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 January 2025

We thank Oleg Itskhoki, Max Croce, Tony Zhang, Thomas Mertens, Hanno Lustig and Tarek Hassan for invaluable comments and suggestions; 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 January 2025
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

Since the late 1980s, following significant financial account liberalization, emerging markets have been an appealing investment option for global investors. One common argument supporting investment in these markets is their potential to provide hedging opportunities for U.S. investors. This is due to their relatively higher returns and lower correlation with the U.S. market, in contrast to developed economies, whose business cycles are more closely aligned with that of the United States. Nevertheless, capital flows to emerging markets remain consistently lower than those to developed markets—a phenomenon aligned with the "Lucas Paradox," which highlights the persistent empirical observation that returns on capital are higher in less developed markets (Lucas (1990)).

In this paper, we propose that U.S. investors require significantly higher risk premia to invest in emerging markets, which acts as a barrier to capital flows toward these economies. To explore this, we focus on equities, a crucial asset class that is directly comparable across countries and operates in relatively frictionless markets. Utilizing the Morgan Stanley Capital International (MSCI) database, we analyze USD-denominated annualized stock market returns from 22 developed markets dating back to 1970 and 15 emerging markets from 1988 to 2020.

Our analysis of 37 equity markets, which collectively represent 86% of global stock market capitalization and two-thirds of world GDP over the past five decades, reveals two key findings. First, stock market returns are both higher and more volatile in emerging markets compared to developed economies. Specifically, doubling a country's income per worker is associated with a 3.1 percentage point reduction in mean stock market returns, while the correlation between return volatility and income is -0.6. Second, markets with higher stock returns exhibit a strong covariance between their equity dividend growth rates and the global dividend growth rate.[1] This relationship arises from differences in dividend growth rate volatilities across countries. Emerging markets experience substantially higher volatility in dividend growth rates, but exhibit weaker correlations with global dividend growth.

Motivated by these empirical findings, we investigate whether the risk-return trade-off predicted by asset pricing theory can explain the observed differences in risk premia between developed and emerging markets. Specifically, we examine the role of long-run risks as defined by Bansal and Yaron (2004) who focus on the pricing of risks associated with persistent fluctuations in economic growth prospects. Our approach is guided by two key motivations. First, an expanding body of literature, initiated by Aguiar and Gopinath (2007), highlights the significance of shocks to trend growth rates in explaining business cycle dynamics in poor and

[1] The global dividend growth rate is defined as the stock-market-capitalization-weighted average of dividend growth rates from five major economies: the U.S., U.K., France, Germany, and Japan. We confirm the robustness of our findings to alternative definitions of the global variable.

emerging markets, as well as in reconciling disparities in macroeconomic behavior between these markets and developed economies. Second, long-run risks have demonstrated profound implications for asset pricing, successfully addressing several longstanding puzzles in the literature, such as the equity premium puzzle (Bansal and Yaron (2004); Colacito and Croce (2011); Nakamura et al. (2017)), the low correlation between consumption differentials and exchange rates (i.e., the Backus and Smith (1993) puzzle) and the forward-premium anomaly (Colacito and Croce (2013)), bond return predictability and violations of uncovered interest parity (Bansal and Shaliastovich (2013)), and currency risk premia (Colacito et al. (2018b)). In this context, we analyze whether the heterogeneity in risks stemming from volatile and uncertain growth prospects can account for the differences in international stock market returns, particularly between wealthy and poorer nations.

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 key distinguishing feature of our framework is the focus on a representative U.S. investor, endowed with a consumption stream, dividend payments from risky capital investments across different countries, and access to a risk-free asset. Beyond the inherent risks of stochastic dividend payments, the investor is also exposed to exchange rate risk, as foreign equity payouts are denominated in local currencies. Initially, we simplify the global economy by assuming the existence of a single, perfectly tradable good, which eliminates exchange rate volatility. In subsequent robustness exercises, we assess the impact of incorporating exchange rate risk. This approach allows us to concentrate on the core mechanism of our model: the pricing of global long-run risks in equity markets.

Specifically, we assume that economic growth rates feature a small but persistent component, which manifests itself in both consumption growth and growth in dividend payments from invested capital. This persistent component comprises a global common piece and an idiosyncratic one unique to each country, with the latter being uncorrelated across markets. Countries vary in their sensitivity to the global piece. With recursive preferences as in Epstein and Zin (1989), a U.S. investor's valuation of foreign assets becomes particularly sensitive to persistent global shocks. Countries whose dividend growth is more responsive to these shocks are perceived as riskier investments by the U.S. investor and must offer higher expected returns to compensate for this added risk. Additionally, each country is subject to both common and idiosyncratic transitory shocks, which affect growth rates for only a single period. The common transitory shocks also contribute to risk premia differentials for a U.S. investor.

Quantifying the implications of long-run risks in our model presents two key challenges. First, we must identify global shocks. Second, we need to measure the exposure of individual countries' dividends to both global long-run growth prospects and purely transitory shocks. Additionally, we must estimate the parameters governing the U.S. investor's consumption growth process. Identifying global persistent shocks is particularly difficult due to the limited availability of historical macroeconomic and financial data, which exist primarily for a few developed economies. To address this, we utilize the MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017), which includes data on consumption growth rates and price-to-dividend ratios. Balancing the trade-off between cross-sectional and time-series coverage and data quality, we define our global variable using data from five major economies–U.S., U.K., France, Germany, and Japan–over the 1940-2020 period.[2]

Following insights from 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 determined solely by the global persistent process. This relationship allows us to project future consumption growth onto lagged values of the price-to-dividend ratio, thereby recovering the time series of the persistent process. We implement this projection within a panel regression framework and define the persistent process as the equally-weighted mean of the predicted component of consumption growth across the five countries. The residual variation in global consumption growth, computed as the equally-weighted mean across the same five economies, represents the transitory global component.

Under standard assumptions for preference parameters, equity excess returns over the risk-free rate are determined by the U.S. agent's exposure of consumption growth to global persistent and transitory shocks, as well as the sensitivity of different countries' dividend growth to these shocks. To estimate the U.S. consumption growth exposure to the global persistent process, we perform a linear regression of U.S. consumption growth on the global persistent process. Similarly, a regression of U.S. consumption growth on the residual component of global consumption growth provides the exposure parameter to the global transitory shock.

We use a similar approach to estimate the parameters governing countries' dividend growth rate processes, starting by defining a global dividend growth process. This process incorporates the same global persistent and transitory shocks as the global consumption growth process, though with distinct exposure parameters, and includes an additional orthogonal transitory shock to account for the higher volatility observed in stock market variables compared to macroeconomic variables. We calculate global dividend growth as a stock-market-capitalization-weighted average of dividend growth rates for the same five major economies–U.S., U.K., France, Germany, and Japan–over the 1975-2020 period using MSCI data. Notably, the stock-market-capitalization-weighted mean stock market return across these five countries closely aligns with the returns on the MSCI-defined "World Index," validating our selection of these economies for defining global variables.

[2]We confirm the robustness of our findings to alternative definitions of the global variable.

To estimate each country's exposure parameters for the dividend growth process, we use moments that capture the sensitivity of country-level dividends to global predictable growth. As discussed above, these moments are particularly informative for understanding the cross-section of equity returns. Since global and country-level dividends respond to the same global shocks, their co-movement provides insights into each country's exposure parameters to these shocks. Specifically, to determine countries' exposure to transitory global shocks, we follow a procedure analogous to that used for U.S. consumption: we regress each country's dividend growth rate on the residual global dividend growth, excluding the persistent component. Once these parameters are identified and the contribution of transitory shocks is accounted for, we can recover exposures to the persistent global process from the regression coefficients of countries' dividend growth on global dividend growth. These parameters directly link to excess returns in the model. For instance, emerging markets whose dividends exhibit strong co-movement with global growth have high inferred exposures to the persistent global component, prompting U.S. investors to demand higher risk premia to invest in equities from those markets.

Using this methodology across the 37 countries in our dataset, we demonstrate that long-run risks explain a substantial share of the observed return disparities, as well as the inverse relationship between income levels and returns (i.e., low income/high return versus high income/low return). The model predicts a mean excess return of 9.8%, closely aligning with the observed mean of 9.3% in the data. For the U.S., the model implies an excess return of 6.2%, consistent with the historical figure reported in Bansal and Yaron (2004), though slightly below the observed post-1970 mean of 7.6%. The model also predicts lower excess returns in wealthier countries, with a doubling of income per worker leading to a 1.3 percentage point decline in risk premia. Notably, the correlation between model-implied and actual mean excess returns across countries is 0.54, suggesting that the model accounts for more than half of the observed cross-country variation in equity risk premia.

What explains the differences in risk premia between rich and poor countries? The variation arises primarily from the parameters governing the sensitivity of dividend growth to global persistent fluctuations. To illustrate this, we conduct a robustness exercise where we set all countries' exposures to the transitory global shock to match the level estimated for the U.S., while maintaining the heterogeneous exposure parameters to the global persistent process as in our baseline specification. Under this alternative specification, the mean model-implied excess returns increase slightly to 10%, and the correlation between model-implied and observed excess returns remains virtually unchanged. These results reinforce the conclusion that cross-country differences in risk premia are largely driven by the sensitivity of dividends to the global persistent process.

Nevertheless, accounting for global transitory shocks in dividend growth remains crucial.

To illustrate this, we conduct a second exercise where we set all countries' exposures to the transitory global shock equal to the level estimated for the U.S. We then infer new exposures to the persistent global process using the same covariance moment between countries' dividend growth and the global dividend growth process as in the baseline specification. This effectively assigns all cross-sectional variation in the covariance of a country's dividend growth rate with the global dividend growth solely to the parameter governing exposure to the global persistent process. While the average risk premia decrease only slightly to 9.3%, the cross-sectional variation undergoes a significant shift. The correlation between mean model-implied and observed excess returns plummets to just 0.2, indicating that the model struggles to capture the variation seen in the data.

The model not only aligns well with observed levels of risk premia, but also captures second moments in the data effectively. Specifically, the average standard deviation of returns in the model is 0.365, closely matching the observed value of 0.336, with a cross-sectional correlation of 0.59 between model-implied and realized standard deviations across the 37 countries. Consistent with empirical data, the model predicts higher return volatilities in poorer countries compared to richer ones. These results demonstrate that this parsimonious framework successfully explains a substantial portion of the variation in both the levels and volatilities of stock market returns across countries with varying income levels.

The preceding analysis assumes away real exchange rate volatility. However, fluctuations in the real exchange rate can pose a risk to the U.S. investor when they covary with the investor's stochastic discount factor, which in our model is tied to her consumption stream. The literature offers a variety of theoretical perspectives on exchange rates, ranging from frictionless models where bilateral exchange rate movements mirror differences in consumers' stochastic discount factors, to frictional frameworks that introduce wedges, and even to models where exchange rates are entirely decoupled from macroeconomic variables (see Itskhoki (2021) for a comprehensive review).

Instead of exploring various mechanisms of exchange rate determination, we perform a robustness exercise to assess the potential impact of exchange rate risk on equity risk premia within the framework of our model. When the real exchange rate deviates from unity, dividend growth rates in our analysis must be expressed in each country's local currency, as the U.S. investor prices these flows–including exchange rate fluctuations–through her no-arbitrage condition. Turning to MSCI, which provides consistent coverage of equity markets data in both USD and local currency, we re-estimate the key exposure parameters for dividend growth rates using local-currency data, while maintaining all other model parameters at their baseline values. Under this alternative specification, the model-implied mean risk premium declines by one percentage point to 8.2%, and the correlation between model-implied and observed risk premia across the 37 markets increases marginally to 0.56. Notably, model-implied risk premia remain closely aligned with those from our benchmark calibration, as evidenced by a cross-sectional correlation of 0.7 between the two sets of estimates.

The robustness exercise indicates that exchange rate risk premia do not play a significant role in shaping equity risk premia within the context of this model, especially when key model parameters are derived from the comovement of countries' dividend growth with global dividend growth. In essence, this critical moment remains consistent regardless of the currency used for denomination. This result aligns with the observation that dividend growth volatility is largely invariant across local- and foreign-currency measures for most countries. Similarly, Chernov et al. (2024) report that the volatility of equity returns is nearly identical whether measured in local currency or in USD. These findings reinforce the conclusion that long-run risk is a dominant factor in explaining the observed disparities in risk premia between developed and emerging markets.

The remainder of the paper is organized as follows. In Section 2, we describe our data sources and we discuss various challenges regarding the measurement of financial and macroeconomic variables across rich and poor countries. In Section 3, we document the key facts on international stock markets. In Section 4, we lay out our quantitative analysis of a risk-based explanation of these facts. In Section 5, we conclude and discuss directions for future research. Algebraic 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) and Colacito and Croce (2013), who examine macroeconomic and financial variables in the U.S. and the U.K., and Lewis and Liu (2015), who study consumption and equity correlations across the U.S., U.K. and Canada. All of these papers find a significant role for shared long-run risk across countries. Our emphasis on heterogeneous exposures to a global shock brings 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 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 to 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 observed risk premia across developed and emerging markets. These features of our analysis differentiate our work from the work by Nakamura et al. (2017), who find that heterogeneous exposures of consumption growth to global persistent shocks, alongside country-specific persistent shocks, both priced by a local investor, account for a significant amount of the variation in risk premia among 16 developed economies. We find that systematic differences in dividend growth exposures to global shocks, rather than consumption growth exposures, account for risk premia differentials among developed and emerging markets.

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 study of emerging market equities relates our paper 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. Using empirical tools that are traditionally employed by the finance literature, the authors document an important role of a global factor–U.S. equity return–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. Similarly, Brusa et al. (2014) and Karolyi and Wu (2020) find that global currency factors can empirically reconcile the cross-section of asset returns across countries. Brusa et al. (2014) further use international equity and currency returns data to quantify an asset pricing model that features a reduced-form stochastic discount factor. These papers complement our work and provide strong support for the role of global risk factors in driving equity risk premia around the world. Unlike these papers, we rely on consumption and dividend data 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 structural consumption-based long-run risk model. To our knowledge, the sensitivity of countries' dividend growth rates to the global dividend growth rate has not been previously studied by the existing international asset pricing literature.

A broader literature demonstrates the importance of global shocks in driving asset prices and macroeconomic variables. 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. Longstaff et al. (2011) find that global factors can account for the majority of sovereign credit spreads, while Borri and Verdelhan (2015) relate excess returns on foreign sovereign bonds to their co-movement with U.S. bonds. Lustig and Verdelhan (2007) link currency risk premia to U.S. consumption-based risk. Gourio et al. (2013) examine the role of world shocks in driving equity returns in high versus low interest rate countries. Rey (2015), Miranda-Agrippino and Rey (2020) and Miranda-Agrippino and Rey (2022) document a 'global financial cycle' in stock and corporate bond returns. Bai et al. (2023) explore the role that the world financial cycle plays in reconciling sovereign credit spreads in emerging markets. Kalemli-Özcan and Varela (2021) document that the average excess currency returns among 22 emerging markets co-moves with global risk sentiment. Andrews et al. (2024) find that countries feature heterogeneous exposures to news shocks about expected global growth and inflation, and show that a model in which agents price these shocks can account for the cross section of carry trade returns. 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. 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). Ohanian et al. (2018), on the other hand, emphasize the role of labor market frictions. 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. Recently, Oskolkov (2024) links capital flows to the interactions between a financially-constrained global financial intermediary and local investors. 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. Farhi and Gabaix (2016) link international asset prices to disaster risk, and Lewis and Liu (2017) show that global and idiosyncratic disasters can reconcile equity return differentials among 20 developed countries. None of these studies examine 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 exposures to this component by developed and emerging markets' equity dividends, which result in equity return differences.

2 Data Description

In this paper, we pool real and financial data from multiple sources. In this section, we describe the main variables and data sources that we use throughout the paper. In Appendix A, we describe supplemental variables and data sources.

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 focus on stock market returns since equity is an asset class that is relatively more easily comparable across countries. Our goal is to understand the determinants of equity returns across countries.

2.2 Country-Level Equity Returns and Risk Premia

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 for the U.S., which we obtain from St. Louis FRED. To compute risk premia over a risk-free rate, we use the annual nominal interest rate on 3-month T-bills for the U.S. from St. Louis FRED, deflated by the inflation rate as above.

Our dataset includes stock market returns in 22 developed markets during the 1970-2020 period, and returns in 15 emerging markets dating back to 1988 until 2020.[3] Table 15 in Appendix B contains descriptive statistics for equity returns in each country.[4] The 37 markets that we study account for 86% of world stock market capitalization and are considered investable by MSCI.[5] While equity is not the only way to access investment opportunities in

[3]Select emerging markets enter the database in the late 1980's. We include markets in our analysis as soon as they appear in the dataset.

[4]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; and furthermore, the theoretical assumption of a small open economy is difficult to justify.

[5]International Finance Corporation (1986) documents 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

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 63%, and the statistic is not systematically lower in emerging markets (see Figure 8 in Appendix A). 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%.

2.3 Country-Level Equity Dividends

Equity dividends play a key role in our quantitative analysis. Specifically, we will be using moments on dividend growth rates to infer some of the key parameters of interest in the model.

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

$$\Delta d_{t+1} \equiv \frac{D_{t+1}}{D_t} - 1 = \frac{\left(R_{t+1}^{tr} - R_{t+1}^{p}\right)}{\left(R_t^{tr} - R_t^{p}\right)} \frac{P_t}{P_{t-1}} - 1 = \frac{\left(R_{t+1}^{tr} - R_{t+1}^{p}\right)}{\left(R_t^{tr} - R_t^{p}\right)} R_t^p - 1$$

Real dividend growth rates follow by subtracting U.S. inflation rates. Table 16 in Appendix B contains descriptive statistics for dividend growth rates in each country. For robustness exercises that examine currency risk, we rely on real dividend growth rates denominated in local currency. We obtain the identical series as above from MSCI in local currency. The coverage is identical to the USD-denominated variables. To construct real local-currency variables, we use annual country-level inflation rates from the Worl Bank's World Development Indicators (WDI thereafter), supplemented by observations from the International Monetary Fund (IMF

a regular basis, and we focus on the markets that they deem investable in our study.

thereafter) for Taiwan.

2.4 Global Macroeconomic and Financial Variables

In order to quantify long-run risks priced by a U.S. investor, we need to identify global persistent and transitory shocks as well as the sensitivity of U.S. consumption growth to these shocks. To estimate the global persistent component of consumption, we will rely on methods used by Bansal et al. (2012) and Colacito et al. (2018b), which require consumption growth and equity price-to-dividend data. Recovering global persistent shocks is particularly challenging because we need to balance time-series and cross-sectional data coverage of these variables. Ideally, we would like to use historical series for as many countries as possible in order to identify a global persistent component in consumption, but price-to-dividend observations are very limited. We obtain historical consumption, population and price-to-dividend observations from the MacroHistory Database, provided by Jordà et al. (2019) and Jordà et al. (2017). To balance off time series and cross sectional coverage against measurement error, we define 'global' or 'world' per-capita consumption growth to be the mean of the following five economies: U.S., U.K., France, Germany and Japan during the 1940-2020 period,

$$\Delta c_{Wt} = \frac{1}{5}\sum_{k=1}^{5} \Delta c_{kt}, \tag{1}$$

where k indexes each country. These countries account for 61% of stock market capitalization of the 37 countries that are in our sample, so they reflect a significant portion of global financial market activity.[6]

Finally, in order to quantify differences in risk premia across countries, we need to identify the sensitivity of each country's dividend growth rates to global persistent and transitory shocks. To do so, we will rely on dividend growth rates for each country, as described in Section 2.3 above, as well as on a 'global' dividend growth rate. We define global dividend growth to be the stock-market-capitalization weighted mean of dividend growth rates for the same five economies as above: U.S., U.K., France, Germany and Japan during the 1975-2020 period.[7] Specifically,

[6] In Appendix D, we show that our measure of a 'global' persistent process is robust to including 6 other developed economies with historical data coverage, which account for an additional 7% of global stock market capitalization. As we describe in Appendix A, stock market capitalization data coverage begins in 1975. Thus, the reported shares are a lower bound for our entire period of study which dates back to 1940 when our five major economies constituted a much larger share of world economic activity. This data limitation is also a reason why we cannot use stock-market-capitalization weighted mean of consumption data in our definition of a global variable. Since adding countries changes the share of stock market capitalization only marginally, and since we cannot weigh historical series by market cap, we opt to limit our definition of 'global' to the five economies with the largest contribution to global financial activity.

[7] In Appendix D, we show that country-level estimates of the key parameters that govern risk premia in the

let $\omega_{it} = \frac{\text{Stock Market Cap}_{it}}{\sum_{k=1}^{5} \text{Stock Market Cap}_{kt}}$ denote the stock market capitalization share for country i. Then,

$$\Delta d_{Wt} = \sum_{k=1}^{5} \omega_{kt} \Delta d_{kt}, \tag{2}$$

where Δd_{Wt} denotes global or 'world' dividend growth rate. Our definition of the 'world' equity market corresponds very closely to MSCI's definition. Figure 10 in Appendix D 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. Among these countries, the dominant role of the U.S. is apparent from the high correlation of U.S. equity returns with both indices. Since we aim to understand cross-country patterns of stock markets in this paper, given historical data limitations discussed above, it is reasonable to approximate 'global' variables with our set of five countries.

2.5 Country-Level Macroeconomic Variables

To measure the level of development of each country, we turn to Version 10.0 of the Penn World Tables (PWT thereafter) described in Feenstra et al. (2013). We use this dataset to compute income per worker from annual series of real GDP and employment for each country dating back to the year in which the country enters the MSCI dataset until 2019, which is the terminal year for the PWT dataset. We supplement with data from WDI for the year 2020.

3 Stock Markets Across Countries

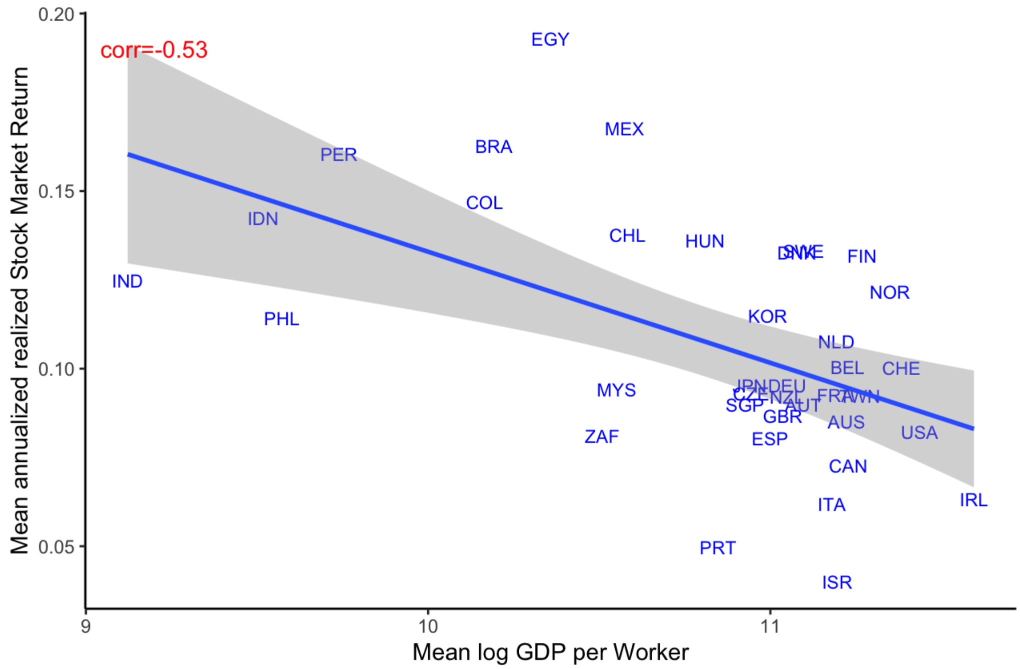
In this section, we describe a number of empirical properties of the returns to equities—most notably, a systematic negative link between the level of development and the first and second moments of stock market returns across countries, as well as a positive relationship between returns and the sensitivity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

3.1 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. Figure 1 plots mean realized stock market

model are robust to different definitions of 'global' dividend growth. Thus, we opt for the 5-country definition in order to maintain consistency with the estimates of 'global' persistent and transitory shocks that stem from consumption and price-dividend data.

Figure 1: The Cross-Section of Stock Market Returns



Notes: The figures plots the relationship between time-series mean USD-denoted stock market returns and time-series mean log income per worker for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

Table 1: Summary Statistics for Equity Returns

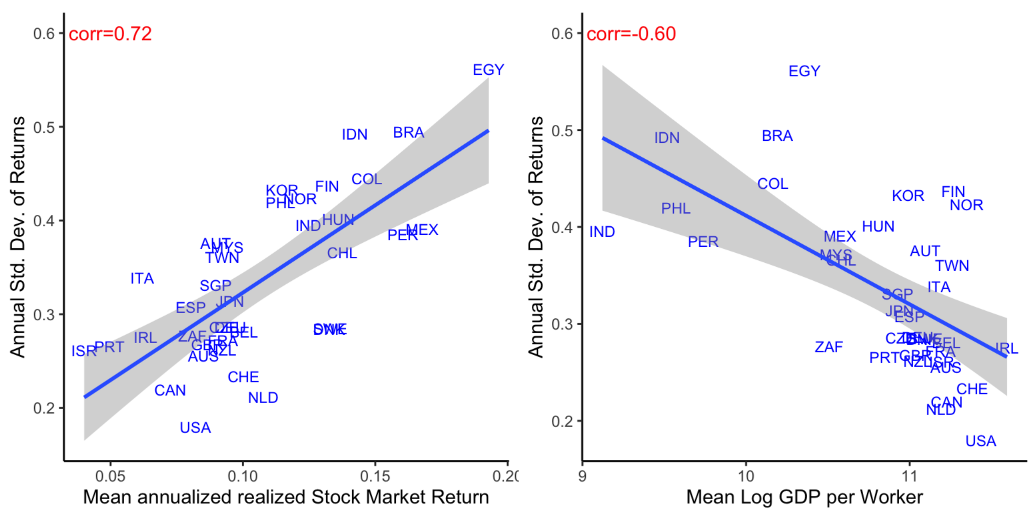
	N	Mean	Median	Std. Dev	Q_{10}	Q_{90}	Constant	y_i	R^2
r_i	37	0.107	0.095	0.034	0.069	0.152	0.446***	-0.031***	0.282
							(0.091)	(0.008)	

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

returns, r_i, against the mean (log) income per worker, y_i, for each country during the entire period for which data are available via MSCI, as well as the correlation between the two variables. Equity returns are systematically higher in poorer countries—doubling a country's income per worker results in a 3.1 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 10.7% on average, but there is a great deal of heterogeneity across countries. Returns are as low as 4% in Israel and as high as 19.3% in Egypt. The U.S. return to equity is approximately 8% over this period.

In Appendix E, we analyze the time series of the country-level returns. Table 21 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 -0.041 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 22, and we obtain very similar results. Moreover, in Figure 9 in Appendix B, we plot the cross-section of mean equity returns against income per worker by decade, beginning in 1970 when only developed country observations are available. It is clear from these figures that returns vary significantly over the entire period of study, but there is no convergence in returns across rich and poor countries over the five decade period. For example, during the most recent decade, returns were significantly higher in richer markets over poorer markets, while during the 2001-2010 period, the opposite was true, and in fact this very decade is marked by some of the highest returns in emerging markets.

Figure 2: Volatility of Stock Market Returns



Notes: The above figure plots the cross-sectional standard deviation of the time-series mean annualized USD-denoted stock market returns in each country against mean annualized realized USD-denoted Stock market returns (left) and time-series mean log income (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

While equities in emerging markets yield higher returns, they are also more volatile. 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 0.72. 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.

Table 2 reports summary statistics for the standard deviation of equity returns across countries. Volatilities differ substantially across countries, with the U.S. being the least and Egypt being the most volatile market.

Table 2: Standard Deviation of Annual Returns

Statistic	N	Mean	Median	St. Dev.	Q_{10}	Q_{90}	corr(., y_i)
St. Dev. of Annual Returns	37	0.336	0.314	0.088	0.247	0.440	-0.60

Notes: Table reports summary statistics of the estimated annual cross-sectional Standard Deviation of USD-denoted equity returns in the data and its correlation with log income. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020.

For completeness, in Table 3, we report summary statistics for the risk premia for each country, r_i^e, which we define to be the mean return to equity over the entire sample period for each country in excess of the mean risk-free rate in the U.S. over the 1970-2020 period, as defined in Section 2.2. The mean risk premium across countries amounts to 9.3%, and the statistic for the U.S. amounts to 7.6% over this period, which aligns with the value of 7.1% reported by Nakamura et al. (2017), but is higher than the historical value of 6.2% reported by Mehra and Prescott (1985). Risk premia are systematically higher in poorer countries—doubling a country's income per worker results in a 2.4 percentage point decline in risk premia. It is precisely these cross-country differences in risk premia that we will quantify via the lens of an asset pricing model.

Table 3: Summary Statistics for Risk Premia

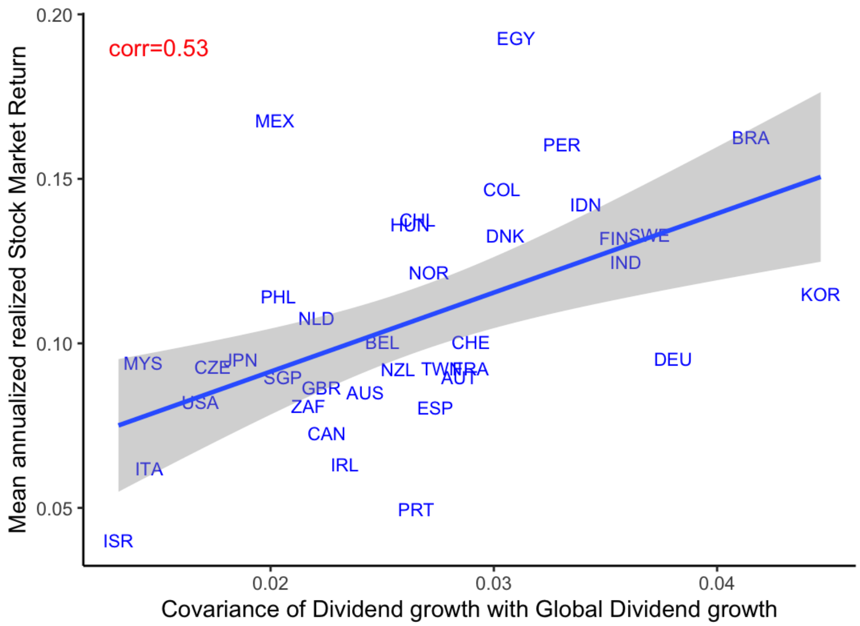
	N	Mean	Median	Std. Dev	Q_{10}	Q_{90}	Constant	y_i	R^2
r_i^e	37	0.093	0.089	0.032	0.057	0.131	0.349***	-0.024***	0.180
							(0.093)	(0.009)	

Notes: Table reports summary statistics of the time-series mean realized risk premia from the data (r^e) for 37 countries, and the results of a linear regression of r^e on log 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 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020. Interest rate on 3-month T-bills for U.S. during 1970-2020 from St. Louis Fred. Standard errors statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.2 Equity Dividend Growth Rates

The question that we want to answer is what drives the systematic relationship between returns and income. Figure 3 offers the first clue. It plots the mean stock market returns for each country for the entire period of study against $cov(\Delta d_i, \Delta d_W)$, which is the covariance of the country's dividend growth rate with the growth rate of the 'world' dividend defined in expression (2) in Section 2.4. 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.

Figure 3: Stock Market Returns and Dividend Comovement



Notes: The figures plots time-series mean annualized USD-denoted stock market returns against the covariance of the country-level annualized dividend growth rates with the world annualized dividend growth rates. The world dividend growth rates is defined as a market-cap weighted average of the dividend growth rates of the U.S.,U.K.,France, Germany and Japan. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

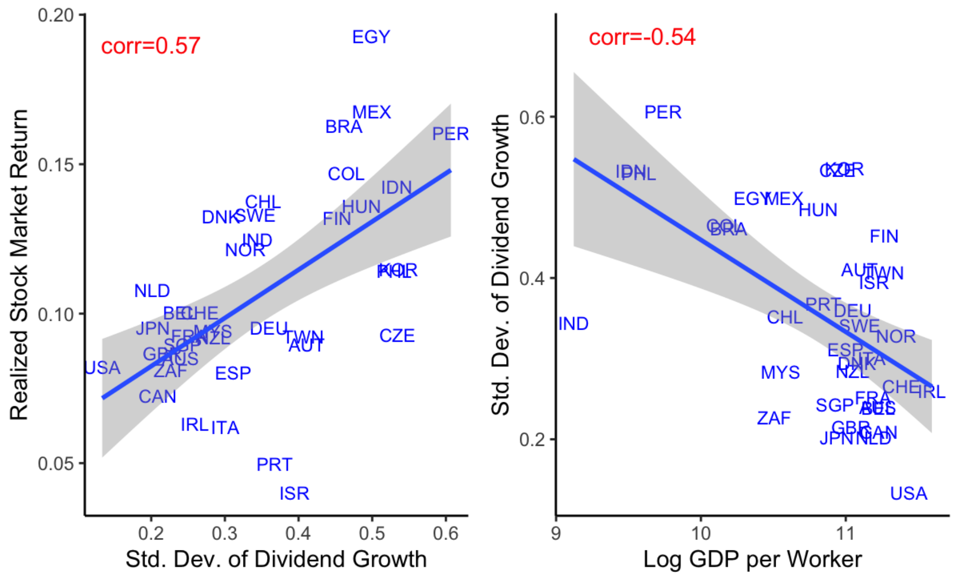
In order to analyze the statistical properties of dividend co-movement, recall that one can recover the covariance for each country from a linear regression of the country's dividend growth rate on the global dividend growth rate,

$$\Delta d_{it} = \beta_i^d \Delta d_{Wt} + \epsilon_{it}. \tag{3}$$

The covariance follows from the coefficient estimate of this regression, which we denote by

$\beta_i^d \equiv \frac{cov(\Delta d_i, \Delta d_W)}{var(\Delta d_W)}$. β_i^d has a natural interpretation: it measures the sensitivity of a country's fundamentals (i.e. dividends) to global fluctuations in dividends. In column (i) of Table 4, we report the coefficient estimates for each country, followed by the corresponding standard errors in column (ii). The average country has a coefficient estimate above unity and the coefficients are precisely estimated for the majority of countries, which suggests that this statistic is highly informative. Specifically, the covariances in dividend growth rates with the world extracted from the estimated β_i^d are strongly related to mean returns to equity as can be seen in Figure 3 above.

Figure 4: Volatility of Dividend Growth



Notes: The figures plots time-series mean annualized USD-denoted stock market return against the annualized time-series standard deviation of dividend growth rates (left) and the time-series standard deviation annualized dividend growth rates against time-series mean log income per worker (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

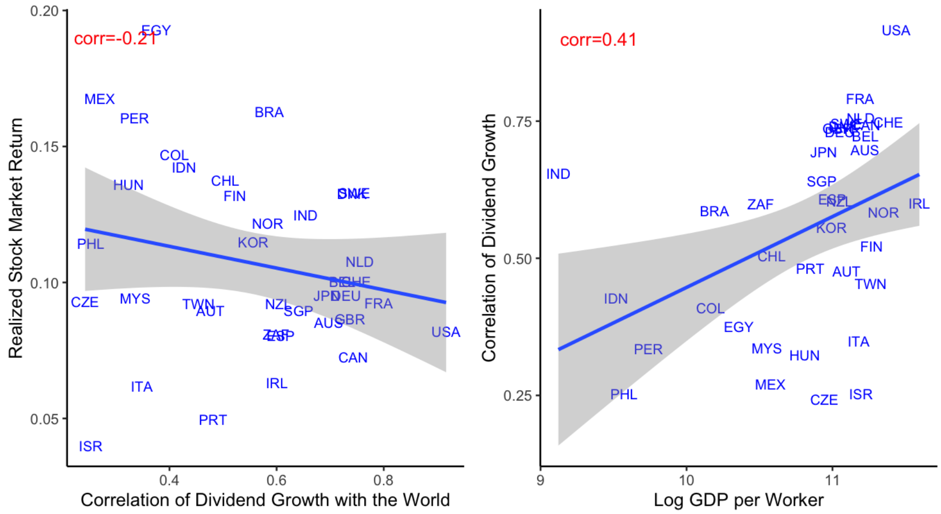
When we take a step further and we decompose the covariance of dividend growth rates into each country's standard deviation of dividend growth and the correlation between the dividend growth and the global growth rate, it becomes apparent that the systematic relationship between returns and covariances is driven by countries' volatility levels. In fact, the left panel of Figure 4 plots the country-level mean stock market returns against the standard deviation of dividend growth rates as well as the cross-country correlation between the two variables, which amounts to 0.57. Countries that enjoy high returns are those that exhibit high underlying fundamental volatility. Moreover, the right panel of the same figure demonstrates that it is the less developed economies that experience more volatile dividend growth rates.

Table 4: Dividend Comovement and Risk Premia, by Country

	(i)	(ii)	(iii)
Country	β_i^d	s.e.(β_i^d)	r_i^e
AUS	1.24***	0.19	0.079
AUT	1.47***	0.41	0.084
BEL	1.28***	0.18	0.094
BRA	1.77***	0.46	0.142
CAN	1.15***	0.16	0.066
CHE	1.48***	0.2	0.094
CHL	1.19***	0.37	0.117
COL	1.19**	0.53	0.124
CZE	0.97	0.82	0.069
DEU	1.94***	0.27	0.089
DNK	1.56***	0.21	0.126
EGY	1.13*	0.61	0.169
ESP	1.4***	0.28	0.074
FIN	1.58***	0.47	0.112
FRA	1.48***	0.17	0.086
GBR	1.14***	0.16	0.080
HUN	0.94	0.59	0.112
IDN	1.52**	0.59	0.122
IND	1.41***	0.33	0.101
IRL	1.04***	0.25	0.043
ISR	0.76	0.59	0.017
ITA	0.74**	0.3	0.056
JPN	0.95***	0.15	0.089
KOR	1.99***	0.54	0.094
MEX	0.9	0.59	0.147
MYS	0.64*	0.33	0.074
NLD	1.13***	0.15	0.102
NOR	1.39***	0.29	0.116
NZL	1.15***	0.28	0.072
PER	1.25*	0.72	0.137
PHL	0.89	0.63	0.094
PRT	1.18***	0.39	0.029
SGP	1.05***	0.19	0.084
SWE	1.89***	0.25	0.127
TWN	1.23***	0.44	0.072
USA	0.86***	0.06	0.076
ZAF	0.85***	0.23	0.058
mean	1.24		9.26
std. dev.	0.34		3.24

Notes: Table reports country-level estimated beta resulting from a regression of country-level time-series mean annualized USD-denoted stock market returns on the time-series mean annualized USD-denoted world stock market returns, where the world stock market returns is defined as the market-cap weighted average of all countries' stock market returns, the expected risk premia from the data (r_i^e) and their summary statistics. std. dev. denotes the cross-sectional standard deviation. β_i^d and its associated standard error are estimated coefficients from a regression of Δd_{t+1} on Δd_{Wt+1}. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2020.

Figure 5: Dividend Growth Correlation



Notes: The figure plots time-series mean annualized USD-denoted stock market return against the correlation of the time-series country-level annualized dividend growth rates with the world annualized dividend growth rates (left). The world dividend growth rates is defined as a market-cap weighted average of the dividend growth rates of the U.S.,U.K.,France, Germany and Japan. Additionally, this figure plots the correlation of the country-level annualized dividend growth rates with the world annualized dividend growth rates against time-series mean log income per worker (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

In contrast, countries whose dividend growth rates are more correlated with the world do not exhibit systematically different returns as is apparent in the left panel of Figure 5, where the correlation is only -0.2. Not surprisingly, it is the poorer countries that are less correlated with the world, which can be seen in the right panel of the same figure.

Table 5: Summary Statistics for Equity Dividends

Variable	N	Mean	Median	Std. Dev	Q_{10}	Q_{90}	corr$(., r_i)$	corr$(., y_i)$
cov$(\Delta d_i, \Delta d_W)$	37	0.027	0.027	0.008	0.017	0.036	0.530	-0.266
s.d.(Δd_i)	37	0.353	0.341	0.121	0.213	0.531	0.572	-0.545
corr$(\Delta d_i, \Delta d_W)$	37	0.553	0.586	0.181	0.302	0.747	-0.212	0.414

Notes: Table reports the summary statistics of moments of countries time-series country-level annualized dividend growth rates. The table displays the covariance of the time-series country-level annualized dividend growth rates with the world annualized dividend growth rates, the time-series standard deviation of country-level annualized dividend growth rates and the correlation of the time-series country-level annualized dividend growth rates with the world annualized dividend growth rates.The world dividend growth rates is defined as a market-cap weighted average of the dividend growth rates of the U.S.,U.K.,France, Germany and Japan. Data is truncated at the 1st and 99th percentile. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2020.

In Table 5, we include summary statistics for the covariance of countries' dividend growth rates with the global dividend growth rate, $cov(\Delta d_i, \Delta d_W)$, the corresponding correlation, $corr(\Delta d_i, \Delta d_W)$, and the standard deviation of each country's dividend growth rate, $s.d.(\Delta d_i)$. For reference, in the last two columns of the table we report how each of these variables correlates with mean returns across countries as well as with mean income levels. Standard deviations range from as low as 0.13 for the U.S. to a three-fold value of 0.61 for an emerging market like Peru, and they are generally decreasing in countries' level of development. Meanwhile, 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 a β_i^d that is not precisely estimated.

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. 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.

4 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.

4.1 The Model

We follow the international long-run risk literature and we consider an international endowment economy.[8] We view each market as a small open economy and we focus on asset valuations from the perspective of a U.S. investor. 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.

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

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

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

where ψ denotes the intertemporal elasticity of substitution, γ is risk aversion, β is the rate of time discount, and $\nu_t (V_{t+1})$ 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:

$$\begin{aligned} 1 &= \mathbb{E}_t \left[M_{USt+1} R_{ft+1} \right] \\ 1 &= \mathbb{E}_t \left[M_{USt+1} R_{USt+1} \right] \\ 1 &= \mathbb{E}_t \left[M_{USt+1} \frac{q_{it+1}}{q_{it}} R_{it+1} \right] \ \forall \ i \neq US, \end{aligned} \tag{4}$$

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

$$m_{USt+1} = \theta \log \beta - \frac{\theta}{\psi} \Delta c_{USt+1} + (\theta - 1) r_{USt+1}^c, \tag{5}$$

where $\theta = \frac{1-\gamma}{1-\frac{1}{\psi}}$, and r_{USt+1}^c 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:

$$\begin{aligned} \Delta c_{it+1} &= \mu_i + \phi_i x_t + x_{it} + \pi_i \eta_{t+1} + \eta_{it+1} \\ x_{t+1} &= \rho x_t + e_{t+1} \\ x_{it+1} &= \rho_i x_{it} + e_{it+1} \\ \Delta d_{it+1} &= \mu_i^d + \phi_i^d x_t + \tilde{\phi}_i^d x_{it} + \pi_i^d \eta_{t+1} + \tilde{\pi}_i^d \eta_{it+1} + \eta_{it+1}^d \end{aligned} \tag{6}$$

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_{it+1}^d with variance $\sigma_{\eta_i^d}^2$. We assume that all shocks are independent and normally distributed, with respective variances as defined above. We do not assume any particular pattern regarding the exposure parameters to shocks, and we recover the parameter values from macro and financial data in our quantitative exercise.

Risk Premia. In order to emphasize the importance of countries' heterogeneous exposures to global persistent shocks in driving equity return differences, we begin by solving the model in the absence of exchange rate risk. Effectively, we assume no exchange rate volatility across countries (driven by the shocks in our model), which is a commonly-employed benchmark by the macroeconomics literature that is consistent with the assumption of a single traded good, where the real exchange rate is unity. In Section 4.4, we relax this assumption and we demonstrate that our main quantitative results are robust in an environment where real exchange rate risk is explicitly priced.

Furthermore, we assume that the return to any asset (including the asset that pays aggregate U.S. consumption as a dividend) that the U.S. investor requires reflects global shocks only. Since we use U.S. consumption growth data in our quantitative exercise, we recognize that idiosyncratic shocks may be present. 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. In Section 4.3.2, we quantify the contribution of global and idiosyncratic shocks to countries' dividend growth rates and we discuss the roles that these shocks play in driving equity returns and their volatilities.

To derive risk premia, we solve the model using a log-linear approximation around the balanced growth path as described in detail in Appendix C. Under the assumption of log-normality, the log-linear approximations to the Euler equations in expression (4) yield the following risk premia (or excess returns, $\mathbb{E}[\hat{r}_i^e]$) for a risky asset from country i:

$$\mathbb{E}\left[\widehat{r_i^e}\right] \equiv \log \mathbb{E}\left[R_i\right] - \log \mathbb{E}\left[R_f\right] + \mathbb{E}\left[\Delta q_i\right]$$
$$= -\operatorname{cov}\left(m_{US}, r_i\right) - \frac{1}{2}\operatorname{var}\left(r_i\right), \tag{7}$$

where r_i is the logged real return to the risky asset from country i and $\mathbb{E}[\Delta q_i] = 0$ by assumption. Under the assumption that returns reflect only global shocks and following the methodology outlined in Appendix C, the risk premia can be written as:

$$\mathbb{E}\left[\widehat{r_i^e}\right] = \gamma \pi_{US} \pi_i^d \sigma_\eta^2 + (1-\theta)\kappa^2 \left(\frac{\phi_{US} - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)\sigma_e^2$$
$$-\frac{1}{2}\left[\kappa^2 \left(\frac{\phi_i^d - \frac{\phi_{US}}{\psi}}{1-\kappa\rho}\right)^2 \sigma_e^2 + \left(\pi_i^d\right)^2 \sigma_\eta^2\right], \tag{8}$$

where κ is a constant defined in Appendix C 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 (first line of expression (8)), and the variance of returns (second line), 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.

4.2 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 (6). 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.

Before delving into the details, from expression (8), note that risk premia only reflect parameters that govern the global shocks and countries' exposures to these shocks. Additionally, observe that country-specific exposures of consumption growth to global shocks (ϕ_i and π_i)

for foreign countries (vis-a-vis the U.S.) do not drive risk premia since the U.S. investor is pricing the assets in our model. Therefore, we proceed in two steps. First, we describe the moments that identify parameters related to global and U.S. processes, and then we focus on the country-specific dividend growth processes. Crucially, we only use time-series moments on dividend growth, rather than data on returns or price-dividend ratios, to identify country-level parameters that capture the heterogeneous exposures to global shocks and ultimately drive risk premia differentials.

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 useful to specify global processes for consumption and dividend growth for exposition purposes. A natural process global for consumption, measured by expression (1) in the data, is given by:

$$\Delta c_{Wt+1} = \mu_W + x_t + \eta_{t+1}, \tag{9}$$

where x_t is the global persistent component defined in expression (6) and idiosyncratic components have been averaged out.[9] This consumption growth process closely mimics the consumption growth process for the U.S. in Bansal and Yaron (2004). We will rely on second moments from the global consumption process in our identification strategy, so we need not specify a value for the mean growth rate, μ_W.

To identify the global persistent component, x_t, 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 (20) in Appendix C). 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. As we describe in Section 2.4 above, we define the world to consist

[9] One can view this process as a special case of the following process: $\Delta c_{Wt+1} = \mu_W + \phi_W x_t + \pi_W \eta_{t+1}$, where the exposure parameters ϕ_W and π_W are normalized to unity.

of five major economies, each denoted by k below: U.S., U.K., France, Germany and Japan, due to reliable data coverage during the 1940-2020 period. Tables 17 and 18 in Appendix B report summary statistics for consumption growth and price-dividend ratios for each of the five countries.

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

$$\Delta c_{it+1} = \alpha \cdot pd_{it} + \epsilon_{it+1} \qquad \forall t, i, \tag{10}$$

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

$$x_{t+1} \equiv \frac{1}{5} \sum_k \Delta \hat{c}_{kt+1} = \frac{1}{5} \sum_k \hat{\alpha} \cdot pd_{kt}, \tag{11}$$

where $\Delta \hat{c}_{kt+1}$ is a fitted value for country k of the pooled linear regression in expression (10).

Table 6: 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. Standard errors are not adjusted. Newey-West adjusted standard errors yield the same significance. *p<0.1;**p<0.05;***p<0.01.

We report the estimate of α in the left panel of Table 6. 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.[10] Having obtained a series for the global persistent component, x_t, we estimate ρ from an AR(1) regression corresponding to the second line in expression (6), and we report the results in the right panel of Table 6. 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.

We recover the variance of the persistent global shock, σ_e^2, from an autoregression of the global consumption growth process. Specifically, taking the time-series variance of Δc_W in expression (9) yields $\sigma_e^2 = \frac{(1-\rho^2)\beta_W^c \text{var}(\Delta c_W)}{\rho}$, where $\beta_W^C \equiv \frac{\text{cov}(\Delta c_{Wt+1}, \Delta c_{Wt})}{\text{var}(\Delta c_W)}$ is the coefficient estimate of the following regression:

$$\Delta c_{Wt+1} = \beta_W^C \Delta c_{Wt} + \epsilon_{t+1}, \tag{12}$$

and it is reported in the right panel of Table 7, 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 transitory shock follows from the global consumption growth series, after accounting for the persistent component, $\sigma_\eta^2 = \text{var}(\Delta c_W) - \sigma_x^2$. This approach to recovering the persistent and transitory innovations to global consumption growth is in the spirit of Bansal and Yaron (2004), who aim to account for observed variations in consumption growth (in the U.S.) over a long horizon. In Appendix D, we re-estimate the global consumption growth parameters using different countries and we document similar findings.

Table 7: Summary Statistics for World (5 countries) Consumption Growth

	N	Mean	Median	Std. Dev	Q_{10}	Q_{90}	Constant	Δc_{Wt}	R^2
Δc_{Wt+1}	81	0.022	0.022	0.034	0.000	0.049	0.013**	0.459***	0.217
								(0.004)	(0.100)

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

[10] Colacito and Croce (2011) identify the persistent process from a projection of consumption growth on the price-dividend ratio and the risk-free rate of a country. For our sample of countries and period of study, the coefficient estimates of the risk-free rate are not statistically different from zero, so we exclude risk-free rates from the analysis as they do not seem to contain additional information.

Idiosyncratic consumption growth parameters for the U.S. To identify the parameters that govern the U.S. consumption growth process in the first line of expression (6), we use the series described in Section 2.4 for the 1940-2020 period. Under the assumption that innovations are independent, 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 global persistent process, x_t,

$$\Delta c_{USt+1} = \phi_{US} x_t + \epsilon_{t+1}. \tag{13}$$

Given the specifications for U.S. and global consumption growth in expressions (6) and (9), the exposure parameter to the global temporary shock follows from a regression of U.S. consumption growth on the residual component of global consumption growth,

$$\Delta c_{USt+1} = \pi_{US}(\Delta c_{Wt+1} - x_t) + \epsilon_{t+1}. \tag{14}$$

The results from these regressions are displayed in Table 8. The mean U.S. consumption growth rate is 2.1% as reported in Table 17 in Appendix B 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.

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 specify a global dividend growth process (measured by expression (2) in the data) as follows:

$$\Delta d_{Wt+1} = \mu_W^d + \phi_W^d x_t + \pi_W^d \eta_{t+1} + \eta_{Wt+1}^d, \tag{15}$$

where $\eta_W^d \sim N(0, \sigma^2_{\eta_W^d})$ is independent of all country-specific and global shocks defined above. The global dividend growth process features the same transitory and persistent global shocks that govern the global consumption growth process, but with different leverage parameters. As was the case for each individual country, the global 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 2.4, 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 during the 1975-2020 period. Due to the relatively short time coverage on dividend growth data, compared to consumption growth data, we are not able to identify π_W^d and, espe-

Table 8: US consumption growth

	Dependent variable:	
	Δc_{USt+1}	
	(1)	(2)
x_t	2.133*	
	(1.195)	
$\Delta c_{Wt+1} - x_t$		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 $\Delta c_{Wt+1} - x_t$ 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

cially, ϕ^d_W from linear regressions as in the case for consumption.[11] In order to relate our results to the existing literature, we set the leverage parameter to the global persistent process, ϕ^d_W, to 3, which is the value that Nakamura et al. (2017) use for 12 developed economies. We set π^d_W to 4.9, which implies that the transitory and persistent global shocks that the U.S. agent prices in our model account for 89% of the observed variation in global dividend growth in MSCI data, with the residual shock, η^d_W, accounting for only 11% of variation. Furthermore, as we show in column (i) of Table 10 below, our choice of a value of 4.9 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.[12]

We summarize the values for the parameters that govern preferences, global processes and

[11] In principle, we could use the historical series on price-dividend ratios and returns from the MacroHistory database for the five countries that define our 'world' to derive global dividend growth historically, but we do not have stock market capitalization data before 1975 to weigh the countries accordingly. While consumption series across countries are relatively smooth, the same is not true for financial series, so country weights affect the results, and the unweighted mean is quite different from the 'world' equity portfolio as defined by MSCI.

[12] In Figure 10 in Appendix D, 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.

the U.S. consumption growth process in Table 9, alongside the moments. 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 high, which reflects the fact that dividend growth is several orders of magnitude more volatile than consumption growth.

Table 9: Moments and Parameters for Preferences, Global Processes, and U.S. Consumption

Parameter	Value	Moment
γ	4	Literature (Colacito and Croce, 2011)
ψ	1.5	Literature (Colacito and Croce, 2011)
β	0.99	Literature (Colacito and Croce, 2011)
ρ	0.758	AR1 reg. coeff. est. in eq. (6) for x_t estimated in eq. (10), 5 countries
σ_e	0.017	Autoreg. coeff. est. in eq. (12) for Δc_W defined in eq. (1), 5 countries
σ_η	0.021	Variance of Δc_W (net of x_t) defined in eq. (1), 5 countries
μ_{US}	0.021	Mean of Δc_{US}, USA
ϕ_{US}	2.133	Reg. coeff. est. in eq. (13) for Δc_{US}, USA
π_{US}	0.425	Reg. coeff. est. in eq. (14) for Δc_{US}, USA
ϕ^d_W	3.000	Literature (Bansal and Yaron, 2004; Nakamura et al., 2017)
π^d_W	4.900	$\phi^d_W \sigma^2_x + \pi^d_W \sigma^2_\eta = 89\%$ of var(Δd_W) defined in eq. (2), 5 countries
$\sigma_{\eta^d_W}$	0.047	11% of var(Δd_W) defined in eq. (2), 5 countries

Notes: Table reports the parameter values and moments used in calibration.

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 (6) for all countries. To recover π^d_i, we follow a similar procedure as we did for U.S. consumption above, and we run the following regression for each country's dividend growth:

$$\Delta d_{it+1} = \pi^d_i (\Delta d_{Wt+1} - \phi^d_W x_t)/\pi^d_W + \epsilon_{it+1}, \tag{16}$$

which identifies the parameter of interest under the independence assumption among all idiosyncratic and global shocks. The resulting regression coefficient estimates for each country are reported in column (ii) of Table 10. For the majority of countries, the parameters are precisely estimated; the mean centers at 5.97 and the parameter value for the U.S. is 4.21.[13] These parameters do not display any systematic pattern across rich and poor countries.

Finally, given all other parameters, to recover the key dividend exposure parameters to the persistent global process, ϕ^d_i, we rely on the covariance of a country's dividend growth rate

[13]Standard errors omitted due to space constraints and available upon request.

with the world, which is given by $\text{cov}(\Delta d_{it+1}, \Delta d_{Wt+1}) = \phi_i^d \phi_W^d \sigma_x^2 + \pi_i^d \pi_W^d \sigma_\eta^2$. We recover the covariance from the coefficient estimates of country-level regressions of dividend growth rates on the global dividend growth, β_i^d, as reported in Table 4 in Section 3.2. Recall that this moment is very informative about stock market returns in the data (see Figure 3 in Section 3.2), and it is the most important moment in the identification procedure as it directly dictates the risk premia differentials that we document below. Crucially, notice that we identify all country-specific parameters using dividend growth data only—we do not rely on cross-country equity prices in our identification procedure.

We report the resulting parameter values for ϕ_i^d for each country in column (i) of Table 10, along with the correlation of this variable with income per worker. The mean value for the leverage parameter across countries amounts to 6.21 and the value for the U.S. is 3.5.[14] As is evident from Table 10, emerging markets display higher exposures to the persistent global process than developed ones–the correlation between income per worker and ϕ_i^d is -0.45–and are characterized by higher model-implied excess returns, as we demonstrate below. Given the importance of these parameters in the quantitative analysis, in Appendix D, we discuss the robustness of the estimates under different specifications of the global dividend growth process.

4.3 Results

4.3.1 Equity Risk Premia

We begin by evaluating the ability of the model to reconcile observed risk premia in the data, under the assumption that real exchange rates equal to unity–i.e. in the absence of real exchange rate risk. We compute risk premia for each country by plugging the parameter values reported in Tables 9 and 10 into expression (8).

In Table 11, we report the summary statistics of risk premia that we compute from our model. The mean risk premium in the model is 9.8%, which is nearly identical to the mean reported in MSCI data of 9.3% in Table 3 above. 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 column (iii) of Table 10, we report excess returns implied by the model for all 37 countries (data counterparts are in column (iii) of Table 4). The model-predicted excess return ranges from 3.32% in Israel to a high of 12.39% in Egypt, and the U.S. value amounts to 6.23%. More interestingly, the model is able to reconcile the cross section

[14]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 4.9 for π_W^d.

Table 10: Dividend Growth Exposure Parameters and Resulting Risk Premia, by Country

	(i)	(ii)	(iii)
Country	ϕ_i^d	π_i^d	$\widehat{r_i^e}$
AUS	5.06	6.02	9.30
AUT	5.99	7.02	10.47
BEL	5.24	6.20	9.55
BRA	10.59	8.51	10.61
CAN	4.72	5.58	8.75
CHE	6.06	7.19	10.52
CHL	6.45	5.76	11.27
COL	8.22	5.78	12.34
CZE	3.49	4.46	6.18
DEU	7.99	9.40	11.31
DNK	6.44	7.51	10.87
EGY	8.85	5.47	12.39
ESP	5.80	6.72	10.30
FIN	8.71	7.54	11.95
FRA	6.10	7.14	10.57
GBR	4.61	5.57	8.54
HUN	7.61	4.52	12.35
IDN	8.29	7.39	11.98
IND	9.70	6.86	11.79
IRL	5.69	5.03	10.46
ISR	2.43	3.58	3.32
ITA	3.07	3.59	5.18
JPN	3.89	4.64	7.14
KOR	10.95	9.56	9.85
MEX	4.94	4.33	9.35
MYS	3.50	3.07	6.34
NLD	4.61	5.47	8.56
NOR	5.65	6.74	10.08
NZL	6.23	5.58	11.07
PER	9.22	6.04	12.19
PHL	5.09	4.27	9.61
PRT	6.44	5.74	11.27
SGP	4.27	5.13	7.91
SWE	7.81	9.10	11.35
TWN	6.76	5.95	11.54
USA	3.49	4.21	6.23
ZAF	5.89	4.11	10.86
mean	6.21	5.97	9.82
std. dev	2.12	1.62	2.20
corr($\cdot$,y_i)	-0.45	0.01	-0.34

Notes: Table reports the country-level parameters ϕ_i^d, π_i^d and the estimated risk premia $\widehat{r_i^e}$. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2020.

Table 11: Summary Statistics for Risk Premia (Model)

	N	Mean	Median	Std. Dev	Q_{10}	Q_{90}	Constant	y_i	R^2
$\widehat{r_i^e}$	37	0.098	0.105	0.022	0.063	0.121	0.238***	-0.013**	0.115
							(0.065)	(0.006)	

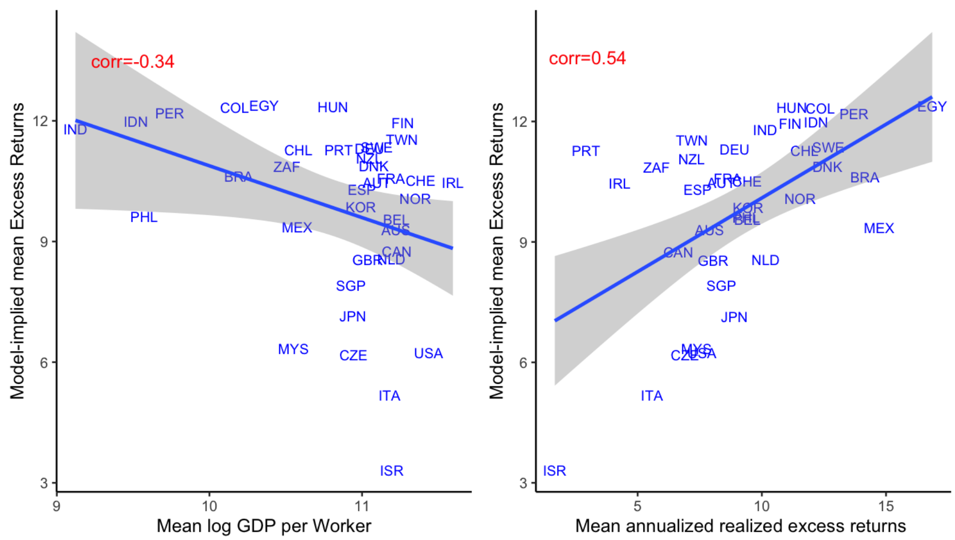
Notes: Table reports summary statistics of the predicted risk premia from the parameterized model ($\widehat{r^e}$) for 37 countries, and the results of a linear regression $\widehat{r^e}$ on the time-series mean log income per worker, y_i. Annual country-level equity return observations are truncated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

of risk premia in the data. The right panel of Figure 6 plots model-implied against realized excess returns at the country level and the accompanying correlation between the two series, which amounts to 0.54. The left panel of Figure 6 plots mean model-implied excess returns against mean logged income per worker as well as the correlation between the two variables, which amounts to -0.34. Thus, risk premia implied by the model are 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 as in Table 10. The first row of Table 23 in Appendix E shows the summary statistics from this exercise. Mean risk premia, denoted by $\hat{r}_r^e$ (for robustness), increase to 10%, and the correlation between the model-implied and realized excess returns is effectively unchanged. Similarly, the correlation between the benchmark model-implied excess returns and the counterfactual one is effectively 1, which suggests that risk premia in the model did not change in the cross-section, only slightly in levels. This finding demonstrates that the values of ϕ_i^d generate the majority of risk premia differentials across 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 23 in Appendix E shows the summary statistics from this exercise. While risk premia levels, denoted by $\hat{r}_r^e$, decrease only slightly to 9.3% on average, there is a notable change in the cross-sectional variation. The correlation between the model-implied and realized excess returns drops to a mere 0.2, while the correlation between the baseline and the counterfactual risk premia is only 0.58. This finding implies that

Figure 6: Model-Implied Excess Returns



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 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020. Interest rate on 3-month T-bills for U.S. during 1970-2020 from St. Louis Fred.

it is important to separately identify persistent from transitory shocks when estimating the global dividend process, even though the latter do not play an important role in governing the levels of risk premia.

4.3.2 Volatility of Returns to Equity

We proceed to evaluate whether the model can account for the cross-sectional volatility of equity returns reported in Section 3.1. 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 12 reports the average standard deviation of dividend growth among the 37 markets in our dataset, as well as the percent of variance that is explained by the long-run and short-run global components. The long-run global component accounts for nearly double the variation than does the short-run global component—22% versus 13%. Not surprisingly, the largest part of the variation is explained by the residual idiosyncratic component.

What are the implications for the volatility of equity returns? Table 13 reports summary statistics of the volatility of equity returns implied by the model. The model generates a

Table 12: Standard Deviation of Dividends: Data vs. Model

	s.d.(Δd_{Data})	$\frac{var(\Delta d_{long-Run})}{var(\Delta d_{Data})}$	$\frac{var(\Delta d_{short-Run})}{var(\Delta d_{Data})}$
All Markets	0.353	0.217	0.126

Notes: Table reports summary statistics of the Standard Deviation of Dividends in the data 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 1970-2020.

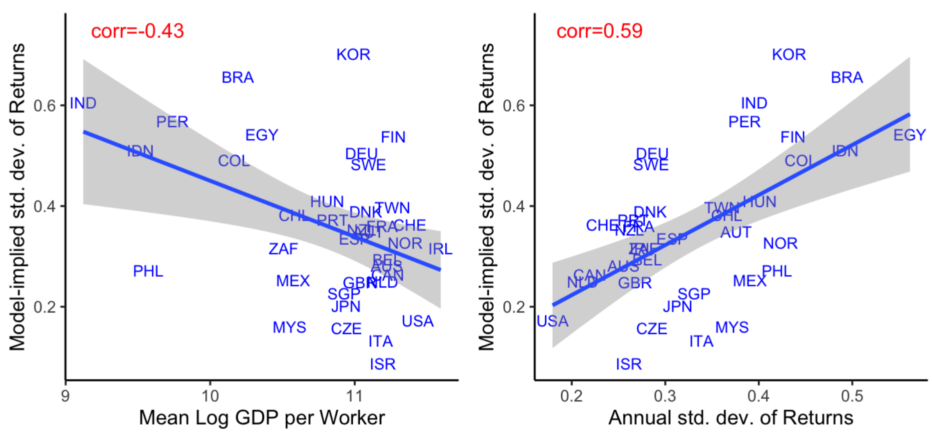
Table 13: Standard Deviation of Equity Returns

Statistic	N	Mean	Median	St. Dev.	Q_{10}	Q_{90}	corr(., y_i)
Predicted St. Dev. of Returns	37	0.365	0.357	0.150	0.174	0.552	-0.43

Notes: Table reports estimated the predicted standard deviation of Returns in the model and the correlation with time-series mean log income. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020.

standard deviation of returns to equity of 0.365 for the average country, which is nearly identical to (and somewhat exceeds) the mean of 0.336 reported in MSCI data in Table 2 in Section 3.1.

Figure 7: Model-Implied Standard Deviation of Equity Returns



Notes: The above figure plots the predicted standard deviation of risk premia against the time-series standard deviation of risk premia from the data (left) and time-seires mean log income (right) for 37 countries. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

To evaluate the cross-sectional predictions of the model, in the left panel of Figure 7, we plot the model-implied 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 7, we plot the model-implied 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—0.59. With these statistics at hand, we conclude that our parsimonious model, which excludes currency risk and relies on a single moment on dividend growth comovement with the world, can reconcile at least 50% of the variation in levels and volatilities of stock market returns across rich and poor countries.

A few observations are in order. Recall that, when we derive risk premia in the model, we assume that the U.S. agent does not price idiosyncratic shocks for country i $(e_{it}, \eta_{it}, \eta^d_{it})$. If we were to relax this assumption, our model-implied measure of risk premia, which excludes real exchange rate risk, would only change to the extent that the term $\text{var}(r_i)$ would change in expression (7). This follows directly from the fact that the U.S. SDF does not reflect any i-specific idiosyncratic shocks.[15] This does not mean that the U.S. agent does not price events that affect the dividend that she receives from country i; indeed, shocks to those dividends are at the very heart of the risk premium that the agent demands to hold that asset. It is simply that the agent prices the portion of the variations in dividends that covary with her SDF, and that portion is heterogeneous across assets and captured by parameters ϕ^d_i and π^d_i.

The assumption of pricing global shocks only simplifies the quantitative analysis significantly, as we do not need to estimate parameters that relate to idiosyncratic persistent and transitory shocks for each country $(\rho_i, \sigma_{ei}, \sigma_{\eta i}, \sigma_{\eta^d_i})$. Notice that, even if we were to estimate these parameters, the ultimate result would be an increase in the model-implied variance of returns and a decrease in the mean returns in each country. Under the current calibration, the model predicts a variability in returns that is at par with the data–and in fact slightly higher. Hence, a model that features idisycnhratic shocks would further raise this variance and worsen the model's fit to the data on average. This means that, given the moments that we choose in our estimation, the model suggests that idiosyncratic shocks are not critical to account for observed risk premia and the variability of returns in the average country. However, if we consider the cross-section in the right panel of Figure 7, a number of countries lie below the 45-degree line, which implies that the volatility of returns in those economies is below what the model predicts. Hence, it is possible that idiosyncratic shocks may account for the residual volatility in those markets, but the outcome would be a fall in mean model-implied risk premia for the same markets. Thus, it would be more fruitful to consider other sources of risk (or frictions) to improve the fit of the model.

[15] It is worth to note that the risk premium for U.S. equities would change by an extra term because the U.S. agent would be pricing U.S. idiosyncratic shocks, e_{it} and η_{it}.

4.4 Real Exchange Rate Risk

In the model, we assume that the U.S. agent is pricing all assets—domestic and foreign. Therefore, she faces real exchange rate risk from dividend income incurred from abroad. If the volatility of real exchange rate growth, Δq_i, is non-zero, the U.S. agent would be pricing it, which would result in the following risk-premium expression for equity from country i:

$$\mathbb{E}\left[\widehat{r_i^{e,rer}}\right] = -\operatorname{cov}\left(m_{US}, r_i\right) - \frac{1}{2}\operatorname{var}\left(r_i\right) - \operatorname{cov}\left(m_{US}, \Delta q_i\right) - \frac{1}{2}\operatorname{var}\left(\Delta q_i\right) - \operatorname{cov}\left(r_i, \Delta q_i\right). \quad (17)$$

Relative to the risk premium equation (7) that we quantify, currency risk adds the last three terms in equation (17). The last term, which is referred to as the "cross term" is roughly 0 in the data (see Chernov et al. (2024)). Furthermore, $\frac{1}{2}\text{var}(\Delta q_i)$ is a small number (less than 0.1% for a typical country—see Table 2 in Colacito and Croce (2011) for U.S.-U.K. for example). Hence, if currency risk premia were to be incorporated in the model, model-implied risk premia would change by the amount corresponding to the third term, $\text{cov}(m_{US}, \Delta q_i)$.

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 a frictionless environment, the growth rate of the real exchange rate is:

$$\Delta q_{it+1} = m_{it+1} - m_{USt+1}, \quad (18)$$

which obtains directly from the Euler equations for domestic and foreign agents who price a given asset using their respective SDF. If agents' SDFs reflect consumption growth, as in our model, then the third covariance term in expression (17) would be non-zero (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, Verdelhan (2010) for a model that builds on consumption habits or the seminar work by Lustig and Verdelhan (2007) that emphasizes the role of U.S. consumption growth).[16] Any market friction would decouple variability in real and financial variables (see ex. Itskhoki and Mukhin (2021), Itskhoki (2021) and Lustig and Verdelhan (2019) among others for discussion on the "exchange rate disconnect puzzle"). Furthermore, exchange rate regimes, which are notably different between emerging and developed markets (as documented by Ilzetzki et al. (2019)), could introduce further sources of exchange rate risk premia for a U.S. agent. Finally, a segment of the finance literature aims to explain the behavior of currency risk premia using reduced-form SDFs that are entirely orthogonal to macroeconomic variables (ex. Verdelhan (2018) and related work).

[16] Recently, Hassan et al. (2024) re-examine long-run risk and habit models and their implications for the cross-section of currency risk premia.

Given the vast literature, it is outside of the scope of this paper to incorporate the various mechanisms of exchange rate determination. Instead, we conduct a robustness exercise to quantify how large the contribution of exchange rate risk could be within the context of our model. Observe that, if the real exchange rate is not unity, we would need to denominate dividend growth rates in our quantitative exercise in each country's local currency. This follows directly from the third line in the Euler equation for foreign equity in expression (4), where R_{it+1} is denominated in local currency by definition and it reflects local-currency denominated dividends, which becomes more apparent from the approximation methods detailed in Appendix C. Therefore, to evaluate the role of currency risk, we re-calibrate the model's parameters related to dividend growth using dividend series denominated in local currency, as described in Section 2.3. Recall that, MSCI data coverage is identical in local currency and USD, which implies that our robustness exercise focuses on the exact same time period for each country as our benchmark calibration above.

Table 14: Parameters and Resulting Risk Premia, in local currency

	(i)	(ii)	(iii)
	$\phi_i^{d,lc}$	$\pi_i^{d,lc}$	$\widehat{r^{e,lc}}$
mean	4.88	5.23	8.20
std. dev	1.89	1.57	2.62
corr(.,ϕ_i^d)	0.80	-	-
corr(.,π_i^d)	-	0.72	-
corr(.,r^e)	-	-	0.56
corr(.,$\widehat{r^e}$)	-	-	0.70
corr(.,y_i)	-0.35	0.01	-0.32

Notes: Table reports parameters, the estimated risk premia $\widehat{r^{e,lc}}$ in local currency, and their correlation with income, parameters from the benchmark calibration and risk premia. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2020.

Specifically, we keep the values of all global and U.S. parameters as outlined in Table 9, and we re-estimate all the country-specific parameters related to dividend growth, ϕ_i^d and π_i^d, using dividend growth series denominated in local currency. We report summary statistics for the estimated country-level parameters and the model-implied risk premia in Table 14.[17] Notice that the mean value for the key parameter ϕ_i^d across countries drops to 4.88, compared to 6.21 as reported in Table 10. The implication for model-implied risk premia is a fall in the mean to 8.2% from the benchmark prediction of 9.8%. Hence, risk premia fall on average

[17]Country-level results are available upon request and are omitted due to space constraints.

by roughly 1 percentage point. More importantly, risk premia do not change considerably in the cross section of countries. In particular, the correlation between model-implied and actual risk premia is nearly unchanged–0.56–which is due to the high correlation between model-predicted risk premia under the two specifications. Indeed, notice that the correlation between the resulting parameter values for ϕ_i^d between the two specifications is remarkably high—0.8.

The findings from the robustness exercise suggest that exchange rate risk premia do not have a first-order effect on equity risk premia in this model, when the key model parameters are recovered from countries' dividend growth comovement with the world. In other words, this moment is robust to the currency of denomination. This finding is not surprising in light of the fact that this moment is predominantly driven by the volatility of dividend growth rates, which is very similar whether denominated in local or foreign currency for a typical country. Similarly, Chernov et al. (2024) document that the volaitlity of equity returns is near identical when denominated in local currency and in USD for most countries.

4.5 Additional Robustness of Quantitative Results

In Appendix D, we report the results from several robustness exercises that relate to our definition of a 'global' variable. First, we re-estimate the key autoregressive parameter of the global persistent process, ρ, using historical data from the MacroHistory Database for six additional economies: Australia, Switzerland, Spain, Italy, Netherlands and Sweden. The resulting parameter estimate amounts to 0.81, which compares favorably to our benchmark estimate of 0.758 and to estimates reported by the existing literature. Second, we re-estimate the key country-specific exposures of dividend growth to the global persistent process, ϕ_i^d, using four different definitions of the 'global' portfolio that range from the G-10 countries to the entire set of 37 countries in our study. The correlation of the newly-estimated parameters and our benchmark parameters in nearly 1 in all the specifications, even though the mean levels of the parameters change somewhat depending on the specification. These findings imply that approximating the world with our five countries of choice is a reasonable assumption.

5 Conclusion

In this paper, we have compiled a comprehensive panel of international stock market returns 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. Our parsimonious model accounts for over a half of the observed cross-sectional variation in equity returns and volatilities, but a large amount of variation remains unexplained. Similarly, the behavior of real exchange rates across countries remains unaccounted for, even though real exchange rate risk premia do not appear to be critical in reconciling the cross-section of equity returns.

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 such as 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 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.

Andrews, S., R. Colacito, M. M. Croce, and F. Gavazzoni (2024): "Concealed carry," *Journal of Financial Economics*, 159, 103874.

Backus, D. K. and G. W. Smith (1993): "Consumption and real exchange rates in dynamic economies with non-traded goods," *Journal of International Economics*, 35, 297–316.

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 I. Shaliastovich (2013): "A Long-Run Risks Explanation of Predictability Puzzles in Bond and Currency Markets," *The Review of Financial Studies*, 26, 1–33.

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," *The Journal of Finance*, 62, 1081–1137.

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.

Chernov, M., V. Haddad, and O. Itskhoki (2024): "What do Financial Markets say about the Exchange Rate?" Working Paper 32436, 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 Macro-finance," *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.

Itskhoki, O. and D. Mukhin (2021): "Exchange rate disconnect in general equilibrium," *Journal of Political Economy*, 129, 2183–2232.

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.

Karolyi, A. G. and Y. Wu (2020): "Is Currency Risk Priced in Global Equity Markets?*," *Review of Finance*, 25, 863–902.

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.

——— (2019): "Does Incomplete Spanning in International Financial Markets Help to Explain Exchange Rates?" *American Economic Review*, 109, 2208â44.

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.

Ohanian, L. E., P. Restrepo-Echavarria, and M. L. J. Wright (2018): "Bad Investments and Missed Opportunities? Postwar Capital Flows to Asia and Latin America," *American Economic Review*, 108, 3541–82.

Oskolkov, A. (2024): "Heterogeneous Impact of the Global Financial Cycle," mimeo, University of Chicago.

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 V. Reinhart (2008): "Capital Flow Bonanzas: An Encompassing View of the Past and Present," *NBER International Seminar on Macroeconomics*, 5, 9–62.

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

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.

Verdelhan, A. (2010): "A Habit-Based Explanation of the Exchange Rate Risk Premium," *The Journal of Finance*, 65, 123–146.

——— (2018): "The Share of Systematic Variation in Bilateral Exchange Rates," *The Journal of Finance*, 73, 375–418.

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

Appendix

A Supplemental Data Sources

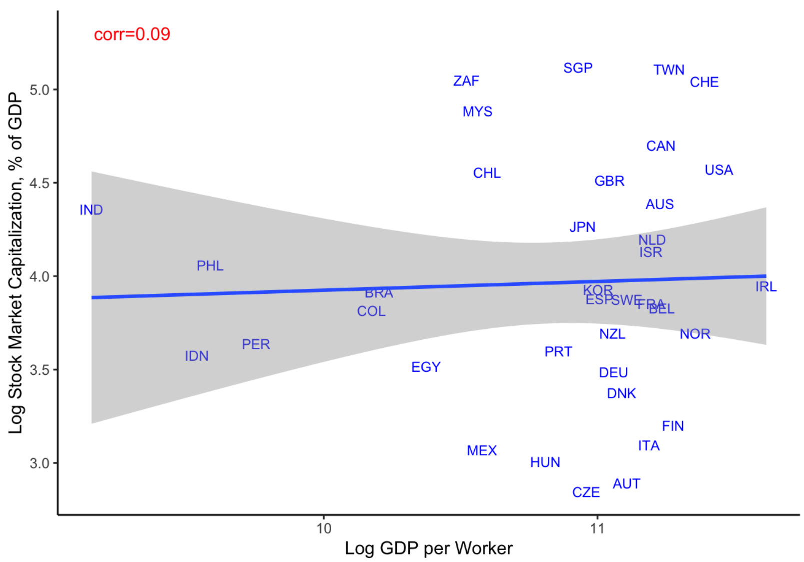
A.1 Stock Market Capitalization

We combine equity returns data with annual stock market capitalization data from the World Development Indicators (WDI hereafter), which covers the 1975-2020 period. We supplement the latter series with observations for the U.K. during 2012-2020, France during 2019-2020, and Taiwan during 1983-2020 from CEIC. We use these data to arrive at stock-market-capitalization weighted average dividend growth rates, which we refer to as 'global' dividend growth rates.

Furthermore, we obtain stock market capitalization to GDP ratios from WDI during the 1975-2020 period. Stock market capitalization for the U.K. during 2012-2020, France during 2019-2020, and Taiwan during 1983-2020 are from CEIC. We compute the ratio relative to GDP using nominal GDP series in USD from IMF for Taiwan. For France and the U.K., we use nominal GDP per capita in USD and population from St. Louis Fred to arrive at total nominal GDP.

Figure 8 plots the log of the stock market capitalization to GDP ratio against a country's level of development.

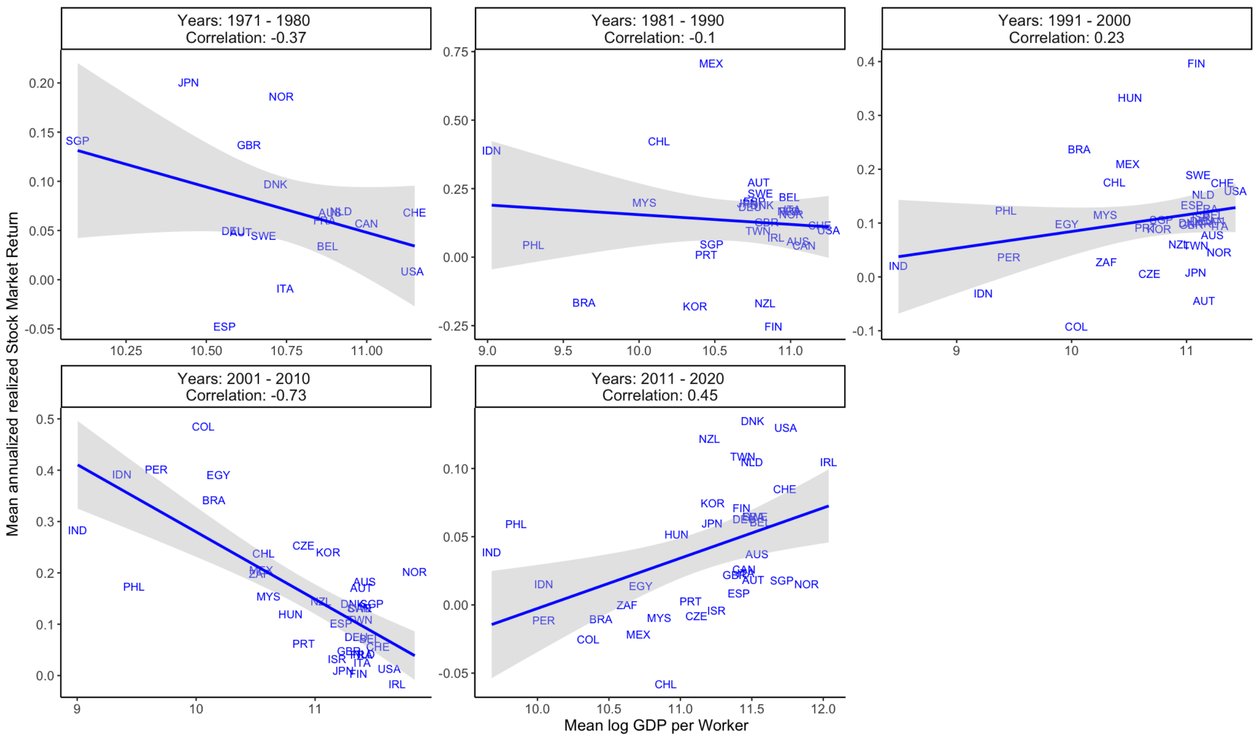
Figure 8: Log Stock Market Capitalization (% of GDP)



Notes: Figure plots (log) stock market capitalization (% of GDP) against time-series mean log income per worker for 37 countries. Data Sources: Stock Market Capitalization from WDI and CEIC for 1975-2020, Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

B Data Description: Supporting Tables and Figures

Figure 9: Stock Market Returns and Income Per Worker, by decade



Notes: The figures plots the relationship between mean annualized USD-denoted stock market returns against time-series mean log income per worker for 37 countries for different decades. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020.

Table 15: Summary Statistics for Equity Returns, by Country

	(i)	(ii)	(iii)	(iv)	(v)	
Country	N	Mean	Median	Std. dev	Q_{10}	Q_{90}
AUS	50	0.085	0.086	0.256	-0.186	0.411
AUT	49	0.090	0.019	0.376	-0.268	0.472
BEL	50	0.100	0.076	0.281	-0.202	0.431
BRA	30	0.163	0.138	0.495	-0.412	0.750
CAN	50	0.073	0.090	0.219	-0.192	0.300
CHE	50	0.100	0.114	0.233	-0.159	0.325
CHL	32	0.138	0.109	0.366	-0.227	0.576
COL	27	0.147	0.121	0.445	-0.341	0.727
CZE	24	0.093	-0.014	0.286	-0.145	0.427
DEU	50	0.095	0.111	0.286	-0.241	0.334
DNK	50	0.133	0.116	0.284	-0.175	0.436
EGY	23	0.193	0.108	0.562	-0.465	0.889
ESP	50	0.080	0.026	0.308	-0.229	0.456
FIN	32	0.132	0.095	0.437	-0.339	0.496
FRA	50	0.092	0.086	0.272	-0.227	0.363
GBR	50	0.087	0.087	0.268	-0.170	0.327
HUN	24	0.136	0.145	0.401	-0.298	0.659
IDN	32	0.142	0.071	0.492	-0.472	0.770
IND	27	0.125	0.073	0.395	-0.286	0.726
IRL	32	0.063	0.115	0.275	-0.241	0.402
ISR	26	0.040	0.057	0.261	-0.327	0.308
ITA	50	0.062	0.020	0.339	-0.252	0.369
JPN	50	0.095	0.081	0.314	-0.264	0.404
KOR	32	0.115	0.090	0.432	-0.402	0.537
MEX	32	0.168	0.149	0.391	-0.238	0.572
MYS	32	0.094	0.018	0.372	-0.225	0.513
NLD	50	0.108	0.109	0.212	-0.159	0.338
NOR	50	0.122	0.051	0.423	-0.299	0.533
NZL	32	0.092	0.094	0.262	-0.223	0.368
PER	26	0.160	0.169	0.385	-0.315	0.659
PHL	31	0.114	0.092	0.419	-0.484	0.602
PRT	32	0.050	0.031	0.266	-0.250	0.416
SGP	49	0.090	0.041	0.331	-0.311	0.503
SWE	50	0.133	0.133	0.285	-0.254	0.478
TWN	32	0.092	0.084	0.361	-0.316	0.496
USA	50	0.082	0.118	0.179	-0.150	0.292
ZAF	27	0.081	0.153	0.277	-0.259	0.428

Notes: Table reports summary statistics of annual equity returns in decimal points. Annual equity returns computed by authors using daily observations of the Total Return Gross Index for each country from MSCI. End year is 2020 and beginning year is country's entry into the dataset. Returns $>$ 200% and $<$ -100% are dropped.

Table 16: Summary Statistics for Dividend Growth, by Country

	(i)	(ii)	(iii)	(iv)	(v)	
Country	N	Mean	Median	Std. dev	Q_{10}	Q_{90}
AUS	50	0.041	0.025	0.240	-0.248	0.266
AUT	49	0.043	0.047	0.411	-0.365	0.438
BEL	50	0.022	-0.014	0.239	-0.177	0.225
BRA	30	0.146	0.084	0.462	-0.443	0.704
CAN	50	0.035	-0.018	0.209	-0.177	0.254
CHE	50	0.084	0.046	0.266	-0.155	0.252
CHL	32	0.065	-0.005	0.352	-0.267	0.481
COL	27	0.155	0.077	0.465	-0.328	0.860
CZE	24	0.090	-0.020	0.534	-0.377	0.815
DEU	50	0.075	-0.006	0.360	-0.245	0.416
DNK	50	0.075	0.044	0.295	-0.302	0.423
EGY	23	0.036	-0.049	0.499	-0.464	0.769
ESP	50	0.018	-0.009	0.311	-0.271	0.270
FIN	32	0.123	0.005	0.453	-0.358	0.907
FRA	50	0.041	0.021	0.252	-0.246	0.337
GBR	50	0.027	0.027	0.215	-0.211	0.312
HUN	24	0.057	0.070	0.486	-0.472	0.489
IDN	32	0.100	0.094	0.533	-0.547	0.791
IND	27	0.104	0.101	0.344	-0.305	0.420
IRL	32	0.020	-0.003	0.259	-0.228	0.274
ISR	26	-0.002	0.091	0.394	-0.516	0.504
ITA	50	0.021	-0.007	0.301	-0.382	0.401
JPN	50	0.044	0.033	0.203	-0.165	0.288
KOR	32	0.145	0.041	0.536	-0.371	0.771
MEX	32	0.192	0.272	0.500	-0.364	0.851
MYS	32	0.051	-0.004	0.284	-0.258	0.464
NLD	50	0.037	0.010	0.202	-0.191	0.300
NOR	50	0.072	0.077	0.328	-0.325	0.426
NZL	32	0.007	-0.022	0.285	-0.278	0.382
PER	26	0.241	0.152	0.607	-0.421	1.011
PHL	31	0.082	0.014	0.530	-0.423	0.721
PRT	32	0.067	0.035	0.368	-0.385	0.306
SGP	49	0.056	0.047	0.243	-0.224	0.366
SWE	50	0.085	0.014	0.341	-0.253	0.435
TWN	32	0.118	0.079	0.407	-0.406	0.721
USA	50	0.027	0.026	0.134	-0.141	0.188
ZAF	27	0.035	-0.007	0.227	-0.261	0.300

Notes: Table reports summary statistics of dividend growth. We drop observations of real growth rates below -100% and above 200% to minimize measurement error. Data Sources: MSCI 1970-2020.

Table 17: Summary Statistics for Consumption Growth, by Country

	(i)	(ii)	(iii)	(iv)	(v)	
Country	N	Mean	Median	Std. dev	Q_{10}	Q_{90}
DEU	81	0.022	0.020	0.046	-0.009	0.068
FRA	81	0.021	0.021	0.072	-0.000	0.053
GBR	81	0.017	0.020	0.028	-0.009	0.045
JPN	81	0.031	0.027	0.081	-0.007	0.091
USA	81	0.021	0.019	0.022	-0.002	0.046

Notes: Table reports summary statistics of annual consumption growth. Data are for 1940-2020 period from MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017).

Table 18: Summary Statistics for Price-Dividend Ratios, by Country

	(i)	(ii)	(iii)	(iv)	(v)	
Country	N	Mean	Median	Std. dev	Q_{10}	Q_{90}
DEU	79	3.71	3.61	0.65	3.22	4.16
FRA	81	3.56	3.46	0.53	3.04	4.20
GBR	81	3.16	3.15	0.28	2.85	3.48
JPN	81	3.90	3.95	0.78	2.80	4.86
USA	81	3.45	3.42	0.46	2.88	4.04

Notes: Table reports summary statistics of pd ratios. Data are for 1940-2020 period from MacroHistory Database provided by Jordà et al. (2019) and Jordà et al. (2017).

C Model Solution

Processes in our environment:

$$\begin{aligned}
\Delta c_{it+1} &= \mu_i + \phi_i x_t + x_{it} + \pi_i \eta_{t+1} + \eta_{it+1} \\
x_{t+1} &= \rho x_t + e_{t+1} \\
x_{it+1} &= \rho_i x_{it} + e_{it+1} \\
\Delta d_{it+1} &= \mu_i^d + \phi_i^d x_t + \tilde{\phi}_i^d x_{it} + \pi_i^d \eta_{t+1} + \tilde{\pi}_i^d \eta_{it+1} + \eta_{it+1}^d
\end{aligned} \tag{19}$$

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:

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

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

where

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

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

$$z_{it+1}^d = A_{i0} + A_{i1}^d x_{t+1} \tag{20}$$

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

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

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

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:

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

similarly:

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

equivalently

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

this is equivalent to:

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

This yields:

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

The demeaned Stochastic discount factor in country i:

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

The demeaned return on consumption in country i:

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

The demeaned return to dividends in country i:

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

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

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

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

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

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

C.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 $\mu_{US} = 0.021$, $\kappa = 0.9975$, which is consistent with the estimate of Bansal and Yaron (2004), who report a $\kappa = 0.997$.

C.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:

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

D Global Variables: Robustness

As described in the main text, we define a 'global' variable to be the mean of five economies: U.S., U.K., France, Germany and Japan. In Table 19, we show that adding observations for Australia, Switzerland, Spain, Italy, Netherlands and Sweden yields estimates for the parameters that govern the global persistent shocks that are very similar to our benchmark estimates.[18]

Furthermore, we show that estimates of country-level exposures to global persistent shocks are robust to different definitions of global dividend growth. First, recall that, as we describe in Appendix A, stock market capitalization data coverage begins in 1975, while dividend growth data begins in 1970 for developed economies. Hence, the key moment of interest that identifies dividend growth exposure to global persistent shocks–namely, the covariance of a country's

[18] The MacroHistory Database also includes consumption data for Portugal, Canada, and Ireland, but price-dividend data are missing for these countries. Price-dividend observations for Belgium are not reliable during the post-war period as the variance is several orders of magnitude higher than what we observe for other countries. Data are available for Finland, Denmark and Norway, but these countries accounted for a negligible share of world economic activity historically. Furthermore, the financial variables from Norway are pooled from a variety of data sources and the coverage of stocks changes multiple times over the period of study, which makes the data difficult to interpret.

Table 19: Global Persistent Component

	Dependent variable:		
	Δc_{t+1}		x_t
pd_t	0.006***	x_{t-1}	0.810***
	(0.000)		(0.068)
		Constant	0.004***
			(0.001)
Observations	845		79
R^2	0.166		0.648

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 = Australia, Switzerland, Germany, Spain, France, U.K., Italy, Japan, Netherlands, Sweden and U.S. and $K = 11$. 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.

dividend growth with the global dividend growth rate—is computed beginning in 1975, even though returns and dividend growth rates date back to 1970 for developed economies. We believe that it is important to weigh stock-market moments by stock market capitalization as it is standard practice when constructing an index; for ex. MSCI indices that combine groups of countries weigh countries' equity indices by stock market capitalization.[19] This weighting scheme aims to capture the importance of each country in driving global economic activity. Second, recall that our definition of global dividend growth reflects five countries: U.S., U.K., France, Germany and Japan.

In Table 20, we explore several different definitions of global dividend growth. Specifically, keeping all other parameters of the model fixed as in Table 9 the main text, we re-estimate π_i^d using expression (16) and ϕ_i^d from the covariance implied by expression (3) for each country, where Δd_W is derived under an alternative definition. In column (i), we let global dividend growth be the stock-market-capitalization weighted mean of all 37 countries in our sample. In column (ii), we focus on the countries that make up MSCI's World Index, which are the following developed economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, U.K. and U.S. In column (iii), we include the 11 countries

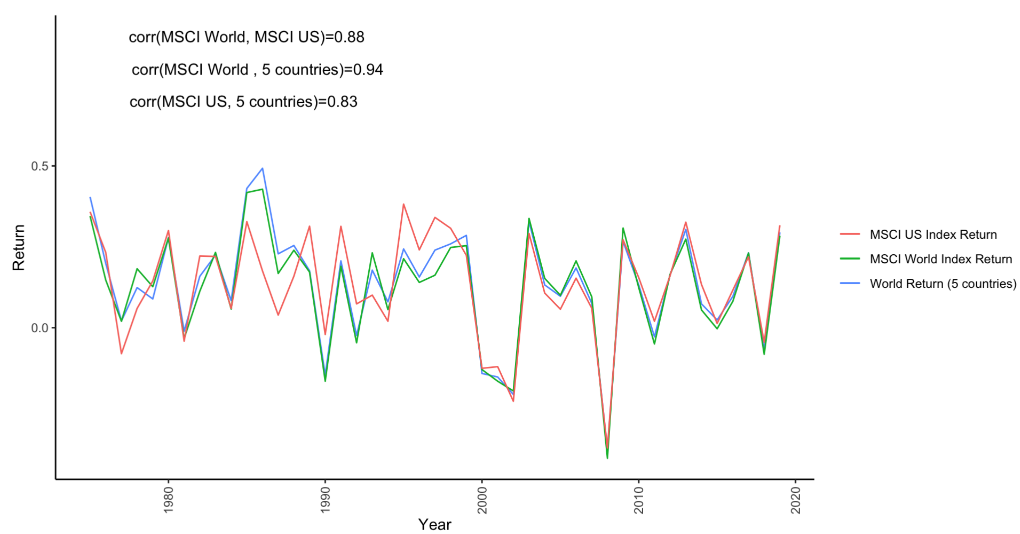
[19]Similarly, an individual country's index weighs firm observations by their respective stock market capitalization.

from the robustness exercise that re-estimated the global persistent process in Table 19, and in column (iv), we include the G-10 countries (which add up to 11 including Switzerland): Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, U.K., and U.S.

The mean level of ϕ_i^d increases as we increase the sample of countries that constitute the world. Compared to the mean in our benchmark specification in Table 10 of 6.21, the most significant increase occurs when we include all 37 countries in the definition of the 'world', which mechanically reflects the increased correlation of each country with the 'world'. But more importantly, in the cross-section of countries, the correlation of estimated ϕ_i^d's under the alternative specifications with our benchmark estimates is almost unity. This finding implies that different definitions of the 'world' do not affect the cross-sectional predictions of our model, and only affect the levels of risk premia.

Finally, in Figure 10, we plot equity returns during the 1975-2020 period for: (i) the U.S., (ii) the definition of World Index provided by the MSCI, and (iii) our definition of a global variable, which constitutes the stock-market-weighted mean of returns for U.S., U.K., France, Germany, and Japan. It is apparent that the three series comove very closely, which reassures our definition of a global variable.

Figure 10: 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 1970-2020.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 20: Estimated ϕ_i^d Under Different Global Dividend Processes

	(i)	(ii)	(iii)	(iv)
Country	$\phi^d_{AllCountries}$	$\phi^d_{MSCIWorld}$	ϕ^d_{C-11}	ϕ^d_{G-10}
AUS	7.14	6.39	5.96	5.60
AUT	9.00	7.97	7.32	6.77
BEL	6.64	6.18	5.97	5.64
BRA	15.22	13.06	12.19	11.40
CAN	6.77	5.99	5.47	5.36
CHE	8.13	7.41	7.13	6.73
CHL	10.12	8.45	7.73	7.37
COL	11.25	10.00	9.24	8.78
CZE	5.75	4.93	4.15	3.68
DEU	10.69	9.74	9.29	8.81
DNK	8.24	7.63	7.33	7.01
EGY	13.43	11.19	9.96	10.03
ESP	8.27	7.49	7.04	6.46
FIN	12.16	10.87	9.98	9.79
FRA	8.12	7.47	7.12	6.69
GBR	5.93	5.55	5.32	4.97
HUN	10.17	9.32	8.32	8.06
IDN	13.40	11.25	10.20	9.64
IND	14.20	12.01	10.99	10.81
IRL	6.81	6.66	6.46	6.12
ISR	3.74	3.16	2.62	2.63
ITA	3.84	3.83	3.76	3.38
JPN	4.75	4.39	4.34	4.10
KOR	15.50	12.90	12.08	11.78
MEX	7.95	6.42	5.63	5.47
MYS	5.87	4.68	4.07	4.13
NLD	5.92	5.57	5.37	5.02
NOR	8.36	7.29	6.69	6.44
NZL	8.31	7.61	7.12	6.81
PER	12.71	11.38	10.68	10.33
PHL	7.66	6.68	5.98	5.84
PRT	9.04	8.25	7.60	7.26
SGP	6.06	5.28	4.93	4.65
SWE	10.08	9.37	8.95	8.49
TWN	9.41	7.91	7.47	7.18
USA	4.37	4.09	3.91	3.79
ZAF	8.20	7.12	6.58	6.35
mean	8.74	7.72	7.16	6.85
median	8.24	7.47	7.12	6.69
std. dev	3.11	2.59	2.40	2.34
corr(.,y_i)	-0.55	-0.51	-0.47	-0.48
corr(., ϕ_i^d)	0.98	0.99	1.00	1.00

Notes: Table reports country-level estimated parameters ϕ^d using different definitions of the Δd_W process. All countries refers to a stock-market weighted Δd_W using all countries in our sample. C-11 refers to a stock-market weighted Δd^W process using the 11 countries used for the robustness exercise in Table 19. G-10 refers to a stock-market weighted Δd_W process using G-10 countries. MSCI World refers to a stock-market weighted Δd_W process using countries that are in the MSCI World database. Data Sources: Dividend series computed by authors using data from MSCI for 1970-2020.

E Supporting Tables

Table 21: Realized Stock Market Returns Regression

	Dependent variable:		
	r_{it}		
	(1)	(2)	(3)
y_{it}	-0.041^{***}	-0.036^{***}	-0.082^{***}
	(0.014)	(0.011)	(0.028)
Constant	0.545^{***}		
	(0.155)		
Observations	1,466	1,466	1,466
R^2	0.006	0.007	0.006
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% and above 200%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020. Standard errors statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 22: Realized Stock Market Returns Regression

	Dependent variable:		
	r_{it}		
	(1)	(2)	(3)
y_{it-1}	-0.050^{***}	-0.039^{***}	-0.117^{***}
	(0.014)	(0.011)	(0.027)
Constant	0.642^{***}		
	(0.151)		
Observations	1,502	1,502	1,502
R^2	0.009	0.009	0.013
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% and above 200%. Data Sources: Equity returns computed by authors using data from MSCI for 1970-2020. Income per worker computed by authors using data from PWT 10.0 for 1970-2019 and from WDI for 2020. Standard errors statistics in parentheses.

Table 23: Robustness Results

Condition	Statistic	N	Mean	Median	St. Dev.	Q_{10}	Q_{90}	corr(.,r_i^e)	corr(.,$\widehat{r_i^e}$)
$\pi_i^d = \pi_{i\,US}^d$ & $\phi_i^d = \phi_i^d$	$\widehat{r_{ri}^e}$	37	10.050	10.840	2.486	6.231	12.533	0.558	0.993
$\pi_i^d = \pi_{i\,US}^d$ & $\phi_i^d = \phi_i^d(\pi_{US}^d)$	$\widehat{r_{ri}^e}$	37	9.299	10.761	4.084	2.865	12.568	0.201	0.581

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