NBER WORKING PAPER SERIES

THE RISKY CAPITAL OF EMERGING MARKETS

Felix Gerding
Espen Henriksen
Ina Simonovska

Working Paper 20769
http://www.nber.org/papers/w20769

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 2014, Revised April 2024

We thank Stan Zin, Juan Carlos Hatchondo, Tarek Hassan, Max Croce, Hanno Lustig, Oleg Itskhoki and the editor, associate editor and two referees at the Journal of Finance for their insightful comments; Joel David for contributions toward the first draft of this paper; Luis-Gonzalo Llosa for contributions during earlier stages of this project; Luca Macedoni and Cynthia Yang for their research assistance; and many seminar and conference participants. Ina Simonovska acknowledges financial support from the Hellman Fellowship and the Institute of Social Sciences at UC Davis. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

The Risky Capital of Emerging Markets
Felix Gerding, Espen Henriksen, and Ina Simonovska
NBER Working Paper No. 20769
December 2014, Revised April 2024
JEL No. E22,F21,G12,O4

ABSTRACT

We build a panel of stock market returns across 37 developed and developing countries spanning five decades. We document: (1) higher and more volatile returns in poorer over richer countries; (2) higher returns in countries with more sensitive dividends to changes in global predictable growth. We quantitatively explore whether consumption-based long-run risk can reconcile these patterns. When we estimate the parameters that govern the U.S. investor's consumption growth and each market's dividend growth process, the model generates higher risk premia in emerging over developed markets, and predicts levels and volatilities of stock market returns that are at par with data.

Felix Gerding
Department of Finance
Universita' Bocconi
felix.gerding@phd.unibocconi.it

Espen Henriksen
BI Norwegian Business School
Department of Financial Economics
Oslo
Norway
espen.henriksen@bi.no

Ina Simonovska
Department of Economics
University of California, Davis
One Shields Avenue
Davis, CA 95616
and NBER
inasimonovska@ucdavis.edu

1 Introduction

Emerging markets have represented an attractive investment category for global investors since they underwent significant financial account liberalization episodes in the late 1980's. A typical argument in favor of investing in emerging markets is that they offer hedging opportunities for a U.S. investor due to these markets' relatively higher returns and lower co-movement with the U.S. market when compared to developed economies whose business cycles are more synchronized with that of the U.S. Yet, capital flows to emerging markets remain systematically lower than those to developed markets—a finding consistent with the 'Lucas Paradox', which refers to the empirical observation that rates of return to capital are persistently higher in emerging markets.

In this paper, we argue that U.S. investors demand systematically higher risk premia to invest in emerging markets, which hinders capital flows to these destinations. We examine in detail one important asset class that is directly comparable across countries and is characterized by relatively frictionless markets—equity. We turn to the Morgan Stanley Capital International database (MSCI thereafter) and focus attention on 22 developed markets dating back to 1970 and 15 emerging markets beginning in 1988 until 2022, which constitutes the most comprehensive cross-country coverage of equity returns to our knowledge.

Two novel facts emerge from our study of 37 equity markets that account for 86% of world stock market capitalization and two thirds of world GDP over the past five decades. First, stock market returns are systematically higher and more volatile in emerging over developed markets—doubling a country's level of income per worker results in a 2.7 percentage point decline in the mean stock market return, and the correlation between the standard deviation of returns and income amounts to -0.57. Second, countries that exhibit high stock market returns experience high covariance of equity dividend growth rates with the world dividend.[1] The latter relationship is driven by cross-country heterogeneity in volatilities of dividend growth rates—emerging markets are characterized by significantly more volatile dividend growth rates, but enjoy lower correlations of dividend growth rates with the world.

Motivated by these empirical regularities, we explore whether risk-return trade-off implied by asset pricing theory can reconcile observed risk premia differentials across developed and emerging markets. In particular, we investigate the role of long-run risks à la Bansal and Yaron (2004), i.e., pricing of risks due to persistent fluctuations in economic growth prospects. Our motivation for this approach is twofold: first, a recent literature, touched off by Aguiar and Gopinath (2007), has documented the importance of shocks to trend growth rates in accounting

---

[1] We define the world dividend growth rate as the stock-market-capitalization weighted mean dividend growth rate among five major economies: U.S., U.K., France, Germany and Japan.

for the properties of business cycles in poor/emerging markets and in reconciling differences in the behavior of macroeconomic variables between these countries and developed ones. Second, long-run risks have been shown to have important implications for asset prices and have been able to resolve a number of 'puzzles' in the asset pricing literature. We explore the extent to which heterogeneity in risk arising from volatile and uncertain growth prospects can reconcile international stock market return differentials.

We consider an international endowment economy along the lines of Colacito and Croce (2011), Colacito and Croce (2013), Lewis and Liu (2015) and Nakamura et al. (2017). A representative U.S. investor is endowed with a stream of consumption and dividends, i.e., payouts from risky capital investments in different countries, and a risk-free asset. Economic growth rates feature a small but persistent component, which manifests itself in both consumption growth and growth in dividend payments from invested capital. In each country, this component contains both a common global piece and an idiosyncratic one. Countries differ in their exposure to the common component. With recursive preferences à la Epstein and Zin (1989), asset values respond sharply to persistent shocks that are global in nature. Countries that are more sensitive to these shocks represent riskier investments and so must offer higher expected returns as compensation. Additionally, each country is exposed to both common and idiosyncratic transitory shocks (i.e., shocks that affect growth rates for only a single period), where the former lead to return differentials.

Quantifying the implications of long-run risks in our model is challenging for two reasons: first, we must identify global shocks; second, we need to measure the exposure of different countries' dividends (and consumption) to global long-run growth prospects and to those that are purely transitory in nature. Identifying global persistent shocks is difficult because historical time series of macroeconomic and financial variables are only available for a handful of developed economies. To accomplish this task, we rely on historical observations from the MacroHistory Database, provided by Jordà et al. (2019) and Jordà et al. (2017), that feature consumption growth rates and price-to-dividend ratios for five major economies: U.S., U.K., France, Germany and Japan during the 1940-2020 period. Building on insights by Bansal et al. (2012) and Colacito et al. (2018b), we exploit the model's prediction that a country's logged price-to-dividend ratio is a function of the global persistent process only, which implies that a projection of future consumption growth on lagged values of the price-to-dividend ratio is able to recover the time series of the persistent process. After accounting for this process, the residual variation in global consumption growth, which we define to be the mean across the five countries, yields the transitory global component.

Having assumed standard values for preference parameters, equity risk premia over the risk-free rate are driven by the U.S. agent's exposure of consumption growth to the global persistent and transitory shocks as well as different countries' exposures of dividend growth to the same shocks. We recover the U.S. consumption growth exposure parameter to the global persistent process from a linear regression of U.S. consumption growth on the world persistent process. A similar regression of U.S. consumption growth on the residual component of world consumption growth yields the exposure parameter to the global transitory shock.

We follow a parallel procedure to recover parameters that govern countries' dividend growth rate processes, which begins with specifying a global dividend growth process. We allow the latter process to reflect the same global persistent and transitory shocks as the world consumption growth process, albeit with different exposure parameters, as well as an additional orthogonal transitory shock, which captures the increased volatility in stock market variables over macroeconomic variables observed in the data. We compute world dividend growth as a stock-market-capitalization weighted average of the dividend growth rates of the same five major economies described above during the 1975-2019 period using data from MSCI. The stock-market-capitalization weighted mean stock market return across these five countries highly correlates with the returns on the 'World Index' as defined by MSCI—a finding that supports our choice of these five economies when defining global variables.

To recover all countries' exposure parameters of the dividend growth process, we leverage the world dividend process and our second finding from international equity markets—namely, the tight link between countries' stock market returns and the sensitivity of their dividends to global predictable growth. Since both world dividends and those of each country are exposed to the same global shocks, the co-movement between the two series is informative about each country's exposure parameters. Specifically, to recover countries' exposure parameters to the transitory global shock, we follow a parallel procedure to the one for U.S. consumption, and we regress countries' dividend growth rates on the residual world dividend growth, net of the persistent component. With these parameters in hand, we can net out the contribution of global transitory shocks, and recover countries' exposures of dividend growth to the persistent global process from regression coefficients of countries' dividend growth rates on the world dividend growth rate. The latter parameters directly map into predicted risk premia in the model; namely, emerging markets whose dividends co-vary strongly with the world have high inferred exposures to the global persistent component and demand high risk premia.

Applying this methodology to the 37 countries in our dataset, we show that long-run risks can account for a significant portion of the observed return disparities and for the pattern of low income/high return vs high income/low return. The model predicts a mean risk premium of 9.8%, compared to a mean of 8.7% observed in the data. The predicted risk premium in the U.S. is 6.2%—a familiar historical statistic—which is somewhat below the mean value of 7.4% observed in data post 1970. Predicted risk premia are lower in richer countries—

the correlation between risk premia and income per worker amounts to -0.34, and is highly statistically significant. More interestingly, the correlation between predicted and realized risk premia across countries amounts to 0.45 and it is also highly statistically significant. Based on this statistic, we conclude that the model accounts for almost half of the observed cross-country variation in equity risk premia.

What drives the differences in risk premia across rich and poor countries? The results stem directly from the magnitudes of the parameters that govern the exposures of dividend growth to global persistent fluctuations. To demonstrate this, we perform a robustness exercise where we set all countries' exposures of dividend growth to the transitory global shock to the level that we estimate for the U.S., while keeping the heterogeneous exposure parameters to the global persistent process unchanged from our baseline specification. Predicted mean risk premia rise slightly in level to 10.2%, and the correlation between predicted and realized risk premia is effectively unchanged. These findings confirm that the majority of the cross-country variation in risk premia is driven by the sensitivity of dividends to the global persistent process.

Nonetheless, accounting for the global transitory shocks in dividend growth is very important. To demonstrate this, in a second exercise, we set all countries' exposures of dividend growth to the transitory global shock to the level that we estimate for the U.S., and we back out the new inferred exposures to the persistent global process from the same covariance moment between countries' dividend growth and the world dividend growth process as in our baseline specification. In this exercise, we are effectively assigning all the cross-sectional variation of the key moment of interest—the covariance of a country's dividend growth rate with the world dividend growth—on the parameter that governs the exposure of dividends to the global persistent process. While risk premia levels decrease only slightly to 9.2% on average, there is a notable change in the cross-sectional variation. The correlation between predicted and realized risk premia drops to a mere 0.16, which suggests that the model struggles to fit the variation in the data.

Finally, the model does not only reconcile levels of risk premia, but it also performs well with respect to second moments in the data. Specifically, the mean level of the standard deviation of returns predicted by the model is 0.367, compared to 0.336 in the data, and the correlation between predicted and realized standard deviations in the cross-section of 37 countries amounts to a highly statistically significant level of 0.56. Much like in the data, the model generates higher volatilities of returns in poorer over richer countries. We conclude that the model can reconcile both levels and volatilities of stock market returns across rich and poor countries.

The remainder of the paper is organized as follows. In Section 2, we describe our data sources and we document the key facts on international stock markets. In Section 3, we lay out our quantitative analysis of a risk-based explanation of these facts. In Section 4, we conclude and discuss directions for future research. Details of data work, derivations, and supporting tables and figures are in the Appendix.

Related literature. Our paper relates to several branches of literature. Our modeling of international long-run risks is related to Colacito and Croce (2011), Colacito and Croce (2013), Lewis and Liu (2015) and Nakamura et al. (2017). All of these papers find a significant role for shared long-run risk across countries. Our emphasis on heterogeneous exposures to a global shock bring us closest methodologically to Colacito et al. (2018b), who examine a cross-section of FX risk premia in major industrialized countries. We build on these authors' insights and rely on predictive regressions for a set of major developed economies to identify a global persistent process using historical consumption growth and price-to-dividend data. A key innovation in our analysis is to exploit our comprehensive equity dataset to analyze the implications for risk premia and their volatility in both developed and emerging markets for a single U.S.-based investor, and the identification of heterogeneous exposures of dividend growth rates on the global persistent process from the co-movement of countries' dividend growth rates with the world—a moment that has a high predictive power in reconciling the cross-section of observed risk premia.

Our finding of more severe exposure to growth shocks in emerging markets relates our paper to Aguiar and Gopinath (2007), who demonstrate the important role of TFP growth rate volatility in driving observed aggregate dynamics in these countries. Similarly, Naoussi and Tripier (2013) find that growth shocks play an even more important role in accounting for the behavior of macroeconomic variables in developing and Sub-Saharan African countries. Our focus on emerging equity markets brings our paper closest to Bekaert et al. (2007a), who examine equity returns in 18 emerging markets during the 1987-2003 period using data from the S&P/IFC Global Equity Market Indices. Similarly to us, the authors find an important role for a global factor–U.S. equity return in their case–in explaining the time series of equity returns in emerging markets. This factor is particularly powerful in accounting for returns in internationally integrated emerging markets, while local liquidity shocks play an important role in driving returns in more closed markets. The authors' findings are one important reason why we focus on emerging markets that are categorized as 'investable' for international investors by MSCI. More importantly, unlike the existing literature, we are able to quantitatively account for first and second moments in equity returns in the cross-section of developed and emerging markets via the lens of a long-run risk model.

A broader literature demonstrates the importance of global shocks in driving asset prices and macroeconomic variables. Recent examples include Rey (2015), Miranda-Agrippino and Rey (2020) and Miranda-Agrippino and Rey (2022), who document a 'global financial cycle' in stock and corporate bond returns. Lustig et al. (2011) pioneered the practice of using a model that features heterogeneous exposures to a global risk factor to explain the cross-section of international currency returns, and they demonstrated that this factor is closely related to changes in volatility of equity markets around the world. Borri and Verdelhan (2015) relate excess returns on foreign sovereign bonds to their co-movement with U.S. bonds, and Longstaff et al. (2011) find that global factors can account for the majority of sovereign credit spreads. Bai et al. (2023) explore the role that the world financial cycle plays in reconciling sovereign credit spreads in emerging markets. Brusa et al. (2014) find that global currency factors are priced in international stock markets. Kalemli-Özcan and Varela (2021) document that the average excess currency return among 22 emerging markets co-moves with global risk sentiment. Lustig and Verdelhan (2007) link currency risk premia to U.S. consumption-based risk. Farhi and Gabaix (2016) link international asset prices to disaster risk. Gourio et al. (2013) examine the role of world shocks in driving equity returns in high versus low interest rate countries. Hassan (2013) provides an endogenous mechanism for heterogeneous exposures to global risk, namely, that currencies of large economies are good hedges against consumption risk and so offer lower returns. Closer to our own study, Hassan et al. (2016) link this mechanism to capital returns in a model with endogenous capital accumulation; large countries have lower required rates of return because they have 'safer' currencies. The authors find that country size variation can explain a good portion of cross-country return variation, but that the magnitudes of return differences fall short of those observed in the data.

Papers that focus on quantity dynamics include Kose et al. (2003), who provide evidence of a 'world business cycle.' Neumeyer and Perri (2005) and Uribe and Yue (2006) argue that U.S. interest-rate shocks are of first-order importance in driving emerging market business cycles as they affect domestic variables mostly through their effects on country spreads. Burnside and Tabova (2009) find that about 70% of the cross-sectional variation in the volatility of GDP growth can be explained by countries' differing degrees of sensitivity to global factors and that low-income countries exhibit greater exposure to these factors. Bekaert et al. (2007b) construct a measure of a country's growth opportunities by interacting the country's local industry mix with global price to earnings (PE) ratios, and find that it predicts future changes in real GDP and investment in a large panel of countries.

Moreover, our paper relates to the broader macroeconomic literature that studies capital flows to developing countries, touched off by Lucas (1990), and the returns to capital there (Caselli and Feyrer (2007)). A related strand investigates the failure of return equalization and the implied lack of capital flows from low to high return countries (see Obstfeld and Taylor (2003), Prasad et al. (2007) and Reinhart and Reinhart (2008) for historical and recent patterns of capital flows across rich and poor countries). In a comprehensive empirical study, Alfaro et al.

(2008) find that differences in institutional quality play an important role in hindering these flows. Ohanian and Wright (2007) evaluate a number of potential explanations with a focus on capital market frictions, but find the explanatory power of each to be limited, as none reverses the standard forces pushing for return equalization. Reinhart and Rogoff (2004) argue that capital does not flow to poor countries because they are serial defaulters. Gourinchas and Jeanne (2013) document a lack of capital flows towards countries with higher productivity growth and investment, and discuss a number of explanations, including domestic financial sector frictions, a mechanism explored in detail in Buera and Shin (2017). Reinhart and Rogoff (2004) point to the effects of serial default in developing countries, and Kraay et al. (2005) to sovereign risk. Gourio et al. (2014) link capital flows to expropriation risk, while Pellegrino et al. (2021) explore the role of information frictions. Gourinchas and Rey (2013) offer a comprehensive survey of the theoretical and empirical literature that examines cross-border capital flows. We depart from this line of work by focusing our analysis on cross-country differentials in a particular type of return to capital—stock market return—and we do not characterize the associated flows of capital to developing countries.

Finally, it is worth to point out that long-run risk is one approach to examine the Lucas Paradox through the lens of asset pricing theory. Two other leading approaches to address asset-pricing puzzles are habits in utility (Campbell and Cochrane, 1999) and rare disasters (Barro, 2006; Gabaix, 2008). Recently, Wang (2021) links currency risk premia to capital accumulation differences across developed countries within the context of a habit persistence model. Lewis and Liu (2017) show that global and idiosyncratic disasters can reconcile equity return differentials among 20 developed countries. Neither of these studies examines emerging markets equity returns, which is the focus of our paper. We choose to work with a long-run risk framework, and we contribute to the literature with new evidence in favor of the existence of a global persistent component in macroeconomic variables, and differential exposure to this component by developed and emerging markets' equities.

2 Equity Returns: Facts

In this section, we describe a number of empirical properties of the returns to equities—most notably, a systematic negative link between the level of development and the first and second moments of stock market returns across countries, as well as a positive relationship between returns and the sensitivity of dividends to global shocks.

2.1 Measuring Returns Using Financial Data

The macroeconomic literature typically measures the returns to capital in a country via the marginal product of capital (see for example Caselli and Feyrer (2007)). In theory, the same object, augmented by changes in the price of capital, characterizes the return to equity in a model with representative firms that issue equity and do not incur any adjustment costs in capital investment (see Gomme et al. (2011) for derivation). If firms partially finance operations via debt, the return to capital becomes the unlevered return to equity, which reflects firms' debt-to-equity ratios. These theoretical relationships imply that returns to capital can be inferred from stock market data.

A number of additional frictions can distort the relationship between empirical and theoretical returns to capital. Financial frictions, policy barriers and poorly functioning institutions in a country can result in capital misallocation across firms, which is reflected in aggregate statistics on the returns to capital. These frictions are particularly prevalent in developing economies, thus creating a wedge between documented returns to capital and those realized by investors (see Hsieh and Klenow (2009), Restuccia and Rogerson (2008), Song et al. (2011), Banerjee and Duflo (2005), and Chari and Rhee (2020) among others). Similarly, realized returns to equity by investors can differ from documented returns to equity due to government taxes or other policy distortions, especially in emerging markets (see Bekaert et al. (2007a)).

While no measure of returns to capital is ideal, we explore stock market returns since equity is an asset class that is relatively more easily comparable across countries. Specifically, we obtain daily observations of the Total Return Gross Index by Morgan Stanley Capital International (MSCI thereafter) via Capital IQ, denominated in USD, for 37 developed and emerging markets that account for two thirds of world GDP. We compute annualized returns, and we subtract annual total CPI inflation rates, which we obtain from St. Louis FRED.

Our dataset includes stock market returns in 22 developed markets during the 1970-2022 period, and returns in 15 emerging markets dating back to 1988.[2] These 37 markets account for 86% of world stock market capitalization and are considered investable by MSCI.[3] While equity is not the only way to access investment opportunities in these markets, it is a very important channel of capital inflow. Among the 37 markets, the stock market capitalization to GDP ratio amounts to a sizeable 65%, and the statistic is not systematically lower in emerging

---

[2] Emerging markets enter the database in the late 1980's. Column (viii) in Table 7 in Section 3.3 documents the year in which each country enters the MSCI dataset, and reports the classification of markets as developed (DM) and emerging (EM) according to MSCI. A notable country that is missing from our study is China, as it was relatively closed to foreign investors for a substantial part of our period of analysis.

[3] International Finance Corporation (1986) document that stock markets in developing countries are considered investable categories for international investors beginning in the late 1980's as they underwent significant financial liberalization episodes. MSCI revises the "investability" of different emerging markets for foreigners on a regular basis, and we focus on the markets that they deem investable in our study.

markets (see Figure 5 in Appendix C). Continental European countries exhibit some of the lowest stock market capitalization ratios as firms in these markets predominantly rely on bank debt for financing. The majority of emerging markets enjoy higher stock market capitalization ratios, followed by Anglo-Saxon markets such as Canada, USA and Great Britain. Some financial centers such as South Africa (for neighboring African economies), Taiwan, Singapore and Switzerland enjoy stock market capitalization rates of over 150%.

2.2 Stock Market Returns

In order to document the main facts, we focus the analysis on the 37 markets for which we obtained stock market data as described above. We compute income per worker from annual series of real GDP and employment from the Penn World Tables Version 10.0 (PWT thereafter) for the 1970-2019 period provided by Feenstra et al. (2013), and we supplement them with data from World Bank's World Development Indicators (WDI thereafter) for the 2020-2021 period.

Table 1: Summary Statistics for Equity Returns

	N	Mean	Std. Dev	Min	Max	Constant	y_i	R^2
r_i	37	0.100	0.032	0.026	0.166	0.396***	-0.027***	0.245
						(0.088)	(0.008)	

Notes: Table reports summary statistics of mean equity returns, r_i, for 37 countries and the results of a linear regression of (mean) r_i on (mean) income per worker, y_i. Annual country-level equity return observations are truncated below -100%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. Standard errors statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The top left panel of Figure 1 plots mean realized stock market returns, r_i, against the mean (log) income per worker, y_i, for these countries during the 1970-2022 period, as well as the correlation between the two variables.[4] Equity returns are systematically higher in poorer

---

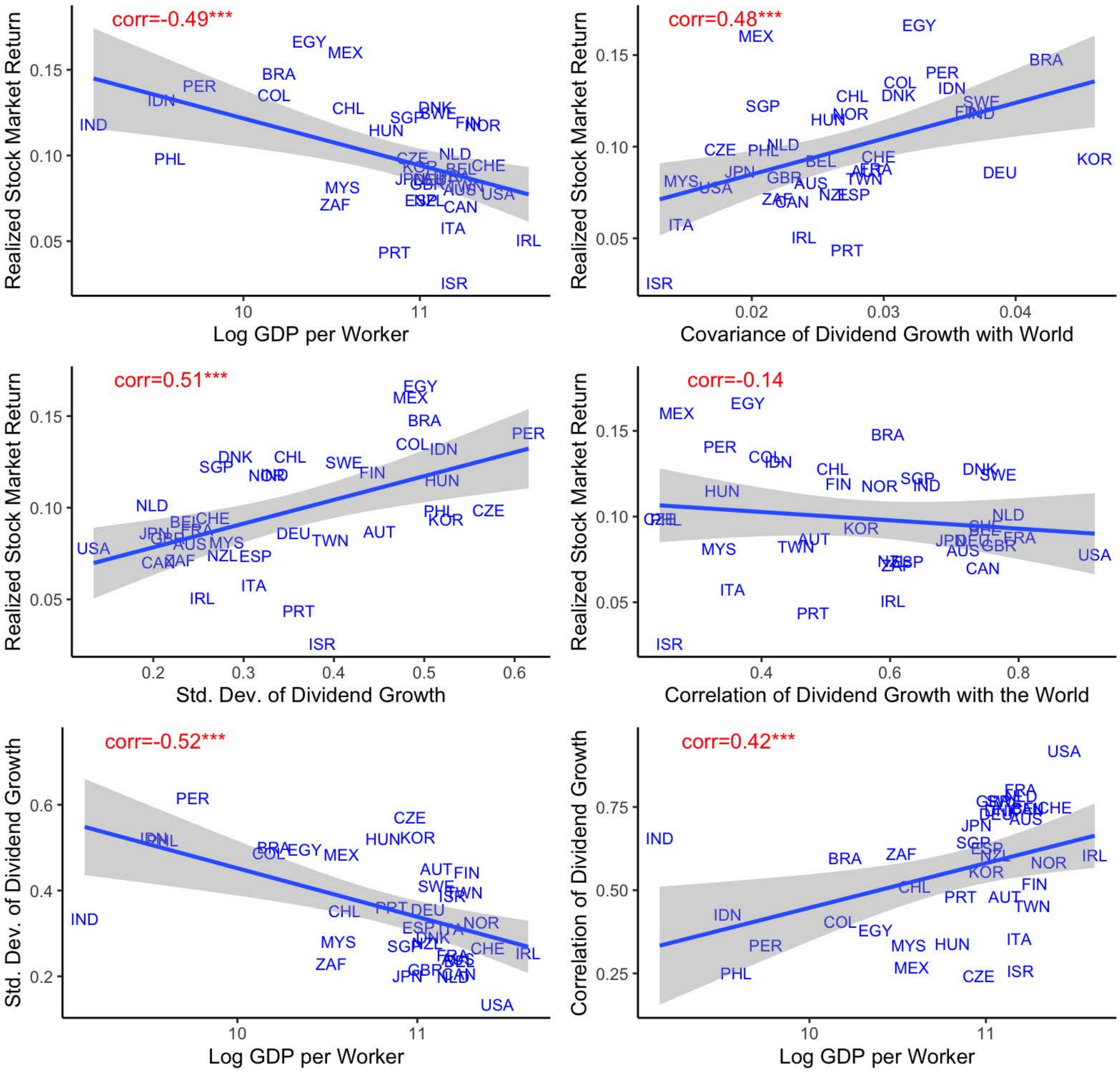
[4] To derive correlations reported in Tables and Figures, for any two variables x and y, with respective means $\bar{x}$ and $\bar{y}$, we compute the product-moment correlation coefficient, which is equivalent to:

$$\widehat{\rho} = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^{n} (y_i - \bar{y})^2}},$$

where n is the number of observations. We test the significance of the correlation with a one sided t-test (the null hypothesis being that the correlation is 0) using the following test statistic:

$$t^* = 2\,\mathrm{t}\left(n-2, |\widehat{\rho}|\sqrt{n-2}/\sqrt{1-\widehat{\rho}^2}\right).$$

Figure 1: Properties of Equity Markets



Notes: The figures plot various relationships between stock market returns, dividend growth rates and income per worker for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

countries—doubling a country's income per worker results in a 2.7 percentage point decline in returns. Table 1 reports summary statistics for the (mean) realized stock market returns across countries as well the results of a linear regression of returns on income per worker. Stock market returns amount to 10% on average, but there is a great deal of heterogeneity across countries. Returns are as low as 2.6% in Israel and as high as 16.6% in Egypt. The U.S. return to equity is approximately 8% over this period.

In Appendix D, we analyze the time series of the country-level returns. Table 11 reports the results of a linear regression of stock market returns for country i in time period t on contemporaneous income per worker, y_{it}. The coefficient estimate on income is -0.044 and highly statistically significant, and it remains negative and precisely estimated when we incorporate country and time fixed effects. In order to eliminate look ahead bias, we repeat the analysis with lagged income per worker in Table 12, and we obtain very similar results.

The question that we want to answer is what drives the systematic relationship between returns and income. The top right panel of Figure 1 offers the first clue. It plots the mean stock market returns for each country for the entire period of study against the covariance of the country's dividend growth rate with the growth rate of the "world" dividend, which we define to be the stock-market-capitalization weighted mean dividend growth rate for the following five economies: U.S., U.K., Japan, France and Germany.[5] Countries with higher stock market returns are characterized by higher co-movement of dividend growth rates with the world. In an economy where investors' consumption co-moves with global shocks, countries whose dividends co-move more strongly with the world would be considered more risky, so an investor would demand higher returns to invest there.

In order to analyze the statistical properties of the dividend co-movement, recall that one can recover the covariance for each country from a linear regression of the country's dividend growth rate on the world dividend growth rate. The covariance follows from the coefficient estimate of this regression, which we denote by β^d. β^d has a natural interpretation: it measures the sensitivity of a country's fundamentals (i.e. dividends) to world shocks. In column (ii) of Table 7 in Section 3.3, we report the coefficient estimates for each country, followed by the corresponding standard errors in column (iii). The average country has a coefficient estimate of 1.22 and the coefficients are precisely estimated for the majority of countries, which suggests

---

[5] See Appendix A.1 for detailed derivation of dividend growth rates in the data. To compute the weighted "world" mean, we obtain annual country-level stock market capitalization data from WDI, which is available for the 1975-2019 period for these five countries, and we combine it with annual country-level dividend growth rates derived from MSCI. Our definition of the 'world' equity market corresponds very closely to MSCI's definition. Figure 6 in Appendix C plots returns to equity for our definition of the world (stock-market-capitalization weighted average of five countries), and the returns from the MSCI series labeled as 'World Index'. Clearly the two series are very closely linked, which reflects the dominance of the five countries of our choice in world equity markets.

that this statistic is highly informative.

Table 2: Summary Statistics for Equity Dividends

	N	Mean	Std. Dev	Min.	Max.	$corr(x_i, r_i)$	$corr(x_i, y_i)$
$cov(\Delta d_i, \Delta d_W)$	37	0.03	0.01	0.01	0.05	0.48***	-0.28
$s.d.(\Delta d_i)$	37	0.36	0.12	0.13	0.62	0.51***	-0.52***
$corr(\Delta d_i, \Delta d_W)$	37	0.56	0.18	0.24	0.92	-0.14	0.42***

Notes: Table reports the summary statistics of moments of countries Equity Dividends with world Equity Dividends for 37 countries for which returns to equity data is available. Data is truncated at the 1st and 99th percentile. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2022. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the first row of Table 2, we report summary statistics of the covariances (computed from the β^ds), which we denote by $cov(\Delta d_i, \Delta d_W)$, and in the second-to-last column, we report the correlation of these objects with mean stock market returns, which amounts to 0.48 and is highly statistically significant. The strong relationship between returns and covariances motivates a theory of stock markets in which global shocks take center stage. Nonetheless, given the large variation is stock market returns across countries and over time, it is important to account both for global as well as idiosyncratic shocks when modeling the behavior of macro and financial variables across countries.

When we take a step further and we decompose the covariance of dividend growth rates into each country's standard deviation of dividend growth and the correlation between the dividend growth and the world growth rate, it becomes apparent that the systematic relationship between returns and covariances is driven by countries' volatility levels. In fact, the middle left panel of Figure 1 plots the country-level mean stock market returns against the standard deviation of dividend growth rates, and it demonstrates a strong link: countries that enjoy high returns are those that exhibit high underlying fundamental volatility. The second row of Table 2 presents summary statistics of the standard deviation of dividend growth rates, as well as the correlation of this statistic with mean returns and with income per worker, which amount to 0.51 and -0.52, respectively. Standard deviations range from as low as 0.13 for the U.S. to a six-fold value of 0.62 for an emerging market like Peru, and they are generally decreasing in countries' level of development as can be seen from the bottom left panel of Figure 1.

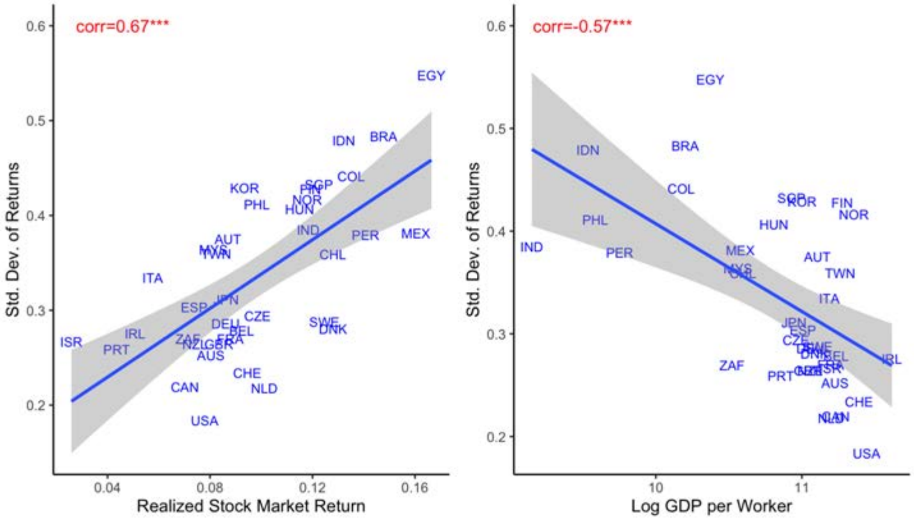
In contrast, countries whose dividend growth rates are more correlated with the world do not exhibit systematically different returns as is apparent in the middle right panel of Figure 1. Not surprisingly, it is the poorer countries that are less correlated with the world, which can be seen in the bottom right panel of Figure 1. The last row of Table 2 presents summary statistics of these correlations. The U.S. enjoys the highest correlation with the world of 0.92, which reflects the predominant role that the U.S. plays in world financial markets, followed by developed European markets. Some of the least correlated countries with the world include Czech Republic, Philippines and Israel, all of which are characterized by β_ds that are not precisely estimated.

Overall, the findings in this section suggest that, in a world economy characterized by global shocks, emerging market equities are more sensitive to those shocks and potentially more risky. In the following section, we formalize both global and idiosyncratic shock processes and we derive predictions about risk premia via the lens of an asset pricing model.

2.3 Stock Market Volatilities

To complete the characterization of stock market returns across countries, we examine their volatility over the same time period. The left panel of Figure 2 plots the standard deviation of stock market returns against the mean level of returns for the 37 countries in our sample, as well as the correlation between the two variables, which amounts to 0.67. Not surprisingly, countries that enjoy higher returns also display higher volatilities of returns. Moreover, emerging markets have more volatile returns, as can be seen from the right panel of Figure 2, which plots the standard deviation of returns against countries' income levels.

Figure 2: Volatility of Stock Market Returns



Notes: The above figure plots the standard deviation of returns against Return to Equity (left) and income (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3 A Long-Run Risk Explanation

In this section, we quantitatively explore a novel explanation for the observed cross-sectional variation in returns on the basis of country income levels—namely, the risk-return trade-off implied by asset pricing theory, and specifically, the role of global long-run risks due to uncertainty regarding future economic growth prospects.

3.1 The Model

We follow the international long-run risk literature and we consider a representative U.S. investor in an international endowment economy.[6] Consumption of the investor and payments to equity in each country experience shocks to expected future growth rates. Each country is exposed to both global and idiosyncratic components of these shocks. Countries differ in their exposure to the global shock process and in the characteristics of the idiosyncratic one. Heterogeneity in exposure to global shocks will play a crucial role in leading to expected return differences across countries.

Preferences. The representative U.S. investor has recursive preferences à la Epstein and Zin (1989). The investor seeks to maximize lifetime utility

$$V_t = \left[(1-\beta) C_t^{\frac{\psi-1}{\psi}} + \beta \nu_t \left(V_{t+1} \right)^{\frac{\psi-1}{\psi}} \right]^{\frac{\psi}{\psi-1}}, \quad \nu_t \left(V_{t+1} \right) = \left(\mathbb{E}_t \left[V_{t+1}^{1-\gamma} \right] \right)^{\frac{1}{1-\gamma}}$$

where ψ denotes the intertemporal elasticity of substitution, γ is risk aversion, β is the rate of time discount, and $\nu_t \left(V_{t+1} \right)$ is the certainty equivalent of period $t+1$ utility. The Euler equations for the risk-free asset, the U.S. risky asset and the foreign risky asset are:

$$\begin{aligned} 1 &= \mathbb{E}_t \left[M_{USt+1} R_{ft+1} \right] \\ 1 &= \mathbb{E}_t \left[M_{USt+1} R_{USt+1} \right] \\ 1 &= \mathbb{E}_t \left[M_{USt+1} \frac{q_{it+1}}{q_{it}} R_{it+1} \right] \; \forall \; i \neq US, \end{aligned} \tag{1}$$

where R_{ft} is the return on a risk-free bond, R_{USt} is the (gross) return to equity in the U.S., R_{it} is the (gross) return to equity in country i, denominated in local consumption units, and $q_{it} = \frac{P_{it}^c}{P_{USt}^c}$ is the real exchange rate between the U.S. and country i, where P^c denotes the price of consumption. Furthermore, M_{USt+1} is the U.S. investor's stochastic discount factor (SDF

---

[6] An important exception is Colacito et al. (2018a) who analyze capital flows in an international production economy featuring long-run risk.

thereafter) whose log denoted by m_{USt+1} is given by

$$m_{USt+1} = \theta \log \beta - \frac{\theta}{\psi} \Delta c_{USt+1} + (\theta - 1) r^c_{USt+1}, \tag{2}$$

where $\theta = \frac{1-\gamma}{1-\frac{1}{\psi}}$, and r^c_{USt+1} denotes the return on an asset that pays aggregate U.S. consumption as its dividend, or equivalently, the return to aggregate wealth.

Dynamics of Consumption and Dividends. The following system lays out the joint dynamics of consumption and dividends for any country i:

$$\begin{aligned} \Delta c_{it+1} &= \mu_i + \phi_i x_t + x_{it} + \pi_i \eta_{t+1} + \eta_{it+1} \\ x_{t+1} &= \rho x_t + e_{t+1} \\ x_{it+1} &= \rho_i x_{it} + e_{it+1} \\ \Delta d_{it+1} &= \mu_i^d + \phi_i^d x_t + \tilde{\phi}_i^d x_{it} + \pi_i^d \eta_{t+1} + \tilde{\pi}_i^d \eta_{it+1} + \eta^d_{it+1} \end{aligned} \tag{3}$$

A detailed description of the environment is as follows: turning first to the consumption process, μ_i is the unconditional mean of i's consumption growth, and x_t and x_{it} are, respectively, the common (i.e. world) and i-specific (i.e. idiosyncratic) time-varying, small but persistent components of the growth rate, so that the conditional expectation at time t of consumption growth in $t+1$ is $\mu_i + x_t + x_{it}$. The world and local persistent components evolve according to AR(1) processes with persistence parameters ρ and ρ_i and variances in the innovations σ_e^2 and σ_{ei}^2. ϕ_i governs the exposure of i's consumption growth to the global persistent component. Intuitively, the higher is the value of ϕ_i, the more responsive is consumption growth to innovations in x. Consumption growth is also subject to purely transitory global and idiosyncratic shocks η_{t+1} and η_{it+1}, respectively, with variances σ_η^2 and $\sigma_{\eta_i}^2$.

Similarly to consumption growth, dividend growth has unconditional mean μ_i^d and levered exposures to the persistent components of consumption growth, x_t and x_{it}, captured by ϕ_i^d and $\tilde{\phi}_i^d$. The transitory consumption shocks η_{t+1} and η_{it+1} also influence the dividend process and the magnitude of this relationship is governed by π_i^d and $\tilde{\pi}_i^d$. For completeness, there is a residual transitory shock that governs dividends denoted by η^d_{it+1} with variance $\sigma^2_{\eta_i^d}$. All shocks are assumed to be independent and normally distributed by their respective variances as defined above.

Real Exchange Rate. To derive risk premia, we first need to characterize real exchange rates. We assume that the real exchange rate is determined outside the model; namely,

$$\Delta q_{it+1} = \zeta_{it+1},$$

where Δq_i denotes the change in the real exchange rate and ζ_{it} is a random variable that is independent from all the shocks in our model. This commonly-employed benchmark by the macroeconomics literature is consistent with the assumption of a single good, and it allows us to hone in on the main mechanism in the model and focus on equity. There are a number of theories of the real exchange rate in the existing literature (see Itskhoki (2021) for a summary of the literature). In this paper, we effectively assume that the SDF that prices equity does not price real exchange rate risk. One alternative approach would be to model real exchange rate changes as the difference between the foreign and the U.S. SDF (see ex. Colacito and Croce (2011), Colacito and Croce (2013), and Colacito et al. (2018b) within the context of long-run risk models of the real exchange rate in developed markets).[7] We choose to proceed with our (independence) assumption in this paper as we want to focus on the properties of equity (specifically, first and second moments) across developed and emerging markets. In light of evidence presented by Ilzetzki et al. (2019) that emerging and developed markets are subject to differing exchange rate regimes, we believe that it is most fruitful to jointly examine equity and currency markets in a model that incorporates an exchange-rate policy dimension, which is beyond the scope of this paper.

Risk Premia. To derive risk premia, we solve the model using a log-linear approximation around the balanced growth path as described in detail in Appendix B. Specifically, we assume that the return to any asset (including the asset that pays aggregate U.S. consumption as a dividend) only reflects global shocks. This assumption implies consumption risk-sharing in an open economy. Since we directly use consumption growth from data in our quantitative exercise, we recognize that the assumptions that lead to risk sharing may be violated in reality. For these reasons, we allow for idiosyncratic shocks in the empirical processes for consumption and dividend growth, and we separately identify the global shocks in the quantitative exercises.

Under the assumption of log-normality, the log-linear approximations to the Euler equations in expression (1) yield the following risk premia (or excess returns, $\mathbb{E}\left[\hat{r}_i^e\right]$) for a risky asset from country i:

---

[7] Recently, Hassan et al. (2024) re-examine these theories and their implications for the cross-section of currency risk premia.

$$\mathbb{E}\left[\hat{r}_i^e\right] \equiv \log \mathbb{E}\left[R_i\right] + \mathbb{E}\left[\Delta q_i\right] - \log \mathbb{E}\left[R_f\right] = -\operatorname{cov}\left(m_{US}, r_i\right) - \frac{1}{2}\operatorname{var}\left(r_i\right) - \frac{1}{2}\operatorname{var}\left(\Delta q_i\right),$$

where r_i is the logged real return to the risky asset from country i. Empirically, the last term in the expression is less than 0.1% for a typical country, so we abstract away from it throughout the analysis (see Table 2 in Colacito and Croce (2011) for U.S.-U.K. for example).

Under the assumption that returns reflect only global shocks and following the methodology outlined in Appendix B, the risk premia can be written as:

$$\begin{aligned}\mathbb{E}\left[\hat{r}_i^e\right] = {} & \gamma \pi_{US} \pi_i^d \sigma_\eta^2 + (1-\theta)\kappa^2 \left(\frac{\phi_{US} - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\sigma_e^2 \\ & - \frac{1}{2}\left[\left(\pi_i^d\right)^2 \sigma_\eta^2 + \kappa^2 \left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)^2 \sigma_e^2\right], \end{aligned} \tag{4}$$

where κ is a constant defined in Appendix B that is a function of the mean growth rate of consumption, μ_{US}. The risk premium features a fundamental trade off between the covariance of the SDF and returns, and the variance of returns, and it reflects the variance in both temporary and persistent global shocks, σ_η and σ_e, respectively, as well as the exposures of the countries' dividend growth to these shocks, π_i^d and ϕ_i^d. The U.S.-specific consumption exposure parameters, π_{US} and ϕ_{US} reflect the assumption that the U.S. agent is pricing the assets. Preference parameters ultimately govern the level of risk premia; for parameter values commonly employed in the literature, risk premia are rising in countries' exposures to growth shocks, π_i^d and ϕ_i^d, and differences in these parameters drive cross-country return differentials.

3.2 Identification of Parameters

To derive the model's risk premia implications and to assess its ability to account for the cross-section of stock market returns in the data, we must assign values to the parameters governing the preferences as well as the consumption and dividend processes laid out in expression (3). Here, we outline an empirical strategy to parameterize the model. We demonstrate that moments on consumption growth, price-dividend ratios and dividend growth enable us to identify all the necessary parameters.

Preferences. We begin by assigning values to the preference parameters. We set $\psi = 1.5$, and $\beta = 0.99$, all standard values in the long-run risk literature. Additionally, we set the coefficient of relative risk aversion $\gamma = 4$, which falls within the range of estimates in Colacito and Croce (2011).

Global consumption growth parameters. In our model, there are both global and idiosyncratic sources of risk, but only the former are priced by the U.S. agent. In order to assign values to the parameters of the model that relate to each country's exposure to global sources of risk, it is necessary to specify global processes for consumption and dividend growth. Recall that our model is a partial equilibrium model in that market clearing conditions are not specified. A natural global process for consumption is given by:

$$\Delta c_{Wt+1} = \mu_W + \phi_W x_t + \pi_W \eta_{t+1}, \tag{5}$$

where x_t is the world persistent component defined in expression (3) and idiosyncratic components have been averaged out.

To identify the world persistent process, we follow the methodology in Colacito et al. (2018b) and we proceed in two steps. First, based on insights in Bansal et al. (2012), we exploit the model's prediction that a country's logged price-to-dividend ratio is a function of the global persistent process only (see expression (10) in Appendix B). This implies that a projection of future consumption (or dividend) growth on lagged values of the (logged) price-to-dividend ratio is able to recover the time series of the persistent process. The challenge with this strategy is to estimate parameters pertaining to the "world" over a long period of time as we want to capture global long-run risks. Time series coverage of dividend growth rates across countries is limited; to the best of our knowledge we can construct these series from the MSCI database beginning in 1970 for developed economies only as we describe in Section 2. On the other hand, consumption growth rates and price-to-dividend ratios over a long horizon are available for a small number of developed countries from the MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017). We turn to this database and we define the world to consist of five major economies, each denoted by k below: U.S., U.K., France, Germany and Japan. These countries account for the majority of world stock market return variation, as we demonstrate in Figure 6 in Appendix D, and are characterized by reliable historical macro and financial time series.

Specifically, we estimate the parameter α from the following pooled regression using data on all five countries during the 1940-2020 period:

$$\Delta c_{it+1} = \alpha \cdot pd_{it} + \epsilon_{it+1} \qquad \forall t, k, \tag{6}$$

where pd_{it} is the logged price-dividend ratio in country i in year t. In the second step, we define the world persistent component as:

$$x_{t+1} \equiv \frac{1}{5}\sum_{k} \Delta\hat{c}_{kt+1} = \frac{1}{5}\sum_{k} \hat{\alpha} \cdot pd_{kt}, \tag{7}$$

where $\Delta\hat{c}_{kt+1}$ is a fitted value for country k of the pooled linear regression in expression (6).

Table 3: Global Persistent Component

	Dependent variable:		
	Δc_{t+1}		x_t
pd_t	0.006^{***}	x_{t-1}	0.758^{***}
	(0.001)		(0.073)
		Constant	0.005^{***}
			(0.002)
Observations	395		79
R^2	0.149		0.584

Notes: Table reports (left) a pooled linear regression of country k's per-worker consumption growth on the log price-to-dividend ratio, pd_{kt}, and the estimated coefficient $\hat{\alpha}$, where k = U.S., U.K., France, Japan, Germany, and $K = 5$. On the right, the table reports the autoregression results of the global persistent process, x_t. $x_{t+1} \equiv \frac{1}{5}\sum_k \Delta\hat{c}_{kt+1} = \frac{1}{5}\sum_k \hat{\alpha} \cdot pd_{kt}$. Data are for 1940-2020 period from MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017). Standard errors statistics in parentheses. *p<0.1; **p<0.05; ***p<0.01. Standard errors are not adjusted. Newey-West adjusted standard errors yield the same significance.

We report the estimate of α in the left panel of Table 3. Our estimate of 0.006 compares favorably to the estimate of 0.005 in Colacito et al. (2018b), and similarly to the authors, we find that country-specific estimates of the parameter are not statistically different from each other, which supports the choice in favor of a pooled regression. Having obtained a series for the world persistent component, x_t, we estimate ρ from an AR(1) regression and we report the results in the right panel of Table 3. The estimate amounts to a sizeable 0.76, which compares favorably to estimates reported by the existing literature (see for ex. Table 4 in Colacito and Croce (2011) for U.S. and U.K.). This estimate constitutes direct evidence in favor of the long-run risk mechanism and plays a key role in quantifying the magnitudes of equity risk premia that we obtain below.

The world consumption growth process closely mimics the consumption process in Bansal and Yaron (2004). In order to relate to the literature, we normalize ϕ_W and π_W to unity. Since we rely on second moments from the world consumption process in our identification strategy, we need not specify a value for the mean growth rate, μ_W.

We recover the variance of the persistent global shock, σ_e^2 from an autoregression of the world consumption growth process. Specifically, expression (5) yields

$$\sigma_e^2 = \frac{(1-\rho^2)\beta_{C_W}\text{var}(\Delta c_{Wt})}{\rho\phi_W^2},$$

where β_{C_W} is the coefficient estimate of the autoregression of world consumption growth, and it is reported in the right panel of Table 4, along with summary statistics of the series in the left panel. The variance of the persistent component, σ_x^2, is a direct function of the variance of the innovations to the persistent component, $\sigma_x^2 = \sigma_e^2/(1-\rho^2)$. Finally, the residual variance of the temporary innovation follows from the world consumption growth series, after accounting for the persistent component, $\sigma_\eta^2 = \text{var}(\Delta c_{Wt}) - \sigma_x^2$. This approach to recovering the persistent and temporary innovations to consumption growth is in the spirit of Bansal and Yaron (2004), who aim to account for observed variations in consumption growth over a long horizon.

Table 4: Summary Statistics for World (5 countries) Consumption Growth

	N	Mean	Std. Dev	Min	Max	Constant	Δc_{Wt}	R^2
Δc_{Wt+1}	81	0.02	0.03	-0.09	0.17	0.01**	0.46***	0.22
						(0.004)	(0.10)	

Notes: Table reports summary statistics of world consumption, Δc_{Wt+1} and the results of a linear regression of Δc_{Wt+1} on its lag, Δc_{Wt}, where the world is computed as the average consumption of U.S.,U.K., France, Germany and Japan. Data are for 1940-2020 period from MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017). Standard errors statistics in parentheses. *p<0.1; **p<0.05; ***p<0.01

Idiosyncratic consumption growth parameters. The parameters that are idiosyncratic to each country are contained in the first three lines of expression (3) and contain i subscripts. However, as described above, only the parameters that govern the exposure of the U.S. consumption growth process to global shocks are relevant to derive risk premia for a U.S.-based investor. We describe the identification for those parameters below.

Idiosyncratic consumption growth parameters for the U.S. To identify parameters that govern the U.S. consumption growth process, we use the series described above for the 1940-2020 period.

We recover the consumption growth exposure parameter to the global persistent process for the U.S. from a linear regression of U.S. consumption growth on the world persistent process, x_t. Given the specification for the world consumption growth in expression (5), the exposure parameter to the global temporary shock follows from a regression of U.S. consumption growth on the residual component of world consumption growth, $\frac{\Delta c_{Wt+1} - \phi_W x_t}{\pi_W}$. The results from these regressions and the summary statistics of the U.S. consumption growth series are displayed in Table 5. The mean U.S. consumption growth rate is a familiar 2% and corresponds to parameter μ_{US} in the consumption process. The leverage parameters to the temporary and persistent global shocks are precisely estimated and correspond to 2.13 and 0.42, respectively.

Table 5: US consumption growth

Statistic	N	Mean	St. Dev.	Min	Max
Δc_{USt+1}	81	0.021	0.022	-0.042	0.011

	Dependent variable:	
	Δc_{USt+1}	
	(1)	(2)
x_t	2.133^{*}	
	(1.195)	
$\frac{\Delta c_{Wt+1} - \phi_W x_t}{\pi_W}$		0.425^{***}
		(0.059)
Constant	-0.027	0.020^{***}
	(0.027)	(0.002)
Observations	79	79
R^2	0.04	0.401

Notes: Table reports summary statistics of US consumption, Δc_{USt+1} and the results of two linear regressions of Δc_{Wt+1} on the persistent process x_t, and on $\Delta c_{Wt+1} - \phi_W x_t$ to estimate ϕ_{US} and π_{US}, respectively. Data are for 1940-2020 period from MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017). Standard errors statistics in parentheses. *p<0.1; **p<0.05; ***p<0.01

Global dividend growth parameters. Following a similar logic to the case of consumption growth, in order to identify parameters pertaining to dividend growth rates, we need to specify a world dividend growth process as follows:

$$\Delta d_{Wt+1} = \mu_W^d + \phi_W^d x_t + \pi_W^d \eta_{t+1} + \eta_{Wt+1}^d, \tag{8}$$

where $\eta_W^d \sim N(0, \sigma^2_{\eta_W^d})$ is independent of all country-specific and global shocks defined above. The world dividend growth process features the same transitory and persistent global shocks that govern the world consumption growth process, but with different leverage parameters. As was the case for each individual country, the world dividend growth process features an additional transitory shock, η_W^d, which reflects the possibility of sources of variation in equity dividends that are not related to sources of variation in real variables such as consumption.

As we describe in Section 2.2, we define the 'world' portfolio to be the stock-market-capitalization weighted mean of five developed economies: U.S., U.K., Germany, France, and Japan. In order to relate our results to the existing literature, we set the leverage parameter to the global persistent process, ϕ_W^d, to 3, which is the value that Nakamura et al. (2017) use for 12 developed economies. We set π_W^d to 5, which implies that the transitory and persistent global shocks that the U.S. agent prices in our model account for 90% of the observed variation in world dividend growth in MSCI data, with the residual shock, η_W^d, accounting for only 10% of variation. Furthermore, as we show in column (i) of Table 7 below, our choice of a value of 5 implies that the leverage parameter of U.S. dividend growth on the global persistent process is 3.5, which compares favorably to the value for this parameter of 3 used by Bansal and Yaron (2004) and Colacito and Croce (2011) for the U.S.[8] We report the values for the parameters that govern preferences and all global processes in Table 6. As is clear from this table, the variance of the global persistent shock is lower than the variance of the global transitory shock, and the residual variance of the shock that governs world dividends is rather small.

Table 6: Preferences and Global Processes, Parameter Values

	Preferences	World
γ	4	
ψ	1.5	
β	0.99	
ϕ_W		1
π_W		1
ϕ_W^d		3
π_W^d		5
ρ		0.758
σ_e		0.017
σ_η		0.021
$\sigma_{\eta_W^d}$		0.005

Notes: Table reports the parameter values used in calibration.

---

[8] In Figure 6 in Appendix C, we show that the 'world' portfolio returns are driven predominantly by U.S. returns, so it is reasonable that the U.S. and the world dividend growth processes in the model have similar leverage parameters to the persistent process.

Idiosyncratic dividend growth parameters. We rely on the same data from MSCI to assign values to the idiosyncratic parameters that govern the process in the fourth line of expression (3) for all countries. To recover π_i^d for each country, we follow a similar procedure as we did for consumption above and we regress Δd_{it+1} on $(\Delta d_{Wt+1} - \phi_W^d x_t)/\pi_W^d$, which identifies the parameters under the independence assumption between all idiosyncratic and global shocks. The resulting regression coefficient estimates and standard errors for each country are reported in columns (iv) and (v) of Table 7 below. For the majority of countries, the parameters are precisely estimated; the mean centers at 6.04 and the parameter value for the U.S. is 4.3.

Finally, given all other parameters, to recover the key dividend exposure parameters to the persistent world process, ϕ_i^d, we rely on the covariance of a country's dividend growth rate with the world, which is given by $\text{cov}\left(\Delta d_{it+1}, \Delta d_{Wt+1}\right) = \phi_i^d \phi_W^d \sigma_x^2 + \pi_i^d \pi_W^d \sigma_\eta^2$. We recover the covariance from the coefficient estimates of country-level regressions of dividend growth rates on the world dividend growth, β^d, as described in Section 2.2. Recall that this moment is systematically related to stock market returns in the data (see Figure 1 above), and it is the most important moment in the identification procedure as it directly dictates the risk premia differentials that we document below. We report the resulting parameter values for ϕ_i^d in column (i) of Table 7, along with the correlation of this variable with income per worker. The mean value for the leverage parameter across countries amounts to 6.27 and the value for the U.S. is 3.5.[9] As is evident from Table 7, emerging markets display statistically significantly higher exposures to the persistent global process than developed ones—the correlation between income and ϕ_i^d is -0.47—and enjoy higher predicted risk premia, as we demonstrate below.

3.3 Results

3.3.1 Equity Risk Premia

We begin by evaluating the ability of the model to reconcile observed risk premia in the data. We compute mean risk premia for each country as the difference between the mean annual nominal stock market return from MSCI, as described in Section 2.2, and the mean nominal interest rate on 3-month T-bills for the U.S. during the 1970-2022 period, which we obtain from St. Louis FRED. In the top panel of Table 8, we report the summary statistics of this variable, denoted by r^e. Mean risk premia amount to 8.7%, and they're systematically higher in emerging markets—doubling a country's income per worker results in a 2.1 percentage point decline in risk premia.

---

[9] It is clear from the regressions that we use to identify π_i^d and ϕ_i^d that π_W^d scales all country-specific dividend growth leverage parameters. This is why we use the estimate of π_{US}^d of 3.5 to cross check our choice of 5 for π_W^d.

Table 7: Estimated Parameters and Resulting Risk Premia, by Country

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
Country	ϕ^d	β^d	s.e.(β^d)	π^d	s.e.(π^d)	$\widehat{r^e}$	r^e	Start year	Type
AUS	5	1.22***	0.18	6.07***	0.91	9.17	7.64	1970	DM
AUT	5.91	1.45***	0.41	7.09***	2.03	10.36	8.32	1970	DM
BEL	5.16	1.26***	0.17	6.25***	0.86	9.41	8.85	1970	DM
BRA	10.73	1.74***	0.45	8.57***	2.24	10.45	13.04	1988	EM
CAN	4.72	1.15***	0.16	5.69***	0.79	8.74	6.63	1970	DM
CHE	6.06	1.48***	0.2	7.33***	1	10.48	9.06	1970	DM
CHL	6.66	1.19***	0.37	5.9***	1.85	11.46	11.12	1988	EM
COL	8.45	1.18**	0.54	5.84**	2.7	12.35	11.40	1993	EM
CZE	3.53	0.93	0.82	4.43	4.04	6.29	7.93	1995	EM
DEU	7.97	1.94***	0.28	9.57***	1.4	11.24	8.22	1970	DM
DNK	6.43	1.56***	0.22	7.64***	1.09	10.82	12.41	1970	DM
EGY	9.38	1.14*	0.62	5.61*	3.08	12.21	14.69	1996	EM
ESP	5.74	1.39***	0.26	6.79***	1.32	10.19	6.99	1970	DM
FIN	8.90	1.57***	0.48	7.66***	2.39	11.89	10.25	1988	DM
FRA	6.05	1.47***	0.17	7.24***	0.85	10.49	8.41	1970	DM
GBR	4.54	1.12***	0.14	5.61***	0.7	8.39	7.95	1970	DM
HUN	7.45	0.89	0.54	4.38	2.66	12.28	9.47	1995	EM
IDN	8.48	1.52**	0.6	7.52**	2.97	11.96	11.54	1988	EM
IND	10.09	1.41***	0.33	7***	1.64	11.49	9.92	1993	EM
IRL	5.79	1.03***	0.25	5.1***	1.26	10.60	3.39	1988	DM
ISR	2.37	0.72	0.56	3.49	2.77	3.14	0.60	1993	DM
ITA	3.01	0.73**	0.29	3.61**	1.46	5.01	5.37	1970	DM
JPN	3.89	0.95***	0.15	4.74***	0.75	7.13	8.24	1970	DM
KOR	11.20	1.99***	0.55	9.72***	2.75	9.47	7.68	1988	EM
MEX	4.92	0.88	0.59	4.32	2.91	9.32	14.36	1988	EM
MYS	3.56	0.63*	0.33	3.11*	1.65	6.51	6.45	1988	EM
NLD	4.57	1.12***	0.14	5.55***	0.68	8.47	9.73	1970	DM
NOR	5.60	1.37***	0.29	6.82***	1.45	9.98	11.40	1970	DM
NZL	6.31	1.13***	0.28	5.63***	1.37	11.15	5.74	1988	DM
PER	9.61	1.25	0.73	6.16	3.64	11.99	12.17	1993	EM
PHL	5.19	0.88	0.64	4.32	3.17	9.78	8.15	1988	EM
PRT	6.56	1.18***	0.4	5.82***	1.98	11.38	2.68	1988	DM
SGP	4.22	1.04***	0.19	5.19***	0.94	7.81	11.86	1970	DM
SWE	7.72	1.87***	0.24	9.19***	1.2	11.29	12.08	1970	DM
TWN	6.91	1.23**	0.45	6.06**	2.23	11.65	6.56	1988	EM
USA	3.50	0.86***	0.06	4.3***	0.28	6.23	7.40	1970	DM
ZAF	5.94	0.83***	0.22	4.09***	1.09	10.93	5.23	1993	EM
mean	6.27	1.22		6.04		9.77	8.73		
std. dev	2.22	0.34		1.66		2.20	3.13		
corr(x,income)	-0.47***					-0.33**	-0.38**		

Notes: Table reports country-level estimated parameters, the estimated risk premia ($\widehat{r^e}$), the expected risk premia from the data (r^e). β^d and its associated standard error are estimated coefficients from a regression of Δd_{t+1} on Δd_{Wt+1}. π_i^d and its associated standard error are estimated coefficients from a regression of Δd_{it+1} on $(\Delta d_{Wt+1} - \phi_W^d x_t)/\pi_W^d$. Starting year is the first observation in our sample. Type refers to a country being classified as an emerging market (EM) or developed market (DM). Data Sources: Dividend series computed by authors using data from MSCI for 1970-2022.

Table 8: Summary Statistics for Risk Premia

	N	Mean	Std. Dev	Min	Max	Constant	y_i	R^2
r^e	37	0.087	0.031	0.006	0.147	0.310***	-0.021**	0.143
						(0.092)	(0.008)	
$\widehat{r^e}$	37	0.098	0.022	0.031	0.123	0.236***	-0.013**	0.111
						(0.066)	(0.006)	

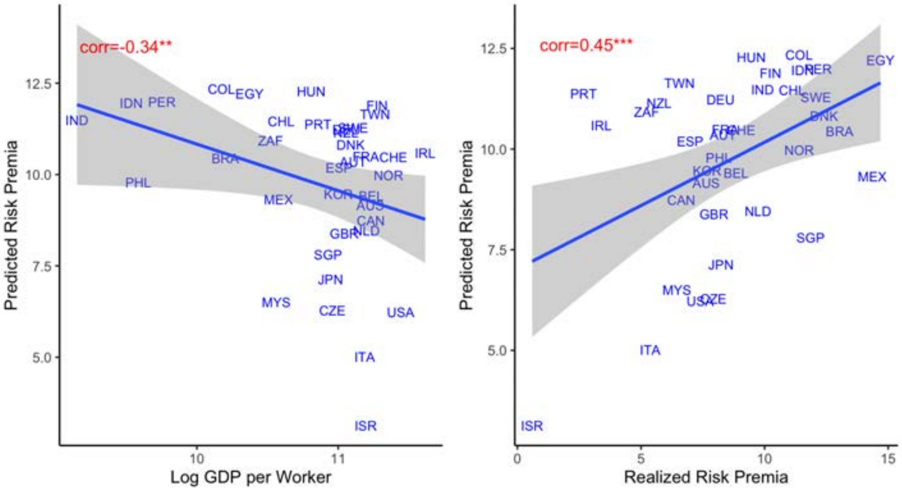
Notes: Table reports summary statistics of the mean realized risk premia from the data (r^e) and the predicted risk premia from the parameterized model ($\widehat{r^e}$) for 37 countries, and the results of a linear regression of r^e (top) and $\widehat{r^e}$ (bottom) on income per worker, y_i. Annual country-level equity return observations are truncated below -100%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. Interest rate on 3-month T-bills for U.S. during 1970-2022 from St. Louis Fred. Standard errors statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the bottom panel of the same Table, we report the summary statistics of risk premia that we compute from our parameterized model, which we denote by $\hat{r}^e$. The average country in our model enjoys a risk premium of 9.8%, which is somewhat higher than the corresponding statistic in the data. Much like in the data, risk premia are higher in emerging markets—doubling a country's income per worker results in a 1.3 percentage point decline in risk premia.

Turning to the cross-section of countries, in columns (vi) and (vii) of Table 7, we report risk premia predicted by the model and observed in the data for all 37 countries. The predicted risk premium ranges from 3.1% in Israel to a high of 12.2% in Egypt, and the U.S. value amounts to a familiar 6.2% (see Mehra and Prescott (1985) and Bansal and Yaron (2004) among others). More interestingly, the model is able to reconcile the cross section of risk premia in the data. The right panel of Figure 3 plots predicted versus realized risk premia at the country level and the accompanying correlation between the two series, which amounts to a highly statistically significant level of 0.45. The left panel of Figure 3 plots predicted risk premia against logged income per worker as well as the correlation between the two variables, which amounts to -0.34 and is statistically significant at the 5% level. Thus, risk premia predicted by the model behave very much in line with those observed in the data.

In the model, risk premia differentials across countries are driven by two parameters, ϕ_i^d and π_i^d, which capture the sensitivity of each country's dividend growth rate to persistent and transitory shocks. To evaluate the role of each parameter in delivering the results, we perform two robustness exercises. First, we set all country-specific π_i^d's to that of the U.S., and we keep the values of ϕ_i^d unchanged from the baseline parametrization. The first row of Table 13 in Appendix D shows the summary statistics from this exercise. Mean risk premia, denoted by $\hat{r}_r^e$ (for robustness), increase to 10.2%, and the correlation between the predicted and realized risk premia is effectively unchanged. Similarly, the correlation between the benchmark predicted

Figure 3: Predicted Equity Risk Premia



Notes: The above figure plots the predicted risk premia from the parameterized model ($\widehat{r^e}$) against income per worker (left) and the predicted risk premia from the parameterized model ($\widehat{r^e}$) against the realized risk premia from the data (r^e) (right) for 37 countries. Data Sources: Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. Interest rate on 3-month T-bills for U.S. during 1970-2022 from St. Louis Fred.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

risk premia and the counterfactual one is effectively 1, which suggests that predicted risk premia do not change. This finding demonstrates that the values of ϕ_i^d generate the majority of risk premia differentials across countries. Hence, we conclude that the model can reconcile both levels and volatilities of stock market returns across rich and poor countries.

In the second exercise, we set all country-specific π_i^d's to that of the U.S., and we re-estimate the resulting ϕ_i^d's so as to match the covariance of each country's dividend growth rate with the world. In this exercise, we are effectively assigning all the cross-sectional variation of the key moment of interest—the covariance of a country's dividend growth rate with the world dividend growth—on the parameter ϕ_i^d. The second row of Table 13 in Appendix D shows the summary statistics from this exercise. While risk premia levels, denoted by $\hat{r}_r^e$, decrease only slightly to 9.2% on average, there is a notable change in the cross-sectional variation. The correlation between the predicted and realized risk premia drops to a mere 0.16, while the correlation between the baseline and the counterfactual risk premia is only 0.5. This finding implies that it is important to account for both persistent and transitory shocks when estimating the world dividend process, even though the latter do not play an important role in governing the levels of risk premia.

3.3.2 Volatility of Returns to Equity

As a final exercise, we evaluate whether the model can account for the cross-sectional volatility of equity returns reported in Section 2.2. By construction, the model matches the variance of each country's dividend growth rate, which is driven by three objects: long-run global component, along with the country's leverage parameter, ($\phi_i^d x_t$), short-run global component ($\pi_i^d \eta_{t+1}$), and residual component ($\tilde{\phi}_i^d x_{it} + \tilde{\pi}_i^d \eta_{it+1} + \eta_{it+1}^d$). Table 9 reports the mean standard deviation among the 22 developed and 15 emerging markets in our dataset, as well as the percent of variance that is explained by the long-run and short-run global components. For both types of markets, the long-run global component accounts for a larger portion of the variation than does the short-run global component. Specifically, 25% (20%) of the variation in developed (emerging) market dividend growth is explained by the long-run component, and 20% (8%) by the short-run. Not surprisingly, the largest part of the variation is explained by the residual idiosyncratic component, especially for emerging markets, which are much more volatile.

Table 9: Standard Deviation of Dividends: Data vs Model

	s.d.(Δd_{Data})	$\frac{var(\Delta d_{long-Run})}{var(\Delta d_{Data})}$	$\frac{var(\Delta d_{short-Run})}{var(\Delta d_{Data})}$
Developed Markets	0.308	0.246	0.203
Emerging Markets	0.468	0.199	0.077

Notes: Table reports summary statistics of the Standard Deviation of Dividends in the data for Emerging and Developed markets, and the fraction of variance accounted for by the long-run and short-run components predicted by the model. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2022.

Table 10: Standard Deviation of Returns

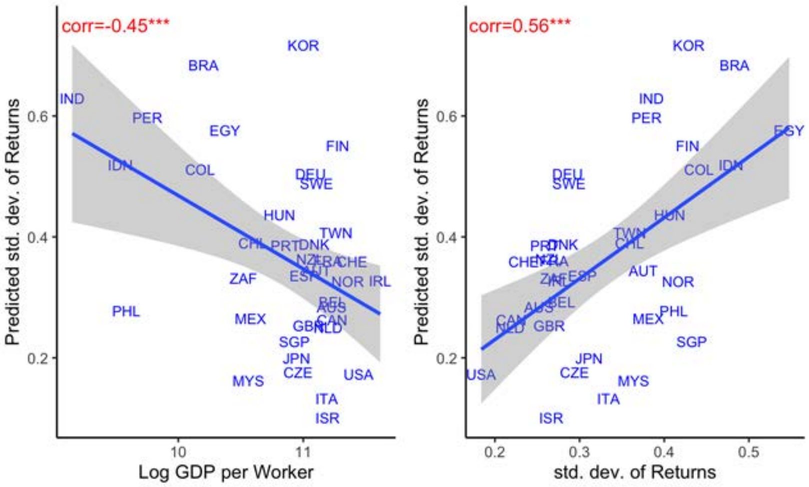
Statistic	N	Mean	St. Dev.	Min	Max	corr(x, inc.)	corr(x,Pred. Vol.)
St. Dev. of Returns	37	0.336	0.086	0.184	0.548	-0.57***	0.56***
Predicted St. Dev. of Returns	37	0.367	0.156	0.100	0.717	-0.45**	

Notes: Table reports summary statistics of the estimated Standard Deviation of Returns in the data and the predicted standard deviation of Returns in the model, their correlation and the correlation with income. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022.

What are the implications for the volatility of equity returns? Table 10 reports summary statistics of the volatility of equity returns in MSCI data and those predicted by the model. The model generates a standard deviation of returns to equity of 0.367 for the average country, which is nearly identical to the average level of 0.336 observed in the data.

To evaluate the cross-sectional predictions of the model, in the left panel of Figure 4, we plot the predicted standard deviation of equity returns against the logged income per worker for the 37 countries in our sample, as well as the correlation between the two variables. Consistent with the data, the model generates higher volatilities in emerging markets. To evaluate the fit of the model to the data, in the right panel of Figure 4, we plot the model-predicted standard deviation of returns against the standard deviation observed for the 37 countries in MSCI data. The correlation between the two variables is remarkably high—0.56—and highly statistically significant. With these statistics at hand, we conclude that the model can reconcile both levels and volatilities of stock market returns across rich and poor countries.

Figure 4: Predicted standard deviation of Risk Premia



Notes: The above figure plots the predicted standard deviation of risk premia against the standard deviation of risk premia from the data (left) and income (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. *$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4 Conclusion

In this paper, we have compiled the most comprehensive panel of international stock market returns to our knowledge, and we have documented: (1) higher and more volatile stock market returns in poorer over richer countries, and (2) higher stock market returns in countries with higher co-movement of dividends with the world. We have found that long-run risk, i.e., risk due to persistent fluctuations in economic growth rates, is a promising channel to reconcile these facts. Key to our results is that emerging markets not only feature large fluctuations in growth rates, but also that the shocks are systemically related across countries, i.e., these markets are highly exposed to global growth-rate shocks.

In our quantitative analysis, one parameter is critical in generating risk premia differentials across countries—the exposure of a country's dividend growth rate to the world persistent process. This parameter is directly governed by one moment in the data—the co-movement of countries' dividend growth rates with the world. While emerging markets generally display higher co-movement, there is a tension between their generally high volatility levels and low correlations with the world. Expanding our simple model to account for regional persistent components as well as richer stochastic discount factor specifications that respond to these processes would greatly improve the ability of the model to account for cross-sectional differences in the data. We see our work as a first step in this direction; we emphasize a single factor–the level of a country's development–in driving return differentials around the world.

We leave for future work a more detailed investigation into the sources of the differences in long-run risk that we measure. The implications of such an analysis would clearly be important on many dimensions; from the point of view of our analysis, in reducing required risk premia associated with investments in poor countries and so potentially attracting additional investment flows. Potential avenues of research include understanding the role that high dependence on the production and export of commodities, whose prices are known to be highly volatile, plays in generating volatility in emerging market macro aggregates. Additionally, examining the degree to which institutional differences across countries shape the ability to respond to external shocks may provide further insights into the mechanisms that result in high exposure of emerging markets to global shocks.

We have focused on consumption-based risk due to uncertainty regarding dividend payoffs, both in the short- and long-run. By doing so, we have abstracted from a number of other sources of risk that may play a role in leading to return differences, for example, default risk or expropriation risk. Additionally, our model does not shed light on the fundamental source of long-run risk, i.e., changing prospects for technological progress, etc. Further work investigating these issues and their interaction with rates of return on capital around the world could be quite fruitful.

References

AGUIAR, M. AND G. GOPINATH (2007): "Emerging Market Business Cycles: The Cycle Is the Trend," *Journal of Political Economy*, 115, 69–102.

ALFARO, L., S. KALEMLI-OZCAN, AND V. VOLOSOVYCH (2008): "Why Doesn't Capital Flow from Rich to Poor Countries? An Empirical Investigation," *The Review of Economics and Statistics*, 90, 347–368.

Bai, Y., P. Kehoe, P. Lopez, and F. Perri (2023): "World Financial Cycles," *mimeo*.

Banerjee, A. V. and E. Duflo (2005): "Growth theory through the lens of development economics," *Handbook of economic growth*, 1, 473–552.

Bansal, R., D. Kiku, and A. Yaron (2012): "An Empirical Evaluation of the Long-Run Risks Model for Asset Prices," *Critical Finance Review*, 1, 183–221.

Bansal, R. and A. Yaron (2004): "Risks for the Long Run: A Potential Resolution of Asset Pricing Puzzles," *Journal of Finance*, 59, 1481–1509.

Barro, R. (2006): "Rare Disasters and Asset Markets in the Twentieth Century," *Quarterly Journal of Economics*, 121, 823–866.

Bekaert, G., C. R. Harvey, and C. Lundblad (2007a): "Liquidity and Expected Returns: Lessons from Emerging Markets," *The Review of Financial Studies*, 20, 1783–1831.

Bekaert, G., C. R. Harvey, C. Lundblad, and S. Siegel (2007b): "Global Growth Opportunities and Market Integration," *Journal of Finance*.

Borri, N. and A. Verdelhan (2015): "Sovereign Risk Premia," Working paper, MIT Sloan.

Brusa, F., T. Ramadorai, and A. Verdelhan (2014): "The international CAPM redux," *Available at SSRN 2462843*.

Buera, F. J. and Y. Shin (2017): "Productivity Growth and Capital Flows: The Dynamics of Reforms," *American Economic Journal: Macroeconomics*, 9, 147–85.

Burnside, C. and A. Tabova (2009): "Risk, Volatility, and the Global Cross-Section of Growth Rates," Working Paper 15225, NBER.

Campbell, J. Y. and J. n. Cochrane (1999): "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior," *Journal of Political Economy*, 107, 205–251.

Caselli, F. and J. Feyrer (2007): "The Marginal Product of Capital," *The Quarterly Journal of Economics*, 122, 535–568.

Chari, A. and J. S. Rhee (2020): "The Return to Capital in Capital-Scarce Countries," Tech. rep., National Bureau of Economic Research.

Colacito, R., M. Croce, S. Ho, and P. Howard (2018a): "BKK the EZ Way: International Long-Run Growth News and Capital Flows," *American Economic Review*, 108, 3416–49.

Colacito, R. and M. M. Croce (2011): "Risks for the Long Run and the Real Exchange Rate," *Journal of Political Economy*, 119, 153 – 181.

——— (2013): "International Asset Pricing with Recursive Preferences," *Journal of Finance*, 68, 2651–2686.

Colacito, R., M. M. Croce, F. Gavazzoni, and R. Ready (2018b): "Currency Risk Factors in a Recursive Multicountry Economy," *Journal of Finance*, 707–720.

Epstein, L. G. and S. E. Zin (1989): "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: A Theoretical Framework," *Econometrica*, 57, 937–69.

Farhi, E. and X. Gabaix (2016): "Rare disasters and exchange rates," *The Quarterly Journal of Economics*, 131, 1–52.

Feenstra, R. C., R. Inklaar, and M. Timmer (2013): "The Next Generation of the Penn World Table," Working Paper 19255, NBER.

Gabaix, X. (2008): "Variable Rare Disasters: A Tractable Theory of Ten Puzzles in Macrofinance," *American Economic Review*, 98, 64–67.

Gomme, P., B. Ravikumar, and P. Rupert (2011): "The Return to Capital and the Business Cycle," *Review of Economic Dynamics*, 14, 262–278.

Gourinchas, P.-O. and O. Jeanne (2013): "Capital Flows to Developing Countries: The Allocation Puzzle," *Review of Economic Studies*, 80, 1484–1515.

Gourinchas, P.-o. and H. Rey (2013): "External Adjustment, Global Imbalances and Valuation Effects," *Handbook of International Economics, 585-640.*

Gourio, F., M. Siemer, and A. Verdelhan (2013): "International risk cycles," *Journal of International Economics*, 89, 471–484.

——— (2014): "Uncertainty and International Capital Flows," *MIT, mimeo.*

Hassan, T. A. (2013): "Country size, currency unions, and international asset returns," *The Journal of Finance*, 68, 2269–2308.

Hassan, T. A., T. M. Mertens, and J. Wang (2024): "A Currency Premium Puzzle," *Working paper.*

Hassan, T. A., T. M. Mertens, and T. Zhang (2016): "Not so disconnected: Exchange rates and the capital stock," *Journal of International Economics*, 99, S43–S57.

Hsieh, C.-T. and P. J. Klenow (2009): "Misallocation and manufacturing TFP in China and India," *The Quarterly journal of economics*, 124, 1403–1448.

Ilzetzki, E., C. M. Reinhart, and K. S. Rogoff (2019): "Exchange Arrangements Entering the Twenty-First Century: Which Anchor will Hold?*," *The Quarterly Journal of Economics*, 134, 599–646.

International Finance Corporation (1986): *Emerging stock markets factbook*, Washington, D.C. : World Bank Group.

Itskhoki, O. (2021): "The Story of the Real Exchange Rate," *Annual Review of Economics*, 13, 423–455.

Jagannathan, M., C. P. Stephens, and M. Weisbach (2000): "Financial flexibility and the choice between dividends and stock repurchases," *Journal of Financial Economics*, 57, 355–384.

Jordà, Ò., K. Knoll, D. Kuvshinov, M. Schularick, and A. M. Taylor (2019): "The Rate of Return on Everything, 1870–2015," *Quarterly Journal of Economics*, 134, 1225–1298.

Jordà, Ò., M. Schularick, and A. M. Taylor (2017): "Macrofinancial history and the new business cycle facts," *NBER macroeconomics annual*, 31, 213–263.

Kalemli-Özcan, Á. and L. Varela (2021): "Five facts about the uip premium," Tech. rep., National Bureau of Economic Research.

Kose, M. A., C. Otrok, and C. H. Whiteman (2003): "International business cycles: World, region, and country-specific factors," *The American Economic Review*, 93, 1216.

Kraay, A., N. Loayza, L. Serven, and J. Ventura (2005): "Country Portfolios," *Journal of the European Economic Association*, 3, 914–945.

Lewis, K. K. and E. X. Liu (2015): "Evaluating International Consumption Risk Sharing Gains: An Asset Return View," *Journal of Monetary Economics*, 71, 84–98.

——— (2017): "Disaster risk and asset returns: An international perspective," *Journal of International Economics*, 108, S42–S58.

Longstaff, F. A., J. Pan, L. H. Pedersen, and K. J. Singleton (2011): "How Sovereign Is Sovereign Credit Risk?" *American Economic Journal: Macroeconomics*, 3, 75–103.

Lucas, Jr., R. (1990): "Why Doesn't Capital Flow from Rich to Poor Countries?" *American Economic Review*, 80, 92–96.

Lustig, H., N. Roussanov, and A. Verdelhan (2011): "Common Risk Factors in Currency Markets," *Review of Financial Studies*, 24, 3731–3777.

Lustig, H. and A. Verdelhan (2007): "The Cross Section of Foreign Currency Risk Premia and Consumption Growth Risk," *American Economic Review*, 97, 89–117.

Mehra, R. and E. Prescott (1985): "The Equity Premium: A Puzzle," *Journal of Monetary Economics*, 15, 145–161.

Miranda-Agrippino, S. and H. Rey (2020): "US monetary policy and the global financial cycle," *The Review of Economic Studies*, 87, 2754–2776.

——— (2022): "The global financial cycle," in *Handbook of international economics*, Elsevier, vol. 6, 1–43.

Nakamura, E., D. Sergeyev, and J. Steinsson (2017): "Growth-Rate and Uncertainty Shocks in Consumption: Cross-Country Evidence," *American Economic Journal: Macroeconomics*, 9, 1–39.

Naoussi, C. F. and F. Tripier (2013): "Trend shocks and economic development," *Journal of Development Economics*, 103, 29 – 42.

Neumeyer, P. A. and F. Perri (2005): "Business Cycles in Emerging Economies: The Role of Interest Rates," *Journal of Monetary Economics*, 52, 345–380.

Obstfeld, M. and A. M. Taylor (2003): "Globalization and capital markets," in *Globalization in historical perspective*, University of Chicago Press, 121–188.

Ohanian, L. and M. Wright (2007): "Where Did Capital Flow? Fifty Years of International Rate of Return Differentials and Capital Flows," mimeo, UCLA.

Pellegrino, B., E. Spolaore, and R. Wacziarg (2021): "Barriers to global capital allocation," Tech. rep., National Bureau of Economic Research.

Prasad, E. S., R. G. Rajan, and A. Subramanian (2007): "Foreign Capital and Economic Growth," *Brookings Papers on Economic Activity*, 38, 153–230.

Reinhart, C. and K. Rogoff (2004): "Serial Default and the "Paradox" of Rich-to-Poor Capital Flows," *The American Economic Review*, 94, 53–58.

Reinhart, C. M. and V. R. Reinhart (2008): "Capital flow bonanzas: an encompassing view of the past and present," Tech. rep., National Bureau of Economic Research.

Restuccia, D. and R. Rogerson (2008): "Policy distortions and aggregate productivity with heterogeneous establishments," *Review of Economic dynamics*, 11, 707–720.

Rey, H. (2015): "Dilemma not trilemma: the global financial cycle and monetary policy independence," Tech. rep., National Bureau of Economic Research.

Song, Z., K. Storesletten, and F. Zilibotti (2011): "Growing like China," *American Economic Review*, 101, 196–233.

Uribe, M. and V. Z. Yue (2006): "Country spreads and emerging countries: Who drives whom?" *Journal of International Economics*, 69, 6–36.

Wang, J. (2021): "Currency Risk and Capital Accumulation," *Available at SSRN 3962478*.

Appendix

A Financial Data

A.1 Dividend Growth

To derive dividend growth rates, we follow the existing literature (see ex. Jagannathan et al. (2000)). Specifically, we retrieve two daily series from MSCI via the Capital IQ platform: (i) Price Return Index (in USD), and (ii) Total Return Gross Index (in USD), and we use the last date of each year. Let R_t^p be the annual growth rate of the Price Return Index in year t, and let R_t^{tr} be the growth rate of the Total Return Gross Index in year t. To back out the dividend growth rate, notice that:

$$R_{t+1}^{tr} \equiv \frac{P_{t+1} + D_{t+1}}{P_t} = \frac{P_{t+1}}{P_t} + \frac{D_{t+1}}{P_t}$$

This yields:

$$R_{t+1}^{tr} = R_{t+1}^{p} + \frac{D_{t+1}}{P_t},$$

hence,

$$D_{t+1} = \left(R_{t+1}^{tr} - R_{t+1}^{p}\right) P_t$$

and

$$\frac{D_{t+1}}{D_t} = \frac{\left(R^{tr}_{t+1} - R^{p}_{t+1}\right)}{\left(R^{tr}_{t} - R^{p}_{t}\right)} \frac{P_t}{P_{t-1}} = \frac{\left(R^{tr}_{t+1} - R^{p}_{t+1}\right)}{\left(R^{tr}_{t} - R^{p}_{t}\right)} R^p_t$$

Real dividend growth rates follow by subtracting U.S. inflation rates. We drop observations of real growth rates below -100% and above 200% to minimize measurement error.

B Model Solution

Processes in our environment:

$$\begin{aligned} \Delta c_{it+1} &= \mu_i + \phi_i x_t + x_{it} + \pi_i \eta_{t+1} + \eta_{it+1} \\ x_{t+1} &= \rho x_t + e_{t+1} \\ x_{it+1} &= \rho_i x_{it} + e_{it+1} \\ \Delta d_{it+1} &= \mu^d_i + \phi^d_i x_t + \tilde{\phi}^d_i x_{it} + \pi^d_i \eta_{t+1} + \tilde{\pi}^d_i \eta_{it+1} + \eta^d_{it+1} \end{aligned} \tag{9}$$

For a consumption paying domestic asset the Euler equation is:

$$1 = E_t \left[M_{it+1} R_{ict+1} \right]$$

with the Stochastic discount factor in country i:

$$m_{it+1} := \log M_{it+1} = \theta \log \delta - \frac{\theta}{\psi} \log \left(\frac{C_{it+1}}{C_{it}} \right) + (\theta - 1) \log R_{ict+1}$$

equivalently:

$$m_{it+1} = \theta \log \delta - \frac{\theta}{\psi} \Delta c_{it+1} + (\theta - 1)\, r_{ict+1}$$

where ψ is IES, γ risk aversion and $\theta = \frac{1-\gamma}{1-\frac{1}{\psi}}$.

The return to the domestic dividend paying asset, R_{idt+1} assumes a similar Euler equation. Following Bansal and Yaron (2004), we approximate returns as:

$$r_{ict+1} = k_{i0} + k_{i1} z_{it+1} - z_{1t} + \Delta c_{it+1}$$

$$r_{idt+1} = k_{i0} + k_{i1} z^d_{it+1} - z^d_{1t} + \Delta d_{it+1}$$

where

$$z_{it+1} = A_{i0} + A_{i1} x_{t+1}$$

$$z_{it} = A_{i0} + A_{i1}x_t$$

$$z^d_{it+1} = A_{i0} + A^d_{i1}x_{t+1} \tag{10}$$

$$z^d_{it} = A_{i0} + A^d_{i1}x_t$$

and $z^d = pd = log(\frac{P}{D})$.The standard asset pricing condition is:

$$E_t\left[M_{USt+1}R_{i,t+1}\right] = 1$$

since

$$m_{USt+1} + r_{it+1} \quad = \quad \theta \log \delta - \frac{\theta}{\psi}\Delta c_{USt+1} + (\theta - 1)r_{USct+1} + r_{it+1}$$

the Euler Equation is equivalent to:

$$E_t\left[\exp\left(\theta \log \delta - \frac{\theta}{\psi}\Delta c_{USt+1} + (\theta - 1)r_{USct+1} + r_{it+1}\right)\right] = 1$$

for any asset from country i. We focus on the asset from the US. For any realization of the state variable, the following equation must be constant:

$$\theta \log \delta - \frac{\theta}{\psi}\Delta c_{USt+1} + (\theta - 1)r_{USct+1} + r_{USct+1}$$

Thus if you plug in the expressions for Δc_{USct+1}, r_{USct+1}:

$$\begin{aligned} &= \theta \log \delta - \frac{\theta}{\psi}\left(\mu_{US} + \phi_{US}x_t + x_{USt} + \pi_{US}\eta_{t+1} + \eta_{USt+1}\right) \\ &+ (\theta)\left(\kappa_{i0} + \kappa_{i1}\left(A_{i0} + A_{i1}x_{t+1}\right) - \left(A_{i0} + A_{i1}x_t\right)\right) \\ &+ (\theta)\left(\mu_{US} + \phi_{US}x_t + x_{USt} + \pi_{US}\eta_{t+1} + \eta_{USt+1}\right) \end{aligned}$$

solving for A_1:

$$A_{i1} \quad = \quad \frac{\phi_{US} - \frac{\phi_{US}}{\psi}}{1 - \kappa_{i1}\rho}$$

similarly:

$$m_{it+1} + r_{idt+1} \quad = \quad \theta \log \delta - \frac{\theta}{\psi}\Delta c_{it+1} + (\theta - 1) r_{ict+1} + r_{idt+1}$$

this is equivalent to:

$$\begin{aligned}
m_{it+1} + r_{idt+1} \quad = \quad & \theta \log \delta - \frac{\theta}{\psi}\Delta c_{it+1} \\
& + (\theta - 1)(k_{i0} + k_{i1} z_{it+1} - z_{1t} + \Delta c_{it+1}) \\
& + k_{i0} + k_{i1} z^d_{it+1} - z^d_{1t} + \Delta d_{it+1} \\
& = \theta \log \delta - \frac{\theta}{\psi}(\mu_{US} + \phi_{US} x_t + x_{USt} + \pi_{US}\eta_{t+1} + \eta_{USt+1})) \\
& + (\theta - 1)(k_{i0} + k_{i1}(A_{US0} + A_{US1} x_{t+1}) - (A_{US0} + A_{US1} x_t) \\
& + (\mu_{US} + \phi_{US} x_t + x_{USt} + \pi_{US}\eta_{t+1} + \eta_{USt+1})) \\
& + k_{i0} + k_{i1}(A_{i0} + A^d_{i1} x_{t+1}) - (A_{i0} + A^d_{i1} x_t) \\
& + (\mu^d_i + \phi^d_i x_t + \tilde{\phi}^d_i x_{it} + \pi^d_i \eta_{t+1} + \tilde{\pi}^d_i \eta_{it+1} + \eta^d_{it+1})
\end{aligned}$$

This yields:

$$A^d_1 \quad = \quad \frac{\phi^d_i - \frac{\phi_{US}}{\psi}}{1 - \kappa_{i1}\rho}$$

The demeaned Stochastic discount factor in country i:

$$m_{it+1} - E_t[m_{it+1}] \quad = \quad (-\frac{\theta}{\psi} + (\theta - 1))(\pi_i \eta_{t+1} + \eta_{it+1}) + (\theta - 1)(\kappa A_1 e_{t+1} + \kappa e_{it+1})$$

The demeaned return on consumption in country i:

$$r_{ict+1} - E_t[r_{ict+1}] \quad = \quad \pi_i \eta_{t+1} + \kappa A_1 e_{t+1}$$

The demeaned return to dividends in country i:

$$r^d_{it+1} - E_t[r^d_{it+1}] \quad = \quad \pi^d_i \eta_{t+1} + \kappa A^d_1 e_{t+1}$$

We assume m,e and r are jointly log-normal.

$$\begin{aligned}
0 &= log(E_t[exp(r^d_{it+1} + \Delta e + m_{USt+1})]) \\
&= E_t[r^d_{it+1}] + E_t[\Delta e] + E_t[m_{USt+1}] \\
&+ \frac{1}{2}Var(r^d_{it+1}) + \frac{1}{2}Var(\Delta e) + \frac{1}{2}Var(m_{USt+1}) \\
&+ Cov(r^d_{it+1}, \Delta e) + Cov(r^d_{it+1}, m_{USt+1}) + Cov(\Delta e, m_{USt+1})
\end{aligned}$$

Combining these terms gives the Risk premium
Total US return:

$$E\left(r_{US} - r_{f_{us}}\right) = -\operatorname{cov}\left(m_{US}, r_{US}\right) - \frac{1}{2}\operatorname{var}\left(r_{US}\right)$$

Total foreign return:

$$\mathbb{E}\left[\hat{r}_i^e\right] \equiv \log \mathbb{E}\left[R_i\right] + \mathbb{E}\left[\Delta q_i\right] - \log \mathbb{E}\left[R_f\right] = -\operatorname{cov}\left(m_{US}, r_i\right) - \frac{1}{2}\operatorname{var}\left(r_i\right) - \frac{1}{2}\operatorname{var}\left(\Delta q_i\right),$$

where

$$\operatorname{Cov}\left(\mathrm{m_{US}}, r_i\right) = \left(-\frac{\theta}{\psi} + \theta - 1\right)\pi_{us}\pi_i^d\sigma_\eta^2 + (\theta-1)\kappa^2\left(\frac{\phi_{US} - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\sigma_e^2$$

$$var(m_{US}) = \left(-\frac{\theta}{\psi} + \theta - 1\right)^2\pi_{US}^2\sigma_\eta^2 + (\theta-1)^2\kappa^2\left(\frac{\phi_{US} - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)^2\sigma_e^2$$

$$var(m_i) = \left(-\frac{\theta}{\psi} + \theta - 1\right)^2\pi_i^2\sigma_\eta^2 + (\theta-1)^2\kappa^2\left(\frac{\phi_i - \frac{\phi_i}{\psi}}{1-\kappa\rho}\right)^2\sigma_e^2$$

$$var\left(r_i\right) = \kappa^2\left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)^2\sigma_e^2 + \left(\pi_i^d\right)^2\sigma_\eta^2$$

B.1 Kappas

We estimate κ using a symmetric balanced growth path, so that the terms are constant across countries. On BGP,

$$\begin{aligned}\bar{z} &= A_0 = \frac{\log\beta + \left(1-\frac{1}{\psi}\right)\mu_{US} + \kappa_0}{1-\kappa_1} \\ &= \frac{\log\beta + \left(1-\frac{1}{\psi}\right)\mu_{US} + \log\left(1+e^{\bar{z}}\right) - \frac{e^{\bar{z}}}{1+e^{\bar{z}}\bar{z}}}{1-\frac{e^{\bar{z}}}{1+e^{\bar{z}}}}\end{aligned}$$

Similarly,

$$\begin{aligned}\bar{z}_m = A_{0m} &= \frac{\log\beta + \left(1-\frac{1}{\psi}\right)\mu_{US} + \kappa_{0m}}{1-\kappa_{1m}} \\ &= \frac{\log\beta + \left(1-\frac{1}{\psi}\right)\mu_{US} + \log\left(1+e^{\bar{z}_m}\right) - \frac{e^{\bar{z}m}}{1+e^{\bar{z}}m}\bar{z}_m}{1-\frac{e^{\bar{z}}m}{1+e^{\bar{z}}m}}\end{aligned}$$

$$\kappa = \frac{e^{A_0}}{1+e^{A_0}} = \frac{e^{A_{0m}}}{1+e^{A_{0m}}}$$

Given $\mu_{US} = 0.017$, $\kappa = 0.9975$, which is consistent with the estimate of Bansal and Yaron (2004), who report a $\kappa = 0.997$.

B.2 Risk-Free Rate

To derive the US risk-free rate

$$E_t\left[\theta\log\delta - \frac{\theta}{\psi}\Delta c_{USt+1} + (\theta-1)r_{USct+1} + r_{ft+1}\right] = 0$$

which yields:

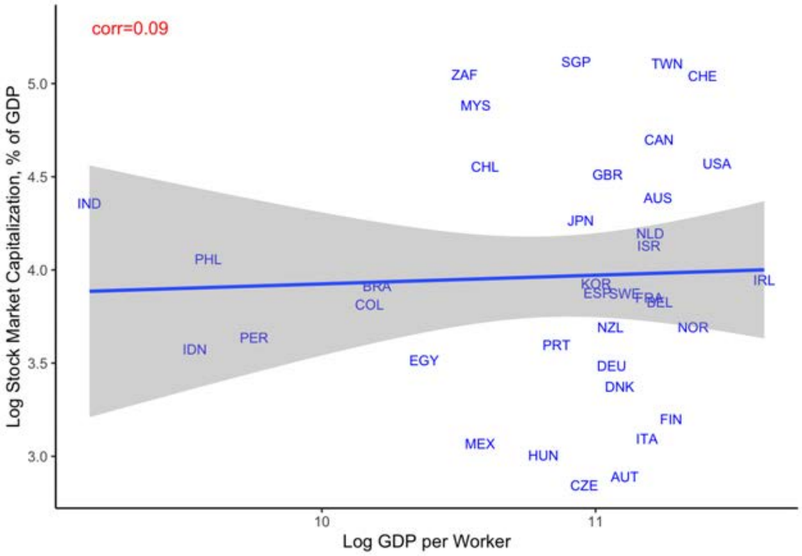
$$r_{f,t} = -\theta\log(\delta) + \frac{\theta}{\psi}E_t\left[\Delta c_{USt+1}\right] + (1-\theta)E_t\left[r_{USct+1}\right] - \frac{1}{2}\operatorname{Var}_t\left[\frac{\theta}{\psi}\Delta c_{USt+1} + (1-\theta)r_{USct+1}\right],$$

following the approach Bansal and Yaron (2004), subtract $(1-\theta)r_{f,t}$ from both sides and divide by θ:

$$r_{f,t} = -\log(\delta) + \frac{1}{\psi}E_t\left[\Delta c_{USt+1}\right] + \frac{(1-\theta)}{\theta}E_t\left[r_{USct+1} - r_{f,t}\right] - \frac{1}{2\theta}\operatorname{Var}_t\left[\frac{\theta}{\psi}\Delta c_{USt+1} + (1-\theta)r_{USct+1}\right]$$

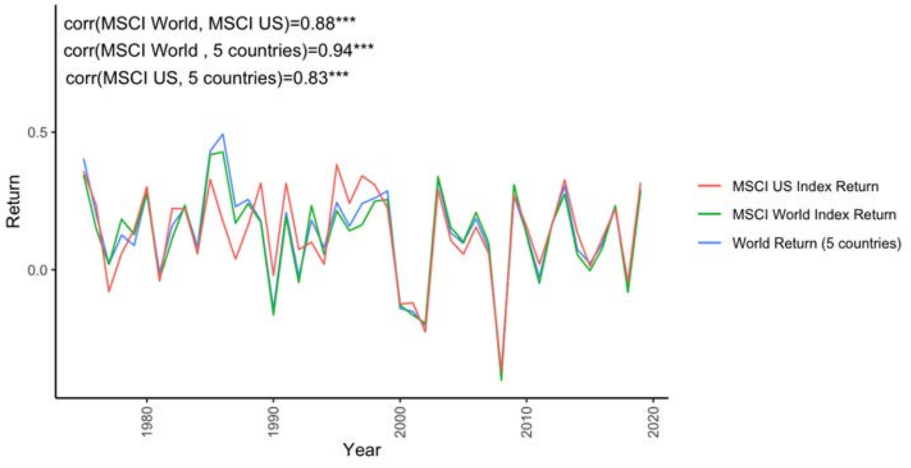
C Supporting Figures

Figure 5: Log Stock Market Capitalization (% of GDP)



Notes:The above figure plots (log) stock market capitalization (% of GDP) against income for 37 countries. Data Sources: Stock Market Capitalization from WDI for 1975-2020, Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 6: Time Series of Stock Market Returns



Notes: The above figure plots various return series over time. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Supporting Tables

Table 11: Realized Stock Market Returns Regression

	Dependent variable: r_{it} (1)	r_{it} (2)	r_{it} (3)
y_{it}	-0.044^{***}	-0.039^{***}	-0.097^{***}
	(0.014)	(0.011)	(0.028)
Constant	0.589^{***}		
	(0.157)		
Observations	1,467	1,467	1,467
R^2	0.006	0.008	0.008
Country fixed effects	N	N	Y
Year fixed effects	N	Y	N

Notes: Table reports the results of a linear regression of equity returns r_{it} on income per worker, y_{it}. Annual country-level equity return observations are truncated below -100%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. Standard errors statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Realized Stock Market Returns Regression

	Dependent variable: r_{it} (1)	r_{it} (2)	r_{it} (3)
y_{it-1}	-0.054^{***}	-0.042^{***}	-0.131^{***}
	(0.014)	(0.011)	(0.027)
Constant	0.684^{***}		
	(0.153)		
Observations	1,503	1,503	1,503
R^2	0.010	0.010	0.016
Country fixed effects	N	N	Y
Year fixed effects	N	Y	N

Notes: Table reports the results of a linear regression of equity returns r_{it} on lagged income per worker, y_{it-1}. Annual country-level equity return observations are truncated below -100%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2022. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020-2021. Standard errors statistics in parentheses.

Table 13: Robustness Results

Condition	Statistic	N	Mean	St. Dev.	Min	Max	corr(x,r^e)	corr(x,$\widehat{r^e}$)
$\pi_i^d = \pi_{i\,US}^d$ & $\phi_i^d = \phi_i^d$	$\widehat{r_r^e}$	37	10.109	2.387	3.053	12.586	0.46^{***}	0.99^{***}
$\pi_i^d = \pi_{i\,US}^d$ & $\phi_i^d = \phi_i^d(\pi_{US}^d)$	$\widehat{r_r^e}$	37	9.178	4.300	-5.857	12.585	0.16	0.50^{***}

Notes: Table reports summary statistics of $\widehat{r^e}$ for 2 restriction of parameters, $\widehat{r_r^e}$. The first restriction sets $\pi^d = \pi_{US}^d$ and keeps ϕ^d unchanged. The second restriction is restricting $\pi^d = \pi_{US}^d$ and re-estimates ϕ^d.