. The Online Appendix B lists alternative determinants that we explore, taken from the investment and capital flow channel and from firms' outward activities. We also motivate therein the country-level characteristics and country-level variables from firm characteristics that likely shape the economic and business environment and that we use as controls.

4 Asset Pricing Test Results

Our asset pricing analysis is focused on exploring the contribution of globally-focused firms to the international pricing kernel. To this aim, we investigate different sets of portfolios. The international finance literature has long faced the challenge of identifying empirically FX factors that are strongly backed by the theory, and it often settled to use countrywide portfolios. We want to verify how the information from time-varying second moments in the risk quantities of some specific assets, the H-FSR portfolios, is of help.

4.1 Principal Component Analysis

We start with a Principal Component (PC) analysis inspired by the recent insights provided in Giglio et al. (2021) on the need to select a set of strong test assets to identify weak factors. To gauge the informativeness of the different portfolios, in Panel A of Table 2, we provide the cross-sectional average of the number of PC needed to explain variations of returns in each set of portfolios. We observe that the percentage of asset variation that the first PC can explain is higher for the broad and diversified portfolios, like the countrywide or investable indices and the industry or random portfolios, than for the subsets built from firms' degree of foreign activity. In addition, the number of PCs needed to explain 70 percent of the variation in the data is lower for the former groupings.

[Place Table 2 about here]

These statistics indicate a low-dimensional factor structure for the broad and diversified portfolios. To further explore the factor structure of the different portfolio sets, we first compute up to the tenth PC from the returns of each set and then regress each one of our observable risk factors on these PCs. We interpret a high R-squared in these regressions as an indication that the portfolio set is a strong test asset for that risk factor. Given the variation in the number of PCs in the statistics of asset returns in Panel A, our choice of ten PCs can be viewed as arbitrary. We opt to follow Pukthuanthong & Roll (2009), who retain from the covariance matrix of country returns the same number of PCs as proxies for global factors. Panel B reports the R-squared of the time-series regressions and, at the bottom, the sum of the R-squared of the nine FX risk factors for the sets. The world market is the strongest factor as it finds overall the highest explanatory power in the ten PCs. However, we also observe R-squared above 40 percent for many FX factors, indicating that they can explain a substantial fraction of asset returns variation. Of the different sets of test portfolios, H-FSR portfolios show the largest sum (3.145) from the nine FX regressions' R-squared, whereas the broad countrywide and the investable indexes have lower values. This validates the strength in the factor structure of H-FSR firms in capturing exposure to FX risk factors.

PC analysis provides a path in asset pricing to gauge risk factors, including global factors (see, for example, Kelly, Pruitt, & Su, 2020), but it is not straightforward for corporate managers. The rest of our analysis continues to focus on exposure to those observable FX risk factors that, while backed by the PC analysis, are directly rooted in theory and can be effectively hedged in corporate operations.

4.2 Conditional Asset Pricing Regressions

We start by replicating the standard estimation approach of asset pricing models, using unconditional cross-sectional regressions with a Fama-MacBeth two-stage methodology. Results are tabulated in Table A2, where we observe a negative and insignificant premium for the market portfolio.[17] All the FX risk factor premia are also estimated with a negative coefficient, and the intercept is always positive and highly

[17] See Bali, Engle, & Tang (2016) for a recent discussion and results on the success of the CAPM.

significant. The estimated risk premia appear unreliable, confirming the failure of the unconditional approach as in previous literature.

Table 3 presents our results from the conditional regressions based on Equation (1). The difference from the results of unconditional regressions is stark. With this approach, we are able to obtain robust estimates of expected magnitude in support of the risk pricing. We present nine specifications, (1) with only the world market portfolio, and (2) through (9) with also different combinations of the currency investments, proxying for state variables linked to PPP deviations. Specification (2) has the three commonly studied currencies, specifications (3) to (8) add one source of FX risk at a time, and in specification (9), we include them all together. At the bottom of the table, we report Wald statistics on the joint significance of all the included FX factor risk coefficients. The results of the table are in support of H1. In specifications (2) to (9), we find that the price of EUR is negative and significant while the one for GBP is positive and significant. Other currencies, like the NOK or SEK, also command a risk premium, but the evidence is less strong. Most notably, the CHF has a significant negative coefficient. Indeed, when we include all the FX risk proxies, the evidence is robust for the presence of the EUR, GBP, and CHF. This is consistent with the theoretical prediction, for which the important currency premia correspond to those of investors with the largest wealth share in the world. The Wald test indicates that these risk proxies are together significant, except for the regression with the AUD. The parameter for the world market risk is always positive and significant at the conventional statistical levels. Even with our smaller cross-section of firms, the magnitude of the prices of risk is comparable with the evidence in the conditional international asset pricing literature.

[Place Table 3 about here]

In all, the evidence shows that the risk factors proposed as proxies for state variables are capturing significant risk components of the expected returns, as we observe that the intercepts in all the specifications across Table 3 are not statistically significant. It is also useful to interpret the evidence for the risk parameters. Given a negative price for a risk factor, an asset with a positive covariation will have a greater hedging demand since it helps against deviations in international parities. In equilibrium, its expected returns will be lower and its price higher. This also implies that companies that have positive correlations with similar risk factors would carry a lower cost of capital, everything else equal. As a result, these additional sources of global risk do not necessarily have adverse effects on firms' cost of equity capital.

Table 4 helps further assess our first testable hypothesis. It reports the results from regressions of specification (9) for the alternative portfolios. First, look at the country-level portfolios of companies with a low level of foreign sales (L-FSR). These assets command a significant world market price. However, the other proxy coefficients for the large and liquid currencies are smaller than Table 3 and with no or only marginal statistical significance. The second and third regressions are based on the broad market index and the investable stocks. Both indexes are comprised of the large, liquid, and easily accessible stocks in each market and partially overlap with the H-FSR companies. However, differently from tests with these companies, we can only find statistical significance for the price of market risk and a p-value of 0.12 and 0.08 for the joint significance test of the FX risk proxies, respectively. The fourth column considers portfolios of the H-FSR firms but now aggregated within industries. The evidence favoring a model with global risk is not strong since only two marginal currencies are priced, and there is no support of systematic FX risk jointly. This weak significance can be explained through offsetting exposures from their cross-country composition. Lastly, for the portfolios constructed by randomly assigning H-FSR firms to pseudo-countries, only one FX risk is priced individually, and the specification is not supported by the joint statistical test. This suggests that the mechanical portfolio composition washes out the information needed to identify the risk.

These results confirm the information provided by the PC analysis on the informativeness in the factor structure of the H-FSR firms aggregated across the country dimension. Changes in relative prices and interest rates among different countries as a result of national fiscal and monetary policies are likely to affect companies within the country in a similar way.[18] This explanation aligns with Heston & Rouwenhorst

[18] The relative importance of global diversification across countries versus industries is also at the center of a debate with respect to firm value (Denis, Denis, & Yost, 2002; Doukas & Lang, 2003; Gande, Schenzler, & Senbet, 2009).

(1994) and a number of papers following the same approach, who find that effects linked to country shocks are more important than industry effects to explain returns in the cross-section of international stocks. Thus, despite an interest to estimate exposures of global firms based on "geographic zones" according to the place where they conduct business (see Dumas, Gabuniya, & Marston, 2022), our analysis re-affirms the importance of headquarter locations in identifying FX risk.

[Place Table 4 about here]

Directly comparing the results of Table 4 with those of Table 3, we find support for hypothesis H1, that the globally-focused companies are the drivers of the statistical significance of the FX risk. This fits with the notion that companies identified from underlying characteristics linked to the real economic activity of their country are more sensitive to global shocks from PPP deviations. On the other hand, world market risk is priced similarly, both in magnitude and significance, in the regressions across both tables.

The specifications of Tables 3 and 4 are consistent with a world where countries are integrated, and local risk is not priced.[19] Nonetheless, it is conceivable empirically that, for example, the sensitivity of the UK portfolio to an unspecified risk of local nature could result in the GBP risk being significant. We thus re-estimate the regressions of Table 3, adding a country-specific intercept for each portfolio in the model to capture potential country-fixed effects. In untabulated results, only two out of the 41 countries exhibit an intercept that is consistently significant in the specifications (1) through (9), while EUR, GBP, CHF are priced similarly to Table 3. This suggests that these portfolios have little sensitivity to a time-invariant domestic market component but high sensitivity to global conditions. We run a few additional tests without reporting the results for brevity. First, in building the H-FSR portfolios, we exclude countries with fewer than 50 firms. Second, we compute these globally-exposed portfolios using only the information on companies' foreign income from the subsidiaries' sales, thus eliminating the information on direct export sales that in WorldScope is quite incomplete. Third, we remove the US firms from the cross-section. In all

[19] For evidence on firm's cost of equity in integrated versus segmented markets, see Errunza & Miller (2000), Chari & Henry (2004).

instances, the results of Table 3 are confirmed. It is worth noting that the sign and the significance of the global risk proxies like the EUR, GBP, and CHF are robust and consistent in all these checks.

To summarize, our tests show that the sensitivity of globally-focused firms to unexpected changes in relative prices and interest rates around the world drives the systematic risk rewarded in global markets.

5 FX Risk Sensitivity and Its Determinants

The methodology that we deploy in the previous section delivers quantities that can provide additional insights on how the relationships of the systematic FX risk of our portfolios vary over time. In this section, we introduce our estimates for the time-varying FX risk sensitivities and analyze their dynamics. We then study variables that explain these sensitivities in the cross-section of countries in our sample.

5.1 Time-varying FX Risk Factor Sensitivity

We start by analyzing the dynamics of FX risk factor sensitivity, the *FX Beta*. Our estimates for the sensitivities are the assets' time-varying quantities of risk that we use as the regressors in the asset pricing tests, scaled by the time-varying variance of the risk factors:

$$\beta_{j,t}^{i} = Cov_{t-1}\left(r^{i}{}_{t}, X_{j,t}\right) / Var_{t-1}\left(X_{j,t}\right) \tag{2}$$

Where, r^i denotes the H-FSR portfolio return in country i and X_j denotes the FX risk for currency j. We use the notation $\beta_{j,t}^{FXc}$ when X_j represents the FX risk for the home currency of the H-FSR portfolio i and $\beta_{j,t}^{rest}$ for the cross-sectional average of $\beta_{j,t}^{i}$, excluding the $\beta_{j,t}^{FXc}$.

Figure 1 presents two examples, with the *FX Beta* for GBP and CHF risk, displayed through a Hodrick-Prescott (HP) filter for visual appeal. We choose to plot these two risk factors because they enter the estimated asset pricing relationship in Table 3 significantly but with the opposite sign.

[Place Figure 1 about here]

For the two currencies, the thick black line identifies the $\beta_{j,t}^{FXc}$, while the *FX Betas* of H-FSR portfolios of the other countries are marked in grey. The plot reveals a number of interesting patterns. The higher sensitivity of the Swiss (U.K.) portfolio to the Swiss franc (British pound) risk aligns with the evidence in Adler & Dumas (1983) that the largest weight of an investor's hedge portfolio is in nominal bank deposits in home currency. Although relatively smaller, many other country portfolios also have CHF and GBP risk betas that are economically meaningful, with a few instances when the *FX Betas* are negative and similar in absolute magnitude to the positive measures. The unreported plots of the *FX Betas* for other currencies present the same properties revealed in Figure 1. The *FX Beta* is usually the highest with respect to its respective home country portfolio (i.e., $\beta_{j,t}^{FXc}$), while those for other country portfolios are quite dispersed. The substantial change in economic magnitude that we observe could explain why it is possible to find statistical significance in the asset pricing tests when looking at the conditional relationship.

In Tables 5 to 7, we proceed with a statistical analysis of these *FX Betas* at the annual frequency, using the last observations of the year, due to the availability of country-level control variables.[20] Table 5 tabulates the results on the time-series properties, confirming the observations obtained from Figure 1. In Panel A, the first three columns report the average, minimum and maximum values for the risk sensitivity of the H-FSR portfolios with their respective home currency, $\beta_{j,t}^{FXc}$.[21] The covariations of the portfolios with a risk factor are often more substantial than the variance of the risk factor, as six of the nine averages of $\beta_{j,t}^{FXc}$ are above one. These conditional risk sensitivities show a wide range between minimum and maximum values with significant variability, as measured by their mean absolute annual changes in Column 4. Compared to their respective time-series mean, $\beta_{j,t}^{FXc}$ values change on average more than 36% per year. Column 5

[20] The analysis at the weekly frequency for tests that do not require the annual data results in comparable conclusions and is available from the authors.

[21] In Table 5, OLS[β_j^{FXc}] are the coefficient of a regression of the H-FSR firms' returns on the currency investments' returns. Overall, these values are similar to the mean of β_j^{FXc}, and reassure that, on average, our conditional approach closely replicates the unconditional evidence on currency exposures.

presents the p-value for the null of a zero mean over the time sample, using the Newey West corrected standard errors with optimal lags. In all cases, we strongly reject the null of constant risk sensitivities.

[Place Table 5 about here]

The results also confirm that firms in the cross-section are more exposed to the currency risk of their country. For each currency, we observe that the time-series average of $\beta_{j,t}^{FXc}$ is larger than the average of the risk sensitivity for the rest of the country portfolios, $\beta_{j,t}^{rest}$, as tabulated in Column 6.[22] Column 7 presents the p-values of a one-sided t-test for the null that $\beta_{j,t}^{FXc}$ is smaller than the rest of the risk sensitivities. We strongly reject this null for all FX risk factors, albeit less so for the risk sensitivity to the euro of the German H-FSR firms. This is most likely because $\beta_{j,t}^{rest}$ includes eight other euro countries in our sample, which are also highly exposed to EUR.

The evidence so far supports the first part of our H2 that FX risk sensitivities are time-varying. In Panel B, we study the dynamics of the *FX Betas* in a pooled panel regression framework. First, in column 1, we test for the level of risk sensitivity during large financial crises. We observe that the $\beta_{j,t}^{i}$ values load positively on the GlobalCrisis flag, a dummy variable that takes the value of one during the years 2000 (for the dot.com bubble), 2008 (for the subprime mortgage crash), and 2011 (for the sovereign debt crisis). On average, *FX Betas* are 0.224 units larger in these periods, an economically significant magnitude when compared to the overall average value of $\beta_{j,t}^{i}$. The mean of all risk sensitivities in our sample is 0.583, very close to the estimated intercept of this regression that also includes the impact of the currency risk factor fixed effects, FX FE, and a negligible upward trend. These findings are also observed in Figure 1, where the *FX Betas* for GBP and CHF are larger during 2000, 2008, 2011 but stationary over the whole sample period.

[22] Table A3 reports the time-series averages of the *FX Betas*. The large relationship between dollar denominated returns for the stock portfolios and for the currency investments explains the positive sign for almost all betas. The U.S. portfolio, which does not suffer from such mechanical relationship, shows lower betas and two with a negative sign.

In the next step, we only focus on $\beta_{j,t}^{FXc}$ to assess how these risk sensitivities change with respect to variations in the value of the home currency (ΔFX). The fluctuations are measured by the annual change in the number of U.S. dollars one unit of home currency buys, and proxy for cash flow shocks to the country's firms. The results in column 2 show that the USD denominated risk sensitivities for the H-FSR portfolios load negatively on ΔFX, after controlling for time (Year FE) and currency (FX FE) fixed effects, which can also be interpreted as country fixed effects. The cash flows of firms with exports and foreign income are shielded through the home currency depreciation, as the activities of these firms will benefit from the exchange rate movements, compared to domestically focused firms. In other words, consistent with the basic insight on firm value in the cash flow exposure literature, these companies become more valuable in correspondence to currency depreciations, and in the data, this compensates for the conversion effect of the home currency drop. Dominguez & Tesar (2006) find that firms with high international sales outperform those with no international sales in periods of currency depreciation but underperform during periods of currency appreciation. Our analysis of the time-variation in risk exposures aligns with their evidence.

To further isolate the impact of currency movements, we study the difference between the *FX Betas* of the H-FSR and L-FSR firms within a country. This allows us to control for common state variables affecting firms' risk sensitivity dynamics. Figure 2 visualizes the relationship for the CHF risk, where we plot the $\beta_{CHF,t}^{FXc}$ spread on the left axis and the one-year change in the USD/CHF rates on the right axis.

[Place Figure 2 about here]

The figure shows that the relative magnitude of the sensitivities as illustrated through the spread is not constant but changes with the weakening and strengthening of the currency. We observe that the spread increases when the home currency loses value with respect to the USD. Columns 3 to 8 in Panel B of Table 5 verify the statistical relationship. We still find a negative and significant slope coefficient for the ΔFX, suggesting that the USD denominated risk sensitivities of the H-FSR firms in periods of home currency depreciation are affected beyond the mechanical effect at work for the USD denominated *FX Betas* of firms in the country. This finding is robust to the presence of a set of state variables that can possibly explain this relationship. For example, including the H-FSR firms' cost of equity in column 4 or the spread between H-FSR and L-FSR firms' cost of equity in column 5 does not alter the relationship between the FX risk sensitivities and home currency movements. The cost of equity for each portfolio is its expected returns implied by our asset pricing model, Equation (1) estimated in column 9 of Table 3, and it can be interpreted as a proxy for firms' discount rate movements. The negative loading on ΔFX and the positive loading on cost of equity (RISK_PREMIA in the table) are consistent with earnings-based valuation models where the FX sensitivities measured in USD are decreasing with positive cash flow news and increasing with discount rate news.

Since Forbes & Rigobon (2002), and recently Akbari et al. (2020), argue that correlation coefficients are conditional on market volatility, we further control for volatilities of the world market, local market, and FX risk factor, as our measures of risk sensitivity could be biased during periods of high uncertainty. We find that the risk sensitivities load positively on the first two measures and load negatively on the latter, which enters in the denominator of the $\beta_{j,t}^{i}$, and when we pool all uncertainty measures, only the local market volatility is estimated significantly. Nevertheless, controlling for this channel does not modify the relationship between risk sensitivities and home currency movements.

In sum, together with Figures 1 and 2, the evidence in Table 5 confirms the hypothesis in H2. We document wide variation both in the cross-sectional relationships and time-series patterns of the exposures of H-FSR firms to FX risk, and show how these risk sensitivities are higher in periods of home currency depreciation.

5.2 Determinants of FX Risk Sensitivity

In Table 6, Panel A, we provide the averages of the $\beta_{j,t}^{i}$ over geographic regions to shed light on their relative magnitude. We use the k-nearest neighbor algorithm(k-NN) to cluster countries into three regions, which we call Asia-Pacific, Europe, and America, given the overwhelming representation of those countries within the cluster.[23] This analysis is justified by the robust finding in the trade literature that a gravity effect explains the size of trade flows around the world, based on geographical as well as other types of distances (see Tinbergen, 1962). The evidence from Panel A shows that countries have the highest exposure to the currency risk of their respective region. For example, the *FX Beta* for CAD, on average, is the highest among countries in the Americas and lowest for the countries in the Asia Pacific region (1.105 versus 0.883), whereas the *FX Beta* for CHF is highest for the countries in Europe (0.513 but decreasing to 0.163 when we exclude the European countries) and lowest for the countries in the Asia Pacific region (0.199). Overall, the evidence suggests that the forces in play for global trade can also be important in explaining the exposure that drives the FX risk covariation of the high foreign sales firms. Motivated by these observations, we explore further the link with the trade channel to understand the fundamental differences among our measures of global systematic risk.

We focus on measures of global trade related to both the domestic and the global economies. We study two key variables: export intensity (EXP_INTENSITY), measured by the relative size of the aggregate export sector in a country, and trade centrality (TR_CENTRALITY), measured by the centrality of the country in the global trade network. We expect the export intensity to be positively associated with the exporting firms' return covariation with the FX risk, whereas we conjecture that our portfolios' covariation with FX risk should be negatively associated with the extent of a country's trade centrality. Countries are more central if they have many strong links to countries that are important for the global output of tradable goods. Richmond (2019) shows that FX risk premia are explained by countries' exposure to trade links. To study how global trade is associated with the cross-sectional differences between *FX Betas* in our panel of 41 countries, we implement the following cross-sectional regression:

$$\beta_{j,t}^{i} = b_1 EXP\_INTENSITY_t^i + b_2 TR\_CENTRALITY_t^i + \boldsymbol{Controls_t^i} \quad (3)$$

[23] K-NN is a non-parametric classification method that minimizes the aggregate pairwise distance of members in a cluster. In our implementation, we use the square of the Euclidean distance between capital cities of countries in our sample, based on their longitude and latitudes.

We investigate the *FX Betas* to each currency separately, although we can draw conclusions from the totality of the evidence across currencies. Panel B presents the results where we report the slope coefficients for the independent variables as averages of the period-by-period estimates from the cross-sectional regressions. The corresponding t-statistic for each estimate reported in square brackets are obtained using the Fama-MacBeth standard errors corrected for the time-dependence, following Petersen (2009).

[Place Table 6 about here]

Overall we find strong statistical support that *FX Beta* is associated with the global trade channel, as posited in H3. We observe that for all nine FX risk proxies the slope coefficient for EXP_INTENSITY is positive, suggesting that firms in countries with larger export activities have a higher sensitivity to the systematic risk from dislocations in PPP. The exposures of the H-FSR portfolios to the three main currencies, EUR, JPY, and GBP, and also the one to CHF significantly load on EXP_INTENSITY, at the five percent level or higher. The coefficient estimates for four more currencies are also marginally significant.

This result is notable given that papers like Dominguez & Tesar (2006) find only weak evidence that measures of trade are linked to firm-level cash flow exposure for a set of companies with characteristics similar to ours. What could be an explanation for our more supportive evidence? PPP shocks affecting H-FSR firms' export competitiveness could be difficult to diversify also for investors who invest globally but consume at home. This seems to matter especially for the risk exposure of the largest currencies, thus those linked to the nationality of investors representing the largest share in world financial markets.

Now consider the measure of global trade built at the global level, trade centrality. The position of a country in the global trade network is shown to be very significant in explaining the relative currency sensitivities of the portfolios. We find that trade centrality is inversely related to the systematic risk of eight of the nine currencies at least at the five percent level of significance. Thus countries that are important in the global trade network are associated with lower systematic FX risk. Richmond (2019) shows that the currencies of central countries are a good hedge against global consumption risk and thus have lower interest rates and currency premia. Our result suggests that a country's centrality allows to better diversify some of the shocks stemming from economic activity around the world and decreases the exposure of the portfolio of the country's firms to the systematic risk attached to currencies. Aligned to our findings, Hassan, Loualiche, Reggi Pecora, & Ward (2021) also connect the structure of trade networks to the systematic risk in exchange rates.

In all, this evidence indicates that exposure to currency systematic risk is heightened by a country's trade intensity and mitigated by their trade centrality, as in H3. Table 6 also reveals that the countries' measures of systematic FX risk are explained by some other country characteristics, (see Online Appendix B for their details), yet the trade channel is a very robust determinant across currencies. For example, consumption is also estimated significantly positive for many of the currency risk factors, albeit not for the risk of the main currencies. Interestingly, the stock market capitalization has a negative and significant coefficient for almost all the *FX Betas*, with the exception of the AUD and CAD. This is possibly an indication that firms from countries with more advanced stock markets and greater availability of derivatives are less sensitive to the FX risk factors. It further strengthens the conjecture that hedging on the part of companies and investors could explain the weak evidence on FX risk pricing, similarly to the argument provided for the evidence on cashflow exchange rate exposure. We do not find a strong and robust association with the degree of the quality of corporate governance and institutions. Among the three variables, we observe that only law and order enters six of the nine regressions with a positive and significant coefficient. Capital account openness is positive and significant for three of the main currencies. However, exposure from more openness to capital flows does not drive out the significant exposure to the high level of trade openness, represented by both export intensity and trade centrality. Taken together, the table indicates that some fundamental characteristics of countries, including macroeconomic quantities that in the empirical analysis are often disconnected from exchange rates, are important determinants of FX risk factor sensitivities.

A concern with this evidence is that the results are driven by the high firm exposure to the respective currency, $\beta_{j,t}^{FXc}$, as illustrated in Figure 1. In unreported analysis, we re-estimate all nine regressions by removing the country portfolio associated with the currency in each regression. In other words, the cross-sectional regressions of the pound sensitivity exclude the portfolio of H-FSR firms in the UK. The results are unchanged. When we repeat the same analysis using the L-FSR portfolios as the dependent variable, we observe that the coefficients for EXP_INTENSITY are still positive, the economic magnitude is not very different, but the statistical significance is substantially weaker. Trade centrality is still inversely related to the risk betas and significant for the sensitivities to six currencies. Overall, these results conform to our expectations of weaker evidence for this set of portfolios.

Tables A4 and A5 show the results from additional regressions of the *FX Betas* for the H-FSR firms, where we consider alternative types of international flows taken from the countries' Balance of Payments and substitute the trade channel variables. We perform two sets of regressions to explore alternatives in both inward and outward capital flows. Table A4 looks at the foreign portfolio investment, while Table A5 covers the FDI outflows, net of repatriation of capital and repayment of loans. The former measures the extent of foreign capital inflows directed toward domestic equity, and the latter measures the purchases of controlling stakes in foreign companies by domestic residents. Differently from Table 6, the coefficients on the investment flows do not have a robust sign and are never statistically significant, except for two currencies with marginal significance. Only two currency coefficients for the direct investment flows are significantly negative. Some of the other variables aimed at capturing broader differences in countries' characteristics appear robust in these sets of regressions from both an economic and statistical standpoint, like what we also observed in Table 6. The Balance of Payments is, of course, a record of both inflows and outflows. We estimate, but for brevity do not report since we also do not find significance, regressions with the remaining broadly classified items, like the assets in foreign portfolio investment, or the FDI inflows, as well as a measure of import as a percentage of GDP. Thus, taken together, our findings validate the importance of the trade channel for the risk exposure of our global assets, while other types of international activities do not have the same explanatory power.

In summary, our analysis of the risk sensitivities deepens our understanding of the systematic exposure to the risk attached to parity deviations between currencies. We provide evidence that the links from the trade channel are more important than those from the investment and capital flow channel in explaining the expected returns of the firms with foreign operations. Our evidence indicates that *FX Beta* is stronger for firms in countries with an export sector that is large relative to their own economy, yet the degree of exposure is mitigated for those firms in countries whose trade activities are diversified around the world. On average, across all FX risk sensitivities, the estimates in Table 6 suggest that one standard deviation increase in EXP_INTENSITY leads to a 0.125 standard deviation increase in the FX risk sensitivities, whereas the same increase in TR_CENTRALITY leads to a 0.108 standard deviation decrease. Global trade is thus an important route to explain the systematic FX risk exposure across countries.

The literature on the cash flow effects from exchange rate changes focuses on the FX exposure betas and their determinants at the industry and firm-level (see, among others, He & Ng (1998) for Japanese MNCs, Allayannis, Ihrig, & Weston (2001) for U.S. industries, Dominguez & Tesar (2006) and Doidge et al., (2006) for a sample of international stocks). In our paper, changes in exchange rates matter as components of risk premia, and thus of companies' discount rate, through their effects of assets' covariances with FX risk factors. Given that our test assets overlap with those for the cashflow investigations, we want to verify that the empirical framework underlying our hypothesis H3 broadly aligns with that line of research. In each country, we aggregate WorldScope Export and Foreign Sales information of all H-FSR firm to measure it as a proportion of their country's exports of goods and services. We find that, on average, the totality of our HFSR firms' international activities is equivalent to 75% of the country's export sector. Therefore one would expect to observe that also the characteristics of these firms that are highly representative of a country's outward propensity are associated with the patterns in the *FX Betas*.

In Tables 7, we present the results from cross-sectional regression similar to those in Tables 6 to validate the importance of the export channel as a driver of FX risk, together with characteristics built at the country level from firm-level determinants (see Online Appendix B for their details). We find that FSR, the share of firms' international activities and also a proxy for multi-nationality, has a positive coefficient, significant at the 1 percent level for eight currencies. Consistent with the message in Table 6, we observe that the extent of firm-level export activity in the cross-section of countries is associated with larger sensitivity to the systematic risk from parity deviations. We find that several additional firm-level characteristics are also important explanatory variables. The statistical significance of size is strong across the majority of currencies, indicating that larger firms that likely have more extensive foreign activities have higher risk sensitivity. On the other hand, there is no support for the foreign asset ratio measure, which suggests that risk from currency fluctuations is explained by periodic flows from the firms' operations and less by the stock of fixed assets. We find that financial leverage is positively associated with FX risk exposure while the evidence on the liquidity proxy provides some support for a negative relationship. Leverage is significant at least at the 5 percent level in seven cases, and volume has a highly significant coefficient in six, although in two instances the coefficient is marginally positive. This evidence is quite useful for corporate managers as it indicates that the risk exposure from parity deviations can be mitigated by reducing leverage and increasing liquidity. Finally, we observe that the relationship with book to market ratio is positive and significant in half of the regressions. In the cross-section of countries, the value firms exhibit greater sensitivity to FX risk, which is in line with the arguments of Fama & French (1993) and the international evidence in Fama & French (2012) for the extra premium of the value versus growth stocks.

[Place Table 7 about here]

We note that, in most specifications, the evidence on the Japanese yen is weak, both in the asset pricing specifications and with the determinants. Harvey (1991) notes that Japan is the country for which his asset-pricing model is rejected. He & Ng (1998) analyze some of the same firm-level determinants within the lens of the hedging theory and, in some cases, find an opposite sign from ours for the Japanese firms in their sample period. We observe that the correlations of our portfolios with the JPY drop significantly following the 2008 global financial crisis due to the yen's role as a safe-haven currency. The peculiarity of its dynamics in the middle of our time sample can explain the conflicting evidence.[24]

[24] Fatum & Yamamoto (2016) document the particular importance of the Japanese yen as the "safest" of the safe-haven currencies, during the global financial crisis of 2008.

While not comprehensive, this analysis provides evidence that some of the same characteristics explored in the studies of cash flow effects from exchange rate fluctuations are also important to explain the currency factor risk sensitivity of our firms' portfolios.[25] We should point out that the relationship between these determinants and the risk sensitivity could also be modified by the extent of hedging activities of these companies. It would be challenging to gather data on the hedging incentives and practices for firms worldwide.[26] In all, we look at our study as a first attempt that can still provide corporate managers with useful information to improve the management of the exposure linked to FX risk. Firm-level determinants point to an association with cash flow effects, while trade variables at the aggregate level connect our findings to systematic economic forces that impact financial variables.

The shortcoming from our analysis is that we only further our understanding of firms that export and derive income from sales in foreign operations. Data on companies' imports are not widely available, and thus we are not able to differentiate from other types of activities that could generate different sensitivity to the systematic risk of foreign nature. Indeed Hoberg & Moon (2019) use textual analysis on 10-K filings of U.S. firms and are able to show that firms selling output abroad have higher expected returns, consistent with exposure, and firms buying input abroad have lower expected returns, consistent with hedging properties. This aligns with the notion that the risk profile of firms, and thus their hedging policies with respect to the systematic risk, likely depends on the heterogeneity of their operations. Our paper shows that one kind of heterogeneity among portfolios of globally exposed companies depends on the risk attached to global trade. We leave the analysis of the firm-level cost of capital with systematic FX risk for future research.

[25] We also estimate these regressions by lagging the independent variables and find that our findings are unchanged.
[26] Besides for the U.S., going back to Allayannis, Ihrig, & Weston (2001) among others, hedging activity has been documented also in Korea, see Bae, Kim, & Kwon (2018); in Europe, see Lyonnet, Martin, & Mejean (2021), in Germany, see Kuzmina & Kuznetsova (2018), in Brazil, see Rossi (2013); in Chile, see Miguel (2016), in Colombia, see Alfonso-Corredor (2018), and in Mexico, see Averell, Stein, Konigsberg, & Calixto López Castañon (2021).

6 Conclusion

Despite the evidence in the literature that companies with foreign activities engage in hedging, we are able to show that these companies are still significantly exposed to systematic foreign exchange rate risk. The results of a global multifactor conditional model with alternative cross-sections support the argument that globally-focused firms are driving the significance of the price of exchange rate risk. We implement a flexible empirical approach that allows us to broaden the investigation of exchange rate risk beyond the three major currencies to the G10 currencies. We find that the risk of the Swiss franc as well as the ones for the euro and British pound are significantly priced, which further corroborates the theoretical underpinnings of our empirical specifications.

We uncover risk factors that are negatively priced, implying that shocks like purchasing power deviations are not necessarily value-reducing for export-oriented firms. Different from contemporaneous covariation with the market, some firms can actually carry a lower cost of capital due to their positive covariation to some of our global risk factors. In addition, we document that their risk exposure to these factors varies over time. Hence the evidence we provide can help global firms in their assessment of what matters for their cost of equity capital and when it matters.

In addition to documenting an association with long-established firm-level characteristics, we also offer novel insights on the role of the trade channel in driving systematic currency risk exposure. We find that the risk sensitivities of high foreign sales firms to the currency factors are explained by their country's export intensity and its trade centrality, presenting a new channel that is of particular interest for policymakers. Our evidence suggests that companies are more exposed to systematic foreign exchange rate risk than counterparts in other countries if they belong to a country that has a larger export sector. Furthermore, we observe that firms face a smaller sensitivity to foreign exchange rate risk if they are based in countries more central to the global trade network relative to those firms in the periphery. Taken together, our findings have importance for both firm and public policy.

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Table 1. Summary Statistics: This table presents the summary statistics for the USD denominated excess returns of the portfolios in our sample. Panel A reports the cross-sectional averages of mean, standard deviation (St. Dev.), and Sharpe ratio, in annual percentages. Panel B reports the cross-sectional averages of correlations of each portfolio with the risk factors. The row Σ FX reports the sum of these values for the FX risk factors. For each country, H-FSR portfolios are constructed from firms with at least 10 percent foreign sales ratio, and L-FSR portfolios are based on those with less than 10 percent foreign sales ratio. INDUSTRY and RANDOM portfolios are constructed from firms with at least a 10 percent foreign sales ratio which are clustered in 34 industry portfolios and 41 pseudo-country portfolios, respectively. DS-INDEX portfolios are the DataStream's total market indexes and INVESTABLE portfolios are the MSCI's Investable Market indexes. The sample period is from January 1996 to December 2019 at the weekly frequency.

	H-FSR	DS-INDEX	INVESTABLE	L-FSR	INDUSTRY	RANDOM
Panel A						
Mean	9.642	7.952	7.303	7.434	6.330	6.747
St. Dev.	23.623	24.303	25.263	28.550	20.687	19.679
Sharpe Ratio	0.413	0.333	0.293	0.251	0.322	0.344
Panel B						
World Market	0.573	0.654	0.661	0.411	0.728	0.850
EUR	0.302	0.282	0.279	0.213	0.211	0.225
JPY	-0.027	-0.054	-0.057	-0.011	-0.097	-0.109
GBP	0.288	0.282	0.282	0.203	0.238	0.266
AUD	0.458	0.477	0.479	0.327	0.442	0.503
CAD	0.411	0.432	0.436	0.289	0.414	0.482
NZD	0.397	0.414	0.414	0.282	0.375	0.425
NOK	0.368	0.369	0.368	0.259	0.302	0.346
CHF	0.168	0.145	0.141	0.124	0.078	0.076
SEK	0.377	0.377	0.377	0.263	0.329	0.372
Σ FX	2.742	2.725	2.719	1.949	2.292	2.587

Table 2. Principal Component Analysis: This table reports the cross-sectional averages for the PC analysis. In Panel A, the first row shows the percentage of asset variation that the first PC explains and the second row shows the number of PCs needed to explain 70 percent of the variation. In Panel B, we report the R-squared of the projection of the risk factors on the first 10 PCs of each set of portfolios. The row Σ FX reports the sum of these values for the FX risk factors. For each country, H-FSR portfolios are constructed from firms with at least 10 percent foreign sales ratio, and L-FSR portfolios are based on those with less than 10 percent foreign sales ratio. INDUSTRY and RANDOM portfolios are constructed from firms with at least a 10 percent foreign sales ratio which are clustered in 34 industry portfolios and 41 pseudo-country portfolios, respectively. DS-INDEX portfolios are the DataStream's total market indexes and INVESTABLE portfolios are the MSCI's Investable Market indexes. The sample period is from January 1996 to December 2019 at the weekly frequency.

	H-FSR	DS-INDEX	INVESTABLE	L-FSR	INDUSTRY	RANDOM
Panel A						
%Var-1stPC	40.401	47.875	48.541	22.999	54.512	74.557
%70Var-NbPC	8.098	6.000	6.000	13.950	3.973	1.000
Panel B						
WorldMarket	0.787	0.922	0.919	0.748	0.972	0.975
EUR	0.419	0.363	0.336	0.324	0.267	0.233
JPY	0.060	0.069	0.071	0.051	0.110	0.063
GBP	0.260	0.217	0.213	0.210	0.217	0.246
AUD	0.519	0.477	0.491	0.474	0.489	0.429
CAD	0.452	0.407	0.415	0.383	0.425	0.399
NZD	0.385	0.357	0.367	0.359	0.364	0.314
NOK	0.396	0.382	0.369	0.346	0.369	0.326
CHF	0.203	0.168	0.152	0.143	0.169	0.132
SEK	0.451	0.403	0.385	0.387	0.324	0.299
Σ FX	3.145	2.844	2.800	2.678	2.734	2.441

Table 3. Conditional Asset Pricing Tests: This table presents the slope coefficients for conditional asset pricing tests of the International CAPM with the H-FSR portfolios as test assets. The analysis is based on the two-stage Bali-Engle methodology; first estimating the conditional covariances with the factors using the cDCC specification and then estimating panel regressions using these as covariates. T-statistics, in square brackets, are obtained using the GLS standard errors corrected for heteroskedasticity, autocorrelation, and cross-correlations of assets. We present nine specifications, (1) with only the world market portfolio, and (2) through (9) with different combinations of the currency investment risks, in addition to the market risk. Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the weekly frequency.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
intercept	0.032	0.001	-0.005	-0.007	0.001	0.000	0.001	-0.004	-0.016
	[0.87]	[0.03]	[-0.25]	[-0.35]	[0.03]	[0.00]	[0.06]	[-0.16]	[-0.81]
World Market	2.636***	2.310***	2.827***	1.876***	2.094***	1.982***	2.239***	1.864***	2.467***
	[5.68]	[4.41]	[5.32]	[3.26]	[3.76]	[3.63]	[4.30]	[3.42]	[4.67]
EUR		-3.555*	-3.984**	-4.105**	-4.331**	-7.004***	-0.667	-8.411***	-6.002**
		[-1.86]	[-2.05]	[-2.10]	[-2.19]	[-2.59]	[-0.31]	[-2.97]	[-1.98]
JPY		0.492	1.293	0.774	0.910	0.441	1.103	0.116	1.140
		[0.35]	[0.95]	[0.55]	[0.67]	[0.32]	[0.78]	[0.08]	[0.84]
GBP		5.022**	5.094**	3.928*	3.928*	4.432**	5.215***	4.981***	4.174**
		[2.56]	[2.48]	[1.94]	[1.91]	[2.24]	[2.67]	[2.58]	[2.10]
AUD			-0.591						-2.695
			[-0.67]						[-1.58]
CAD				2.354					0.496
				[1.54]					[0.26]
NZD					1.473				2.418
					[1.29]				[1.25]
NOK						4.330*			3.213
						[1.88]			[1.20]
CHF							-3.658**		-3.543**
							[-2.52]		[-2.51]
SEK								5.016**	2.115
								[2.19]	[0.83]
Observations	52,542	56,295	57,546	57,546	57,546	57,546	57,546	57,546	63,801
p-Value H_0: joint $\gamma_j = 0$		0.082	0.132	0.052	0.094	0.036	0.011	0.013	0.022

Table 4. Conditional Asset Pricing Tests - other Test Assets: This table presents the slope coefficients for conditional asset pricing tests of the International CAPM with the other portfolios in our sample as test assets. The analysis is based on the two-stage Bali-Engle regressions; first estimating the conditional covariances with the factors using the cDCC specification and then estimating panel regressions using these as covariates. T-statistic, in square brackets, are obtained using the GLS standard errors corrected for heteroskedasticity, autocorrelation, and cross-correlations of assets. We present the specification with all the currency investment risks, in addition to the market risk. L-FSR portfolios are based on firms with less than a 10 percent foreign sales ratio. INDUSTRY and RANDOM portfolios are constructed from firms with at least a 10 percent foreign sales ratio which are clustered in 34 industry portfolios and 41 pseudo-country portfolios, respectively. DS-INDEX porfolios are the DataStream's total market indexes and INVESTABLE portfolios are the MSCI's Investable Market indexes. The sample period is from January 1996 to December 2019 at the weekly frequency.

	L-FSR	DS-INDEX	INVESTABLE	INDUSTRY	RANDOM
intercept	-0.014	0.014	-0.010	0.001	0.006
	[-0.79]	[0.76]	[-0.51]	[0.07]	[0.28]
World Market	2.492***	2.060***	2.843***	1.194**	2.105***
	[4.48]	[4.04]	[5.56]	[2.18]	[3.58]
EUR	-8.341**	-5.445*	-1.869	-1.074	-0.466
	[-2.27]	[-1.93]	[-0.67]	[-0.29]	[-0.12]
JPY	0.545	-0.990	-1.170	-0.218	-0.189
	[0.39]	[-0.90]	[-1.04]	[-0.15]	[-0.14]
GBP	1.615	2.820	0.831	1.657	-4.518
	[0.75]	[1.53]	[0.47]	[0.59]	[-1.59]
AUD	-0.969	-2.530	-1.338	4.252**	2.248
	[-0.47]	[-1.63]	[-0.86]	[2.15]	[1.01]
CAD	3.415	-1.054	-1.866	-1.387	3.475
	[1.43]	[-0.63]	[-1.08]	[-0.48]	[1.33]
NZD	-2.895	1.292	1.569	-4.975**	-5.596**
	[-1.24]	[0.75]	[0.89]	[-1.99]	[-2.13]
NOK	5.749*	2.297	-0.118	-1.723	1.143
	[1.79]	[0.97]	[-0.05]	[-0.52]	[0.36]
CHF	1.104	0.468	0.130	1.976	1.441
	[0.53]	[0.31]	[0.08]	[1.02]	[0.69]
SEK	2.746	4.245*	2.778	2.825	0.959
	[0.82]	[1.79]	[1.17]	[0.94]	[0.31]
Observations	62,550	63,801	63,801	58,797	63,801
p-Value H_0: joint $\gamma_j = 0$	0.103	0.117	0.797	0.439	0.276

Table 5. Conditional Foreign Exchange Risk Factor Sensitivity: In Panel A, columns 1 to 4 present min, mean, max, and the mean absolute changes (MAC) of the conditional foreign exchange rate risk sensitivity (*FX Beta*) for H-FSR portfolios to their home currency risk (β_j^{FXc}). Column 5 reports the p-value for the null of constant *FX Beta* (MAC[β_j^{FXc}]=0). Column 6 reports the mean of the cross-sectional averages of *FX Beta* for all other H-FSR portfolios (Mean [β_j^{rest}]). Column 7 reports the p-value for the null that *FX Beta* to the home currency risk is smaller ($\beta_j^{FXc} < \beta_j^{rest}$). Column 8 reports the unconditional sensitivity of the H-FSR portfolios to their home currency risk (OLS[β_j^{FXc}]). In Panel B, columns 1 and 2 report the slope coefficients for regressions of *FX Beta* for H-FSR portfolios on the global financial crisis dummy (GlobalCrisis), a time trend, and the annual changes in the bilateral exchange rate vis-a-vis USD (ΔFX). Column 1 covers all countries in our sample and column 2 to 9 cover only the G10 countries, minus the U.S. Columns 3 to 8 report the slope coefficients for regressions of the spread between *FX Beta* for H-FSR and L-FSR portfolios on ΔFX, model implied expected returns of the H-FSR portfolios from column 9 of Table 3 (RISK_PREMIA), world market volatility (VOLATILITY_G), local market volatility (VOLATILITY_L), and FX risk factors volatility (VOLATILITY_FX). GlobalCrisis is a dummy variable that takes the value of one for years 2000, 2008, and 2011. FX FE are dummy variables that take the value of one for each of the nine FX risk factors. RISK_PREMIA_SPREAD is the difference between the model implied expected returns of the H-FSR and L-FSR portfolios. T-statistics, in square brackets, are obtained using the Newey-West standard errors. Country H-FSR (L-FSR) portfolios are constructed from firms with at least (less than) a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

Panel A	Min[β_j^{FXc}]	Mean[β_j^{FXc}]	Max[β_j^{FXc}]	MAC[β_j^{FXc}]	MAC[β_j^{FXc}]=0	Mean[β_j^{rest}]	$\beta_j^{FXc} < \beta_j^{rest}$	OLS[β_j^{FXc}]
EUR	0.376	0.899	1.854	0.291	0.000	0.643	0.052	0.984
JPY	-0.867	0.376	1.864	0.442	0.000	-0.048	0.025	0.507
GBP	0.636	1.052	1.788	0.257	0.000	0.588	0.001	1.154
AUD	0.803	1.299	1.692	0.197	0.000	0.748	0.000	1.455
CAD	1.074	1.759	2.550	0.477	0.000	0.990	0.000	1.857
NZD	0.866	1.209	1.950	0.170	0.001	0.576	0.000	1.224
NOK	0.341	1.265	2.402	0.329	0.000	0.644	0.001	1.357
CHF	-0.048	0.701	1.685	0.266	0.000	0.327	0.001	0.711
SEK	0.564	1.143	2.050	0.348	0.000	0.657	0.000	1.276

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intercept	0.623***	1.321***	0.146**	0.079	0.141*	-0.057	0.058	-0.003
	[31.12]	[13.24]	[1.77]	[0.90]	[1.63]	[-0.73]	[0.47]	[-0.03]
Trend	0.009***							
	[10.04]							
GlobalCrisis	0.224***							
	[14.06]							
ΔFX		-1.014**	-0.861***	-0.829***	-0.934***	-0.417*	-0.735**	-0.429*
		[-2.40]	[-3.05]	[-2.94]	[-3.34]	[-1.79]	[-2.47]	[-1.77]
RISK_PREMIA				3.078***				-0.121
				[3.36]				[-0.13]
RISK_PREMIA_SPREAD					2.219**			1.757*
					[2.32]			[1.67]
VOLATILITY_G						1.238***		-0.912
						[3.16]		[-1.45]
VOLATILITY_L							1.966***	1.943**
							[3.04]	[2.67]
VOLATILITY_FX							-1.931**	-1.106
							[-1.96]	[-1.25]
FX FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	YES		YES	
Observations	8541	216	216	216	216	216	216	216
Adjusted R2	0.325	0.532	0.062	0.091	0.088	0.072	0.089	0.111

Table 6. Factor Sensitivity and Trade: Panel A reports the cross-sectional averages of the foreign exchange rate risk sensitivities (*FX Beta*) for the country H-FSR portfolios in each geographic region (or excluding the region). Panel B reports the averages of period-by-period slope coefficients from cross-sectional regressions of *FX Beta* for H-FSR portfolios on the exports of goods and services, as % of GDP (EXP_INTENSITY), Trade Centrality (TR_CENTRALITY), IFRS adoption date dummy, Anti-director index (ANTI_DIRECTOR), capital account openness measure (CAPITAL_ACC_OPEN), the degree of law and order (LAW), as well as domestic consumption, market capitalization of listed companies (MCAP), and domestic credit to the private sector (PRIVATE_CREDIT), all as % of GDP. T-statistics, in square brackets, are obtained using the Fama-MacBeth standard errors corrected for time-dependence following Petersen (2009). Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

Panel A	EUR	JPY	GBP	AUD	CAD	NZD	NOK	CHF	SEK
Asia Pacific	0.409	-0.027	0.449	0.752	0.883	0.597	0.485	0.199	0.496
ex. Asia Pacific	0.766	-0.045	0.671	0.755	1.058	0.580	0.741	0.404	0.748
Europe	0.907	-0.005	0.764	0.764	1.041	0.591	0.817	0.513	0.855
ex. Europe	0.394	-0.071	0.434	0.744	0.957	0.580	0.497	0.163	0.478
America	0.363	-0.160	0.405	0.729	1.105	0.547	0.522	0.092	0.440
ex. America	0.702	-0.014	0.634	0.759	0.976	0.593	0.681	0.384	0.707
Panel B	**EUR**	**JPY**	**GBP**	**AUD**	**CAD**	**NZD**	**NOK**	**CHF**	**SEK**
EXP_INTENSITY	0.144**	0.064**	0.090**	0.172*	0.130	0.190*	0.104*	0.103***	0.126*
	[2.30]	[2.31]	[1.98]	[1.71]	[0.88]	[1.95]	[1.67]	[2.68]	[1.70]
TR_CENTRALITY	-0.156***	-0.049**	-0.079	-0.233***	-0.132**	-0.264***	-0.215***	-0.071**	-0.134***
	[-2.98]	[-2.10]	[-0.98]	[-7.33]	[-2.35]	[-7.58]	[-7.17]	[-2.03]	[-3.40]
IFRS	19.173*	5.657	16.786*	8.045*	10.918	5.873	14.109**	14.504	13.458*
	[1.78]	[1.24]	[1.83]	[1.74]	[1.10]	[1.41]	[2.05]	[1.45]	[1.76]
ANTI_DIRECTOR	-7.361***	-2.095**	-2.329	1.286*	2.630***	1.011	-4.029***	-6.331***	-5.116***
	[-4.77]	[-2.45]	[-0.93]	[1.68]	[3.13]	[0.77]	[-3.28]	[-9.10]	[-5.96]
CAPITAL_ACC_OPEN	0.375***	0.123	0.144**	-0.240***	-0.285	-0.040	0.047	0.231***	0.090
	[3.64]	[1.60]	[2.02]	[-3.67]	[-1.17]	[-0.76]	[0.46]	[4.25]	[1.14]
LAW	6.838***	-2.013	5.381***	6.848*	9.277**	3.779	6.734***	3.508***	8.849***
	[3.62]	[-1.47]	[3.81]	[1.89]	[2.40]	[1.46]	[3.52]	[4.49]	[6.03]
MCAP	-0.092***	-0.064**	-0.092***	-0.044	-0.020	-0.086*	-0.050***	-0.084***	-0.070***
	[-3.33]	[-2.38]	[-3.33]	[-1.62]	[-0.92]	[-1.91]	[-5.44]	[-3.03]	[-2.63]
PRIVATE_CREDIT	-0.105	0.128*	-0.054*	-0.045	-0.126*	0.012	-0.088	-0.025	-0.084*
	[-1.58]	[1.91]	[-1.67]	[-0.59]	[-1.65]	[0.13]	[-1.45]	[-0.91]	[-1.68]
CONSUMPTION	0.493*	-0.062	0.497	0.928***	1.113***	0.699***	0.771***	0.299***	0.640***
	[1.69]	[-0.55]	[1.61]	[5.61]	[3.77]	[4.70]	[5.90]	[3.25]	[4.91]
Observations	713	713	713	713	713	713	713	713	713
Adjusted R2	0.866	0.656	0.884	0.900	0.859	0.872	0.898	0.799	0.904

Table 7. Factor Sensitivity and Firm-level Characteristics: The table reports the averages of period-by-period slope coefficients from cross-sectional regressions of the conditional foreign exchange rate risk sensitivity for the H-FSR portfolios on the median characteristics of the H-FSR firms in their country. FSR is the foreign sales ratio, SIZE is the log of the USD-denominated market capitalization on the last observation of each year, FAR is the foreign asset ratio, B/M is the book to market ratio, and LEVERAGE is the ratio of a firm's value of total debt to its total assets. We compute the trading volume by summing the volume of shares traded over the year, in log (VOLUME). T-statistics, in square brackets, are obtained using the Fama-MacBeth standard errors corrected for time-dependence following Petersen (2009). Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

	EUR	JPY	GBP	AUD	CAD	NZD	NOK	CHF	SEK
FSR	0.802***	0.002	0.594***	0.421***	0.689***	0.330***	0.673***	0.414***	0.705***
	[11.02]	[0.02]	[9.09]	[3.50]	[7.99]	[4.30]	[8.47]	[7.16]	[13.69]
SIZE	7.827**	0.506	5.076**	3.834*	9.034***	3.194**	7.057***	2.822*	6.833***
	[2.23]	[0.44]	[2.39]	[1.94]	[6.72]	[2.40]	[4.77]	[1.80]	[3.39]
VOLUME	-4.932***	-1.218*	-2.429***	1.928**	0.835	0.752**	-2.160**	-2.911***	-2.446**
	[-3.23]	[-1.93]	[-4.32]	[2.13]	[0.89]	[2.28]	[-2.04]	[-4.01]	[-2.38]
FAR	-0.143	0.249*	-0.097	0.131	-0.129	0.296	-0.433**	0.063	-0.119
	[-0.65]	[1.72]	[-0.47]	[0.29]	[-0.43]	[0.65]	[-2.49]	[1.33]	[-0.39]
B/M	0.872***	0.282	0.503*	0.220	-0.014	0.166	0.289	1.178***	0.601***
	[4.70]	[1.31]	[1.89]	[1.41]	[-0.08]	[1.34]	[1.38]	[9.06]	[3.46]
LEVERAGE	0.910***	0.078	0.795***	0.505**	0.427	0.554***	0.569**	0.658***	0.534**
	[2.83]	[0.49]	[3.29]	[2.10]	[0.82]	[3.13]	[2.17]	[4.50]	[2.33]
Observations	973	973	973	973	973	973	973	973	973
Adjusted R2	0.812	0.547	0.822	0.871	0.829	0.853	0.843	0.750	0.844

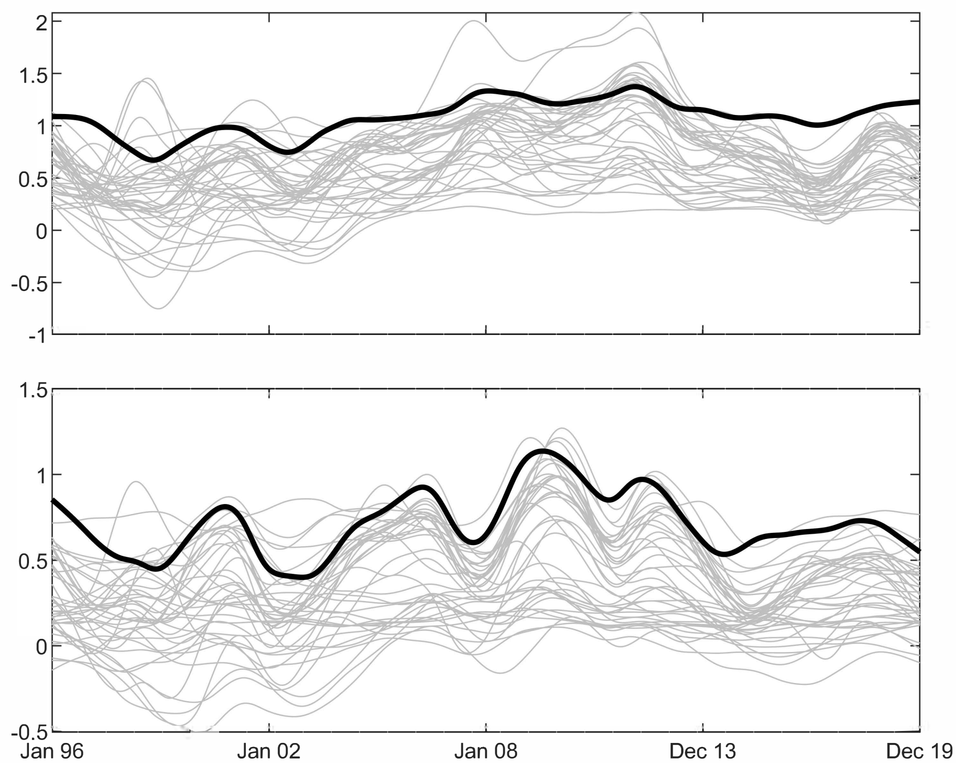

Figure 1. Time-varying FX Exposure. Top panel presents the time-varying sensitivity of the H-FSR portfolios in each country to the GBP risk. The H-FSR portfolio for the United Kingdom is marked with a dark black line. The bottom panel similarly presents the sensitivities of the H-FSR portfolios to the CHF risk, where the portfolio of Swiss H-FSR firms are marked with a dark black line. In both panels, the time-varying exposures are displayed through a Hodrick-Prescott (HP) filter.

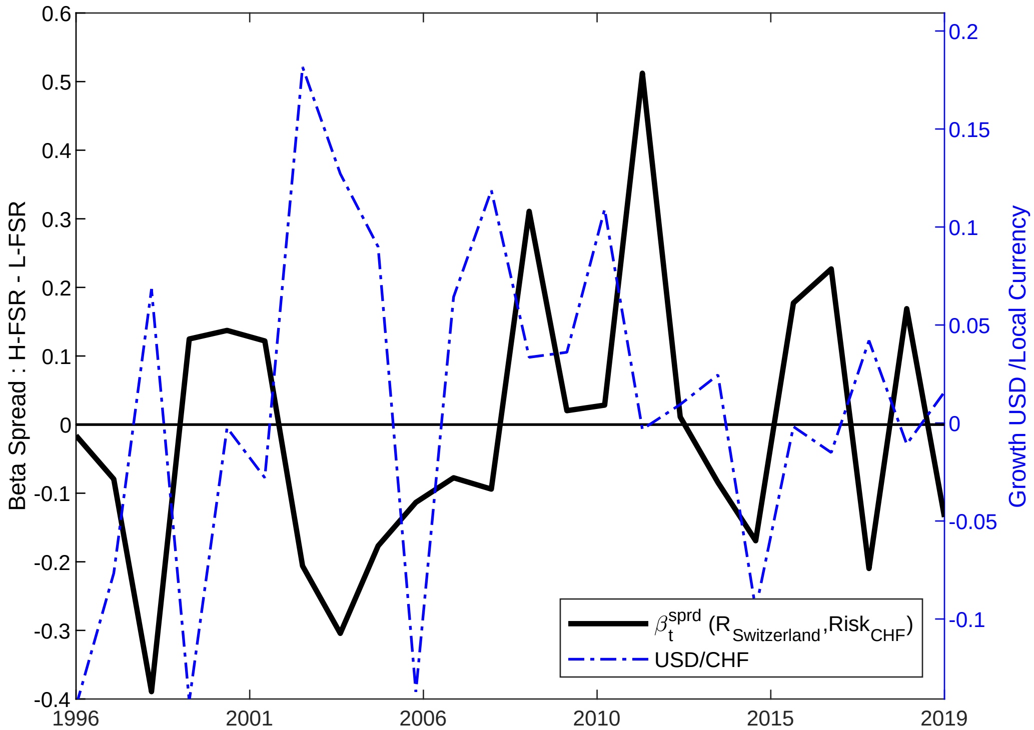

Figure 2. FX Exposure and Currency Fluctuations. On the left axis and in a solid black line, the figure plots the difference between the time-varying FX exposure to the CHF risk of the Swiss H-FSR portfolio and that of the Swiss L-FSR portfolio, at the end of each year. On the right axis and in a dashed blue line, the figure plots the annual growth rate of the CHF currency.

Online Appendix

A. Firm-level Data Cleaning

We access the universe of stocks in major stock exchanges in countries for which DataStream provides a total market index. A country's major stock exchange is the one with the highest number of listed stocks. To be more inclusive, we follow (Chaieb, Langlois, & Scaillet, 2021) and include more than one stock exchange in some countries: Brazil (Rio de Janeiro and Bovespa), Canada (Toronto and TSX Venture), China (Shanghai and Shenzhen), France (Paris and NYSE Euronext), Germany (Deutsche Boerse and Xetra), India (BSE and National Stock Exchange), Japan (Tokyo and Osaka), South Korea (Korea and KOSDAQ), Switzerland (Swiss Exchange and Zurich), and the U.S. (NYSE, NYSE Arca, Amex, and Nasdaq).

To limit the effect of survivorship bias, we include dead stocks in the sample. To identify delisting dates for dead stocks, for each stock, we verify each day if the rest of the time series has the same unadjusted price (UP) in local currency denomination and remove the rest of the time series in such a case.

We follow Ince & Porter (2006) and Lee (2011) and perform the following filters for cleaning the firm-level data based on their price information. For a firm at each week, first, we require that the value of its total return index for either the previous or the current period be above 0.01. Second, we require non-missing and non-zero market capitalization for the firm at those periods. Third, if any weekly return greater than or equal to 100% is reversed in the following period, we assume them to be missing and exclude these observations. Specifically, the returns for both period t and $t-1$ are set to be missing if $(1+r_{j,t}) \times (1+r_{j,t-1}) \leq 1.5$ and at least one of the two returns are 200% or greater, where $r_{j,t}$ denotes the weekly return of firm j at week t. Fourth, observations with weekly return above 300% are assumed as data errors and are excluded.

Lastly, we follow Griffin, Kelly, & Nardari (2010) and Karolyi, Lee, & van Dijk (2012) and exclude depositary receipts, real estate investment trusts, preferred stocks, investment funds, and other stocks with special features. DataStream does not provide any code for discerning noncommon shares from common shares. Therefore, we manually examine the names of the securities and exclude stocks with names including ADR, GDR, REIT, REAL EST, PF, PREF, or PRF. Also, we drop stocks with names including terms provided in Table B.1 of Griffin et al. (2010) due to various special features. For this step, we also collect the Industry Classification Benchmark (ICB) level 4 for each firm from DataStream and exclude firms with ICB classification of REITS (REITs'), and RLISV (Real Estate Inv & Svs) as well as those with CEINV (Closed-End Invest.), OMINV (Open, Misc. Invest.), UNCLS (Unclassified), and UQEQS (Unquoted equities). We also implement country-specific filters provided in Table B.2 of Griffin et al. (2010) to identify special stocks. Chaieb et al. (2021) update this list, which is detailed in their online Appendix.

B. Risk Exposure Determinants and Their Sources

We explore alternative determinants to our hypothesis H3. Most of these variables are available only at the annual frequency, while for the others with a higher frequency, we collect their end-of-the-year observations.

For the investment channel, we consider different types of international capital flows. From the International Monetary Fund's (IMF) Balance of Payments dataset, we collect the extent of domestic equity purchases by foreign investors, i.e., the liabilities item from Foreign Portfolio Investment, scaled by the country's GDP (FPI). From WDI, we collect the Foreign Direct Investment inflow and outflow metrics, scaled by the country's GDP (FDI_OUT). We consider several variables to control for country-level characteristics. To characterize the corporate governance environment and the quality of institutions of the country, we consider the International Financial Reporting System adoption date (IFRS), the anti-director index (ANTI-DIRECTOR) introduced by Pagano & Volpin (2005), and the degree of law and order from the International Country Risk Guide (LAW). For all these variables, a higher value indicates a better environment. We also collect from WDI the domestic consumption (CONSUMPTION), the market capitalization of listed companies (MCAP), and the domestic credit to the private sector (PRIVATE_CREDIT), all as a percentage of the local GDP. Domestic consumption measures a country's economic development. Economies with a higher share of consumption, like the advanced ones, could be more sensitive to the deviations in relative prices, which affect asset holders who might invest internationally but consume at home. Local stock market capitalization and credit to the private sector are intended to explain countries' economic environment and financial development. In general, countries with deeper financial markets and more credit availability provide better conditions for the business activity of both domestic and foreign firms. Furthermore, financial development can be viewed as a proxy for access to financial derivatives, which is an important portion of the risk management of firms in our portfolios. This could be relevant given that a large literature documents that the use of FX derivatives is prevalent around the world among firms with exchange rate exposure. We also include the capital account openness measure introduced by Quinn & Toyoda (2008) and later updated by Fernández, Klein, Rebucci, Schindler, & Uribe (2016), since it is conceivable that the cross-section of assets' risk sensitivities to currency factors is associated with the easiness of capital movements, besides trade flows (CAPITAL_ACC_OPEN). The index is constructed from the IMF's annual publications on capital controls. A high score indicates less restricted capital flows.

We also construct a set of country-level variables from firm characteristics that we collect from WorldScope and DataStream firm-level data. We use the median across the H-FSR firms in each country. The foreign sales ratio (FSR) is the sum of exports and international sales from foreign operations divided by total sales. To measure a firm's size, we collect the log of the U.S. dollar-denominated market capitalization on the last observation of each year (SIZE). We compute the trading volume by summing the volume of shares traded over the year, in log (VOLUME). We take high volume as a proxy for the firm's liquidity in the absence of a more reliable measure of liquidity across our large sample of global firms. We use the foreign assets ratio (FAR) and book to market ratio (B/M) as provided by WorldScope in the year. We construct financial leverage as the ratio of a firm's value of total debt to its total assets for the year (LEVERAGE).

C. Additional Tables

Table A1. H-FSR Summary Statistics: This table presents the summary statistics for the H-FSR portfolios. It reports the mean and the standard deviation (St. Dev.) of the USD denominated excess returns, in annual percentages, for each country. It also reports the number of unique firms (# Firms) as well as the total market capitalization, in USD, of each portfolio (Mcap) at the end of our sample. The total market capitalizations, in USD, of the DataStream's total market index portfolios ([DS-INDEX]) on the same date are also reported. The cross-sectional averages of these statistics for developed markets (DM) and emerging markets (EM) are reported below each group. H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the weekly frequency.

Country	Mean	St. Dev.	# Firms	Mcap	[DS-INDEX]	Country	Mean	St. Dev.	# Firms	Mcap	[DS-INDEX]
Australia	9.023	21.509	878	601,852	1,324,769	Brazil	14.655	26.006	118	321,430	1,047,145
Austria	9.682	16.874	93	58,672	127,819	Chile	10.248	23.434	69	84,308	173,040
Belgium	4.749	17.388	100	234,715	377,940	China	17.781	31.911	1818	2,585,382	1,622,437
Canada	11.884	20.928	1081	924,945	2,040,521	Colombia	4.419	27.100	15	56,141	128,292
Denmark	9.232	17.264	162	369,405	431,625	Czech Republic	8.580	24.810	37	13,412	27,106
Finland	10.753	19.265	153	214,683	275,929	Hungary	9.361	27.362	25	12,343	31,918
France	9.456	17.285	779	2,177,154	2,759,249	India	15.920	27.878	1560	841,159	1,878,213
Germany	7.586	17.625	1271	3,280,270	2,126,147	Indonesia	14.147	33.663	152	52,448	389,708
Hong Kong	11.627	22.354	1312	1,104,845	2,795,222	Malaysia	6.715	31.111	507	159,439	339,824
Ireland	12.931	25.211	10	51,637	100,088	Mexico	8.918	22.276	99	179,635	391,981
Italy	5.656	20.066	299	360,099	710,670	Morocco	2.388	12.830	5	14,003	64,624
Japan	6.979	21.368	1646	3,822,761	5,944,290	Peru	13.791	28.480	34	11,112	99,447
Netherlands	8.613	19.604	189	634,029	886,153	Philippines	8.657	28.717	41	37,466	236,925
New Zealand	6.480	20.100	81	41,457	102,616	Poland	9.678	26.976	245	56,975	131,961
Norway	6.645	24.050	247	208,426	283,206	South Africa	7.538	25.507	151	232,725	423,834
Portugal	8.188	19.374	56	50,720	61,088	South Korea	15.863	36.934	1275	1,008,769	1,064,109
Singapore	9.262	24.851	537	215,804	526,108	Taiwan	1.783	29.987	696	71,162	914,475
Spain	8.582	19.834	144	479,563	747,678	Thailand	10.316	20.810	272	124,932	401,239
Sweden	12.055	22.337	449	513,843	648,545	Turkey	16.932	41.334	170	25,841	145,381
Switzerland	9.374	16.648	248	1,460,335	1,822,230						
United Kingdom	4.871	16.459	1995	2,231,321	3,345,069						
United States	14.020	21.035	5053	21,722,023	32,297,490						
Mean DM	8.984	20.065	763	1,852,662	2,715,202	Mean EM	10.405	27.743	384	309,931	500,614

Table A2. Unconditional Asset Pricing Tests: This table presents the slope coefficients for the unconditional tests of the International CAPM, with the H-FSR portfolios as test assets. The analysis is based on two-stage Fama-MacBeth regressions; first estimating the factor betas over rolling windows of six years and then estimating cross-sectional regressions every period. The table reports the averages of the slope estimates of the period-by-period regressions, scaled by the variance of each factor. T-statistics, in square brackets, are obtained using the Fama-MacBeth standard errors corrected for time-dependence, following Petersen (2009). We present nine specifications, (1) with only the world market portfolio, and (2) through (9) with different combinations of the currency investments, in addition to the market risk. H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the weekly frequency.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
intercept	0.337***	0.427***	0.433***	0.405***	0.428***	0.422***	0.431***	0.439***	0.414***
	[5.38]	[5.98]	[6.26]	[5.63]	[6.04]	[5.67]	[6.15]	[5.93]	[5.44]
World Market	-2.366	-3.385*	-3.337*	-3.126	-3.374*	-3.548*	-3.353*	-3.327*	-2.817
	[-1.34]	[-1.79]	[-1.78]	[-1.63]	[-1.79]	[-1.86]	[-1.81]	[-1.76]	[-1.48]
EUR		-8.077**	-9.077**	-8.565**	-8.478**	-7.483*	-7.915**	-8.142**	-6.446
		[-2.14]	[-2.51]	[-2.31]	[-2.33]	[-1.91]	[-2.13]	[-2.12]	[-1.62]
JPY		-6.681*	-5.937	-4.928	-5.806	-4.080	-7.468*	-7.393*	-5.708
		[-1.70]	[-1.52]	[-1.25]	[-1.47]	[-1.04]	[-1.81]	[-1.85]	[-1.36]
GBP		-8.351*	-9.701**	-8.082*	-8.789**	-7.371	-8.551**	-9.443**	-7.551
		[-1.92]	[-2.27]	[-1.84]	[-2.05]	[-1.63]	[-1.97]	[-2.17]	[-1.63]
AUD			-6.115**						-6.554**
			[-2.11]						[-2.22]
CAD				-3.934					-5.935
				[-0.81]					[-1.19]
NZD					-5.031*				-4.355
					[-1.74]				[-1.45]
NOK						-2.648			-0.051
						[-0.75]			[-0.01]
CHF							-4.372		-1.666
							[-1.39]		[-0.51]
SEK								-9.086***	-8.406***
								[-2.83]	[-2.59]
Observations	38,252	38,252	38,252	38,252	38,252	38,252	38,252	38,252	38,252

Table A3. Summary Conditional Factor Sensitivity: The table reports the mean of the conditional foreign exchange rate risk sensitivity for the H-FSR portfolios to each currency risk. Risk sensitivities with respect to the home currency, β_j^{FXc}, are shown in a bold font and correspond to the figures reported in Table 5. Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

	EUR	JPY	GBP	AUD	CAD	NZD	NOK	CHF	SEK
Australia	0.647	-0.012	0.708	**1.299**	1.236	0.909	0.708	0.325	0.691
Austria	1.143	0.095	0.893	0.720	0.970	0.583	0.911	0.674	0.925
Belgium	0.945	0.069	0.719	0.705	0.859	0.556	0.748	0.656	0.814
Brazil	0.441	-0.204	0.522	0.842	1.183	0.633	0.608	0.129	0.561
Canada	0.499	-0.115	0.554	0.871	**1.759**	0.654	0.691	0.192	0.616
Chile	0.321	-0.070	0.288	0.734	0.932	0.562	0.451	0.061	0.375
China	0.277	-0.078	0.206	0.381	0.567	0.210	0.316	0.158	0.300
Colombia	0.403	-0.209	0.496	0.751	0.957	0.596	0.562	0.107	0.369
Czech Republic	1.291	0.051	0.997	0.840	1.045	0.702	0.981	0.856	1.064
Denmark	1.006	0.012	0.790	0.662	0.835	0.529	0.801	0.580	0.880
Finland	0.887	-0.022	0.719	0.773	1.175	0.588	0.816	0.447	0.864
France	0.976	-0.007	0.724	0.740	1.018	0.573	0.796	0.531	0.852
Germany	**0.899**	-0.019	0.725	0.700	0.993	0.539	0.729	0.481	0.812
Hong Kong	0.178	-0.155	0.223	0.509	0.679	0.340	0.293	0.023	0.239
Hungary	1.031	0.117	0.854	0.882	1.394	0.691	0.977	0.525	0.995
India	0.309	-0.182	0.348	0.603	0.629	0.445	0.408	0.120	0.407
Indonesia	0.559	0.131	0.480	0.711	0.691	0.626	0.463	0.294	0.522
Ireland	0.738	-0.068	0.674	0.667	0.863	0.486	0.611	0.392	0.748
Italy	0.939	-0.006	0.751	0.731	1.015	0.555	0.813	0.515	0.885
Japan	0.455	**0.376**	0.491	0.600	0.699	0.479	0.422	0.288	0.488
Malaysia	0.310	-0.027	0.425	0.738	0.903	0.550	0.385	0.126	0.527
Mexico	0.278	-0.174	0.293	0.660	1.079	0.489	0.487	0.010	0.385
Morocco	0.715	0.166	0.456	0.345	0.371	0.307	0.471	0.414	0.494
Netherlands	0.887	-0.079	0.723	0.757	1.073	0.583	0.817	0.475	0.855
New Zealand	0.670	0.064	0.639	1.106	1.145	**1.209**	0.676	0.381	0.720
Norway	0.955	-0.107	0.856	1.043	1.590	0.781	**1.265**	0.483	1.032
Peru	0.497	0.030	0.472	0.704	0.907	0.521	0.547	0.284	0.447
Philippines	0.277	-0.144	0.372	0.602	0.717	0.509	0.429	0.164	0.373
Poland	1.006	0.015	0.858	0.977	1.417	0.764	0.950	0.589	0.943
Portugal	0.988	0.037	0.900	0.777	0.912	0.604	0.832	0.653	0.862
Singapore	0.438	0.020	0.387	0.699	0.875	0.588	0.423	0.200	0.511
South Africa	0.729	-0.004	0.667	1.121	1.510	0.834	0.969	0.346	0.856
South Korea	0.258	-0.193	0.562	1.012	1.461	0.785	0.465	0.212	0.546
Spain	0.981	-0.019	0.823	0.764	1.078	0.592	0.863	0.547	0.867
Sweden	0.900	-0.127	0.754	0.932	1.274	0.726	0.908	0.418	**1.143**
Switzerland	0.866	0.125	0.655	0.676	0.888	0.523	0.729	**0.701**	0.801
Taiwan	0.329	-0.197	0.424	0.621	0.609	0.458	0.453	0.026	0.388
Thailand	0.295	0.022	0.351	0.526	0.646	0.415	0.381	0.118	0.382
Turkey	0.662	-0.176	0.564	1.060	1.294	0.745	0.939	0.187	0.835
United Kingdom	0.648	-0.081	**0.564**	0.697	0.929	0.533	0.609	0.326	0.659
United States	0.097	-0.374	0.211	0.541	0.920	0.376	0.305	-0.138	0.329

Table A4. Factor Sensitivity and Foreign Portfolio Capital Flows: The table reports the averages of period-by-period slope coefficients from cross-sectional regressions of the conditional foreign exchange rate risk sensitivity for the country H-FSR portfolios on the extent of domestic equity purchases by foreign investors (FPI), as % of GDP, IFRS adoption date dummy, Anti-director index (ANTI_DIRECTOR), capital account openness measure (CAPITAL_ACC_OPEN), the degree of law and order (LAW), as well as domestic consumption, market capitalization of listed companies (MCAP), domestic credit to the private sector (PRIVATE_CREDIT), all as % of GDP. T-statistics, in square brackets, are obtained using the Fama-MacBeth standard errors corrected for time-dependence following Petersen (2009). Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

	EUR	JPY	GBP	AUD	CAD	NZD	NOK	CHF	SEK
FPI	0.126	-0.038	0.132	-0.000	-0.158	0.032	0.065	0.138*	0.097*
	[1.11]	[-0.86]	[1.11]	[-0.00]	[-1.32]	[0.52]	[1.22]	[1.78]	[1.69]
IFRS	16.716*	4.255	13.413*	6.407	9.969	4.753	11.527**	12.853	11.810*
	[1.73]	[1.21]	[1.90]	[1.54]	[1.31]	[1.44]	[2.07]	[1.50]	[1.84]
ANTI_DIRECTOR	-8.891***	9.142	-6.540	4.010	-4.031	2.291	-2.365	-8.027***	-7.573***
	[-4.44]	[0.58]	[-1.61]	[1.58]	[-1.11]	[1.37]	[-0.44]	[-4.18]	[-4.64]
CAPITAL_ACC_OPEN	0.314***	0.081	0.221*	-0.299***	-0.358	-0.096***	-0.095	0.190***	-0.017
	[3.38]	[0.71]	[1.76]	[-6.20]	[-1.61]	[-2.67]	[-1.35]	[3.02]	[-0.34]
LAW	5.969***	-1.431	3.256***	7.347***	10.227***	4.376***	6.457***	2.422**	8.538***
	[3.79]	[-0.66]	[2.86]	[3.16]	[3.06]	[2.75]	[3.82]	[2.31]	[9.12]
MCAP	-0.102***	-0.035**	-0.129*	-0.042	0.034	-0.066**	-0.059***	-0.109***	-0.069***
	[-3.96]	[-2.28]	[-1.91]	[-1.36]	[0.53]	[-2.09]	[-4.01]	[-2.86]	[-3.70]
PRIVATE_CREDIT	-0.051	0.126	0.014	-0.020	-0.059	0.019	-0.042	0.037	-0.024
	[-1.32]	[1.42]	[0.56]	[-0.42]	[-1.08]	[0.40]	[-1.50]	[1.30]	[-0.76]
CONSUMPTION	0.505**	-0.247*	0.504**	0.884***	1.242***	0.592***	0.819***	0.322***	0.700***
	[2.32]	[-1.68]	[2.20]	[10.17]	[3.53]	[5.96]	[7.32]	[4.55]	[8.32]
Observations	759	759	759	759	759	759	759	759	759
Adjusted R2	0.878	0.699	0.897	0.899	0.863	0.880	0.889	0.812	0.904

Table A5. Factor Sensitivity and Foreign Investment Capital Flows: The table reports the averages of period-by-period slope coefficients from cross-sectional regressions of the conditional foreign exchange rate risk sensitivity for the country H-FSR portfolios on foreign direct investment outflows (FDI_OUT), as % of GDP, IFRS adoption date dummy, Anti-director index (ANTI_DIRECTOR), capital account openness measure (CAPITAL_ACC_OPEN), the degree of law and order (LAW), as well as domestic consumption, market capitalization of listed companies (MCAP), domestic credit to the private sector (PRIVATE_CREDIT), all as % of GDP. T-statistics, in square brackets, are obtained using the Fama-MacBeth standard errors corrected for time-dependence following Petersen (2009). Country H-FSR portfolios are constructed from firms with at least a 10 percent foreign sales ratio. The sample period is from January 1996 to December 2019 at the annual frequency.

	EUR	JPY	GBP	AUD	CAD	NZD	NOK	CHF	SEK
FDI_OUT	0.186	-0.509**	-0.147	-0.223	0.091	-0.346***	-0.036	0.202	0.058
	[0.64]	[-2.49]	[-0.79]	[-1.61]	[0.23]	[-2.82]	[-0.22]	[0.67]	[0.22]
IFRS	17.419	2.041	16.383	9.769*	14.036	7.192	13.679	12.266	13.734
	[1.52]	[0.82]	[1.63]	[1.79]	[1.33]	[1.62]	[1.63]	[1.28]	[1.52]
ANTI_DIRECTOR	-8.197***	6.127	-6.321	2.900**	0.526	0.489	-3.569**	-6.626***	-6.019**
	[-3.14]	[0.55]	[-1.06]	[2.37]	[0.12]	[0.24]	[-2.53]	[-6.61]	[-2.10]
CAPITAL_ACC_OPEN	0.361***	0.061	0.323***	0.146*	0.152	0.206***	0.184**	0.230***	0.225***
	[5.17]	[0.73]	[5.36]	[1.92]	[1.04]	[3.28]	[2.38]	[4.63]	[3.35]
LAW	7.307***	0.091	3.615***	2.387*	4.080*	1.577**	4.898***	4.253***	7.233***
	[5.45]	[0.08]	[4.71]	[1.74]	[1.73]	[1.96]	[6.10]	[4.82]	[12.43]
MCAP	-0.089***	-0.022	-0.082***	-0.044*	-0.036	-0.060**	-0.064***	-0.079**	-0.067***
	[-2.72]	[-1.34]	[-2.96]	[-1.91]	[-1.05]	[-1.99]	[-2.77]	[-2.41]	[-2.73]
PRIVATE_CREDIT	-0.115	0.078	-0.046	-0.040	-0.096	-0.006	-0.084	-0.030	-0.075
	[-1.46]	[1.21]	[-1.31]	[-0.56]	[-1.39]	[-0.08]	[-1.61]	[-0.92]	[-1.53]
CONSUMPTION	0.457	-0.167	0.410*	0.614***	0.829***	0.431***	0.591***	0.241***	0.469**
	[1.60]	[-1.62]	[1.78]	[4.62]	[3.72]	[2.59]	[3.70]	[2.75]	[2.40]
Observations	960	960	960	960	960	960	960	960	960
Adjusted R2	0.849	0.600	0.861	0.875	0.838	0.847	0.869	0.776	0.871

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