Dollar-weighted return on aggregate corporate sector: How is it distributed across countries?

Lingxia Sun [a], Dong Wook Lee [b, *]

July 25, 2018

Abstract

This paper computes the dollar-weighted returns (DWRs) on the aggregate corporate sector in each of the 43 sample countries, and shows that the DWRs in U.S. dollars are similar across countries. In contrast, the local-currency DWRs are found to be different across countries, suggesting a role played by currency in the parity of DWRs. It turns out that countries with undesirable qualities (e.g., financially closed) have a higher DWR in local currency but a lower return on their currencies and, consequently, DWRs in U.S. dollars converge across countries. Taken together, our results are consistent with a version of efficient international capital markets where capital flows in such a way that the marginal product of capital is equalized across countries.

Keywords: Dollar-weighted return; Parity; Convergence; Financial openness
JEL classification: F30; F65; G31; G32

[a] Business School of Nankai University, Nankai University, Tianjin, 300071, China
[b] Korea University Business School, Seoul, 02841, Korea

[*] Corresponding author. Professor of Finance, Korea University Business School (KUBS). Address: 523 Hyundai Motor Hall, Korea University Business School, Seoul, Korea 02841; Email: donglee@korea.ac.kr (all lower case). Part of this paper appears in Lingxia Sun's Ph.D. dissertation at KUBS. We are grateful to Ji-Woong Chung, Baeho Kim, Woochan Kim, Ji-Yeol Oh, and seminar participants at KUBS and the 2017 CAFM conference for comments.

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1. Introduction

Emerging markets refer to a group of countries that are emerging from under-developed status and catching up with advanced economies (Bekaert and Harvey (2002; p.429)). By nature, those countries grow fast and so do their corporations. Thus, the securities issued by those corporations offer a higher return than those in developed countries. However, is that high return also the one that is actually experienced by investors? According to Dichev (2007), the return to investors can differ from the return on security if there is a certain correlation between the security return and the capital committed to the security.[1] Not only that. If capital moves "efficiently"—i.e., flowing toward higher expected return (lower price) until the return (price) is no longer higher (lower)—, then the return to investors should be equalized across countries. Indeed, this latter prediction is a rephrasing of the marginal product of capital being equal cross-sectionally, since the efficient capital allocation within and across countries dictates that the return to investors does not differ from one country to another (Caselli and Feyrer 2007). In this paper, we examine the cross-country distribution of the return to investors.

The return to investors we compute in this paper is the internal rate of return or the "dollar-weighted" return (DWR) as dubbed by Dichev (2007). Fama and French (1999) devises a way to compute the DWR for the entire corporate sector by positing a representative investor who invests in a country's corporate sector as if it is a single investment project. As such, it is an aggregate measure that takes into account capital allocation within the corporate sector. We compute this aggregate DWR for a given country by closely following Fama and French (1999) and using data denominated in U.S. dollars in accordance with the international finance literature (e.g., Brennan and Cao 1997; Griffin,

[1] Dichev (2007) offers the following example. Suppose that that the price of a stock rises from $10 to $20 and then falls back to $10 over time. The geometric average return on the security over those two periods is 0%. However, if an investor purchases 100 shares of the stock at $10, buys another 100 shares at $20, and liquidates her entire holdings when the price comes down to $10, then the return that actually accrues to this investor is -26.8%.

Nardari, and Stulz 2004).[2] However, we also compute DWR in local currency and compare the two sets of DWRs in order to gauge the role of currency.

Before reporting the results, we acknowledge that DWR is a tricky measure to estimate. For example, there can be more than one DWRs if the net capital flows between corporations and capital-market investors change signs. Besides, DWR is not useful in evaluating mutually exclusive projects. We take these issues seriously and devote one section (Section 3.3) to the robustness of our DWR estimates. Briefly, the section shows that our DWR estimate for each of our sample countries is the only discount rate—in the range between 0% to 50% in annual terms—that equates the net present value of investing in the country's corporate sector with zero.

Using a sample of 43 countries for the period of 1994-2013, we find little statistical difference in DWR across countries. More specifically, when we categorize sample countries into rich and poor groups (by the GDP per capita), growing and stagnant groups (by the growth in GDP per capita), or financially open and closed groups (by the sum of foreign assets and liabilities), we find no statistical difference in mean and median DWR between the two groups. In order to examine the entire cross-section rather than the difference between two country groups, we also estimate a regression of the deviation of a country's DWR from the global median on a number of country characteristics including the sorting variables above. No variable enters the regression significantly, except for the GDP growth rate. It turns out that the counties with low GDP growth are evenly split between lower-than-median-DWR and higher-than-median-DWR cases. It thus appears that the cross-country dispersion in DWR in U.S. dollars is mostly noise-driven.

To gauge the role of currency in the observed similarity in DWR in U.S. dollars across countries, we turn to the distribution of DWRs in local currency. To see the usefulness of the local-currency DWR, consider a country that offers an attractive profit opportunity in local-currency terms than elsewhere but whose currency is overvalued due to certain macroeconomic conditions (e.g.,

[2] We focus only on publicly traded companies due to data availability, as in Fama and French (1999).

fixed exchange rate regime). If the currency is eventually devalued during our study period, the country's DWR in U.S. dollars would be lowered to a level where it no longer differs from the DWRs of other countries in U.S. dollars. Alternatively—or just put differently—, one can imagine a country that suffers from hyperinflation and thus whose local-currency DWR is overstated. If the country eventually experiences currency devaluation, the country's DWR in U.S. dollars will not be as impressive as its local-currency DWR.

We find that the local-currency DWR is significantly higher in poor countries and financially closed countries than in rich countries and financially open countries, respectively. When we regress the deviation of a country's local-currency DWRs from the global median on a set of country characteristics, financial closedness turns out to be significantly and positively related to the deviation. That is, financially closed countries have a DWR that deviates more from the global median. Given that those countries have a higher DWR in local currency than other countries, our results mean that the parity in DWRs in U.S. dollars is completed by a decrease in currency value in those financially closed countries. To the extent that the currency overvaluation is associated with inflation, our results are also consistent with the "real-term" returns being in parity across countries.

Having observed the cross-sectional convergence of DWR in U.S. dollars and the role of financial openness in the convergence, we turn our attention to its dynamics. To this end, we repeat our estimation of DWR (in U.S. dollars) for a given country by beginning with an estimation period of 1994-2003 and then including one more year to the estimation. The idea behind this analysis builds on Blanchard (1991): if DWRs converge cross-sectionally over time, then those DWRs "should become more similar as they are computed over longer periods of time" (Blanchard 1991; p.167). Indeed, we find that the cross-country dispersion in DWRs decreases over time. Specifically, tor the 11 years following the initial estimation period, the cross-sectional dispersion is reduced almost by half. We additionally find that the reduction in dispersion is accelerated by financial openness.

There is another version of convergence, which can occur in a country's own time-series. Specifically, the cross-country convergence implies that the deviation of a country's DWR from the

global median DWR in a given year can predict the subsequent change in the country's DWR. For example, if a country's DWR is lower than the global median in a given year, the country may see its DWR rise and converge to the global benchmark subsequently. Using the same set of DWRs as those in the preceding convergence analysis, we indeed find this to be the case. Specifically, more than 60% of the initial deviation is "corrected" during the next year and the cross-country convergence is almost completed by the end of the third year. We further investigate whether the convergence in a country's own time-series is facilitated by financial openness, and find that the catching-up of a country's DWR following its deviation from the global median occurs faster, the more financially open is the country.

What are the takeaways? Our analysis suggests that, while some countries have grown fast and their corporations have offered a higher security return than elsewhere, capital has migrated in such a way that investors as a whole did not earn any higher return from those fast-growing countries. More broadly speaking, our results support a version of efficient international capital markets where capital flows to (from) countries with better (worse) profit opportunities and the barriers to such cross-border capital flows lead to changes in currency value. Our paper thus provides empirical evidence—in a new context—to Caselli and Feyrer's (2007) notion that the marginal product of capital is similar across countries.

In fact, the notion of cross-country convergence has a long history. For example, Baumol (1986) examines a possible convergence in per-capita income across countries. A premise in such income convergence is that capital flows to where the marginal product of capital is higher and, afterwards, the return to capital declines (see, e.g., Barro and Sala-i-Martin (1991; p.109).[3] Our paper augments this large literature by providing empirical results stemming particularly from the publicly traded companies as a whole.

The paper also contributes to the growing literature on DWR. Since Dichev (2007), a number of papers have employed this computation method (e.g., Friesen and Sapp 2007; Keswani and Stolin

[3] As noted by De Long (1988; p.1138, ft.4), the idea of cross-country convergence traces further back to 19th century economists such as John Stuart Mill and Karl Marx.

2008; Phalippou 2008; Dichev and Yu 2011; Hayley 2014). Along the way, various interpretational issues have been raised such as the hindsight effect pointed out by Hayley (2014). We emphasize that we steer clear of those controversies and only report the DWR as the internal rate of return on the corporate sector. More precisely, without saying anything about investors' timing ability or equity risk premium, we focus on reporting the return accruing to the collective investor group as an ex-post summary of what happened during our study period. While different narratives can be told about the DWRs we document in this paper, we believe future research can further investigate those accounts.

Finally, our paper is related to the literature on corporate investment in relation to capital-market valuation. Recently, Arif and Lee (2016) use data from developed countries including the U.S. and show that aggregate corporate investment peaks when the stock-market valuation is irrationally high and thus a poor return on corporate equities ensues. An important difference between Arif and Lee (2016) and our paper is that we focus on cross-country capital flows while they examine within-country capital allocation. In the context of our analysis, Arif and Lee's (2016) finding would predict that investor sentiment makes a country's DWR lower than its security return. In a cross-section of countries, the gap between DWR and security return might thus be negatively related to the degree of country-level investor sentiment. We believe it is a rewarding topic that warrants a separate paper.

This paper proceeds as follows. Section 2 details our sample and data. Section 3 reports the estimated DWRs in U.S. dollars and their cross-country distribution. Section 4 examines the DWRs denominated in local currency and reveals the role of currency. Section 5 analyzes the dynamics of the convergence in U.S. dollar-denominated DWRs across countries. Section 6 concludes the paper.

2. Sample and data

We construct our sample by collecting data of all public companies in non-US countries from the Worldscope database and data of all public companies in the U.S. from the Compustat database over the period of 1994-2013. Annual accounting and stock market variables retrieved from the two databases are denominated in U.S. dollars and their full descriptions are provided in Appendix I.

We screen the sample as follows. First, since our study period begins in 1994, the countries that are introduced to the Worldscope after 1994 are excluded. To increase the sample size, however, we make one exception, namely, Czech Republic which starts being covered by the Worldscope in 1995. Second, we require the data of at least 30 firms to be available each year for each country. Third, we remove financial firms (SIC codes of 6000-6999) to reduce the double-counting problem in the estimation of aggregate returns, as suggested by Fama and French (1999).[4] Fourth, we only include the companies that have data on the market capital and book capital for any two years between 1994 and 2013. Finally, we remove Taiwan and Luxemburg from the sample. After this screening process, we have 45,611 firms from 43 countries in the sample. In a given year, as many as 22,833 firms exist in our sample.

3. Dollar-weighted-return (*DWR*) and its distribution across countries

3.1. Estimation method

We compute the DWR of the entire corporate sector in a country from the following equation:

$$0 = -MCAP_{1994} - \sum_{t=1994}^{T=2013} \frac{INV_t - CE_t}{(1+DWR)^{(t-1994)}} - \sum_{t=1994}^{T=2013} \frac{Enter_t - Exit_t}{(1+DWR)^{(t-1994)}} + \frac{MCAP_{2013}}{(1+DWR)^{20}}, \qquad (1)$$

where *MCAP* is the market value of total capital of the sector. *INV* and *CE* are, respectively, the sector's investment and cash earnings. More specifically, *INV* is the change in book value of total capital over the past year, plus depreciation, and *CE* is the sum of income before extraordinary items, extraordinary items and discontinued operation, interest expense, income statement deferred taxes, and depreciation. Book value of total capital (denoted as *BCAP* hereafter) is the sum of the year-end book value of long-term debt, short-term debt, and equity (i.e., total assets net of total liabilities plus

[4] We also drop a Turkish firm (DataStream code 27743T) because it has an extreme large value of market equity.

balance sheet taxes deferred and investment tax credit).[5] The market value of total capital, *MCAP*, is the sum of market value of common equity, book value of long-term debt, book value of short-term debt, and book value of preferred stocks. *Enter* is the initial market capital of firms who enter the sector during the year, and *Exit* is the terminal market capital of firms who leave the sector during the year. We assume that a firm enters our sample at the end of the first fiscal year and that a firm leaves the sample at the end of the last fiscal year. All variables are aggregate, meaning that they are the sum of firm-level data across companies in a country's corporate sector. Finally, the variables are denominated in U.S. dollars.

As in Fama and French (1999), the equation above posits a representative investor who funds the corporate sector throughout the estimation period—i.e., by providing $MCAP_{1994}$ at the start and then (*INV* – *CE*) and (*Enter* – *Exit*) subsequently, until he liquidates his investment in return for $MCAP_{2013}$. If any of additional funding (i.e., *INV* – *CE* and *Enter* – *Exit*) is negative, it means a net payout by corporations. The discount rate in the equation (DWR) is the internal rate of return, as it makes the net present value of this investment zero. DWR is also the average annual return at which the initial and additional capital provisions grow toward the terminal value of the corporate sector. DWR correctly recognizes the amount of capital that is committed to corporations each year, because it is the average annual return weighted by the beginning-of-year market value of total capital (see Hayley (2014) for details). In words, DWR is the return accruing to the representative investor or the investing public as a whole.

Table 1 reports our sample countries by grouping them into developed markets and emerging markets—just for the expositional purposes—along with the average value of the variables for DWR computation. As shown in the second column, the sample is unbalanced in the sense that several

[5] To have the broadest possible coverage of data, we set the variables used to compute the cash flow-related variables to zero if they are missing, except for the income before extraordinary items and changes in book capital. However, when the income before extraordinary items and investment items are missing for some companies in some years, we treat them as missing and set the firms' net cash flows for those years to zero. If short-term debt is not available, we use current liabilities.

countries have a greater presence than others. For example, as many as 5,171 U.S. companies are included in the sample (on average in a given year), followed by Japan with 3,140 companies. At the other end of the spectrum, Czech Republic and Colombia have available data only for 30 and 33 companies, respectively. However, this imbalance does not affect our results, because we compute DWR for each country and then examine the cross-section in which countries are given the same weight. We also report the average number of "entering" and "exiting" companies in the third and fourth columns of Table 1. Approximately 10% of the sample firms are entering firms and about 5% leave the sample during the study period. The table also shows the average aggregate values (in billions of U.S. dollars) of book value of total capital, market value of total capital, cash earnings, and investment for each country.

3.2. Estimation results

Table 2 reports the estimated DWR for each of the sample country. The DWRs for individual countries are reported in Panel A and some summary statistics are provided in Panel B. As in Table 1, we group countries by emerging and developed markets only to enhance readability of the results. On average across all sample countries, the DWR for the aggregate corporate sector is approximately 8.5%, with a cross-sectional standard deviation of 2.8%. Separately for the two country groups, the developed markets have an average DWR of 8.9% and the emerging-market group has an average DWR of 8.2%. That is, the two country groups have very similar DWRs. The standard deviations are also similar, as the developed markets have a cross-sectional standard deviation of 2.8% and the emerging-market group 2.9%.

Interestingly, countries known for impressive economic growth—such as China, Indian, and Poland—have quite a modest DWR. Specifically, China's DWR is only 8.4% while Poland's is meager 6.7%. The Indian case is somewhat better but its DWR is still an unimpressive 9.2%. Thus, the stellar performance of some fast-growing markets seems to hold true only in terms of the security return and the investors' experiences are not as great as the security return might suggest.

Certainly, there is non-negligible variation in DWR across countries. The DWRs range from 1.1% (for Japan) to 15.1% (for Brazil). At a minimum, however, this variation is not to be attributed to the differences between emerging and developed markets. As reported in Panel B of Table 2, basic percentiles are quite similar between the two country groups. Specifically, the DWRs of emerging markets are distributed between 1.8% and 15.1%, while the developed-market group has a range from 1.1% and 14.5%. Quartiles are also similar between the two groups. We will further investigate cross-country variation in DWR in the rest of the paper. Before that, however, we discuss the robustness of our DWR estimates.

3.3. Robustness of DWR estimates

An evaluation of the validity of our DWR estimates is absolutely necessary because the DWR is in essence the internal rate of return. That is, the DWR is the root of a polynomial consisting of the initial and subsequent capital provisions and the terminal payoffs, all computed at a common point in time. As those capital flows between corporations and capital-market investors change signs (e.g., net payouts in one year and net funding the next year), there can be more than one root (see, for example, Ross, Westerfield, Jordan (2008; p.281)). It is also well-known that this return measure is often misleading when mutually exclusive projects are evaluated.

The latter issue is related to the differing scales of investments. For example, the 1% return on a million-dollar investment is clearly better than the 10% return on a thousand-dollar investment. This is less of an issue in our analysis, because the investment in corporations around the world is likely to be highly divisible. Our sample firms are all publicly traded and, as such, the investment can be easily scaled up or down so that the return alone can speak to the superiority among various investment opportunities.

The possibility of multiple roots, however, is an issue that warrants a careful analysis. In principle, there will be more than one root for Eq. (1) in Section 3.1 if the cash flows in the equation change signs frequently. Nonetheless, some of those roots are going to be just a mathematical solution

to the equation and not a proper discount rate that makes an economic sense. As an illustration of our argument, consider the following cash flows: -60 in year 0, +200 in year 1, and -150 in year 2. The cash flows change signs twice and, consistent with the Descartes' Rule of Sign, there are two roots: 13.96% and 119.37%. Each number makes the value of the three cash flows—computed at a common point in time—zero. However, a reasonable discount rate or a proper measure of investment return from those cash flows is obviously 13.96%, not 119.37%.

For each sample country, we thus compute the right-hand side of Eq. (1) using a discount rate between 0% to 50% in annual terms. We are particularly interested in seeing whether the DWR in Table 2 is the only discount rate that generates a zero net present value. While there may be other mathematical "roots" outside the 0%-50% range, we would not consider them to be an economically sensible measure of return on corporations.

We confirm that, for each of our sample countries, the DWR in Table 2 is the only discount rate—in the range from 0% to 50% in annual terms—that generates a net present value of zero. We also create a graph for each of our sample countries that shows the relation between discount rate (x-axis) and net present value (y-axis). As the discount rate increases from 0% to 50%, the net present value declines and *crosses the x axis (i.e., zero net-present-value line) only once*. Those graphs are available upon request.

3.4. Distribution of DWRs across countries

To formally test whether the estimated DWRs are significantly different across countries, we consider several country groups.[6] First, we compare the DWRs of emerging markets with those of developed countries. Second, we group countries by the GDP per capita—averaged over our study period—into "rich" and "poor" countries, and compare their DWRs. Third, we use the annual growth of the GDP per capita—again, averaged over the study period—to sort sample countries into

[6] Our earlier country categorization into emerging vs. developed markets is inevitably arbitrary so we no longer use it.

"growing" and "stagnant" countries, and test the difference between the two groups. Finally, using the sum of foreign assets and foreign liabilities that is scaled by GDP and then averaged over the study period, we identify financially "open" and "closed" countries for another test of cross-country difference in DWR.[7] All these categorizations are based on the sample median.

Table 3 shows that there is no significant difference in mean and median DWR between any of those country group pairs. Specifically, "rich" countries have a mean (median) DWR of 8.9% (9.2%), which are not statistically different from the "poor" countries' mean (median) DWR of 8.2% (8.3%). In a similar manner, "growing" and "stagnant" countries have a mean (median) DWR of 8.5% (8.7%) and 8.6% (8.9%), respectively, which are again statistically indistinguishable. Finally, financially open countries have a mean (median) DWR of 9.1% (9.2%), which is only statistically trivially higher than the mean (median) DWR of financially closed countries—namely, 8.0% (8.3%).

As mentioned at the end of Section 3.2, however, there is sizable variation in the estimated DWRs across countries. It is thus necessary to examine the entire cross-section of the estimated DWRs, in addition to comparing the means or medians of two country groups. For this investigation, we estimate regressions whose dependent variable is the deviation of a country's DWR from the cross-country median. For regressors, we employ a set of country characteristics including the sorting variables above. Since those country attributes are highly correlated with one another, we begin by estimating a univariate regression using financial openness as the sole regressor and then augment it with another country characteristic. Being a measure of how well capital can enter and exit the country, financial openness is conceptually most likely to be related to cross-country variation in DWRs. However, our variable is only an empirical proxy for this financial openness and other country characteristics may also be correlated with financial openness both theoretically and empirically. By

[7] According to Kose, Prasad, Rogoff, and Wei (2009; p.15), this measure best captures a country's financial openness. In effect, the measure is the sum of capital inflows and outflows, or gross capital flows, that is cumulated over time. As such, if a country experiences a massive capital outflow during a year, the country's financial openness in our analysis will increase in the same way as the capital-inflow case.

augmenting our proxy for financial openness with just one more variable, we seek to obtain a bivariate proxy for financial openness while mitigating the multicollinearity problem.

Specifically, we estimate the following equation:

$$(DWR_{median} - DWR_i) = \alpha + \beta \cdot Open_i + \gamma \cdot X_i + \varepsilon_i , \quad (2)$$

where DWR_i is country *i*'s DWR as reported in Table 2, DWR_{median} is the median of our 43 country-specific DWRs, $Open_i$ is country *i*'s financial openness, and *X* is one of the following: null (i.e., no variable), GDP per capita, growth of GDP per capita, stock market size, credit market size, stock market trading volume, trade openness, corporate governance quality (two different measures), political stability, and accounting transparency. All these country-level variables are detailed in Appendix II.

Table 4 reports the results. Across 11 regressions, we find that no variable is reliably related to the variation in DWRs across countries. While the GDP per capita and its growth are significant at the 10% level, the former loses its significance when it is the sole regressor (not reported). The GDP growth, on the other hand, enters the regression with a significant and negative coefficient as the sole regressor, meaning that there is larger variation in DWR among stagnant countries.

Figure 1 thus visualizes the relationship between the estimated DWR and the GDP growth rate. It turns out that the counties with low growth rate are split nearly equally into lower-than-median-DWR and higher-than-median-DWR groups. On average, there is no relation between DWR and GDP growth, confirming our mean/median test results reported in Table 3 (Panel B). That is, the return that accrues to investors is not systematically different between countries that grow fast and those that do not. As a robustness check (not reported), we used the DWRs themselves (instead of their deviations from the global median) as the dependent variable. No variable entered the regression

significantly, either as a sole regressor or as an augmenting variable to financial openness. Our measure of financial openness was never significant either.

In sum, our analysis in this section suggests that our sample countries do not show any systematic pattern in their DWRs cross-sectionally. There is no difference in mean or median DWR between rich and poor countries. Nor is the difference significant between fast-growing countries and others. DWRs are indistinguishable between financially open and close countries. The regression analysis also detects no systematic pattern in the estimated DWRs. All in all, it seems that the variation in DWRs across countries is noise-driven.

4. Role of currency - Comparison between DWR in U.S. dollars and DWR in local currency

All the results in Section 3 are for the DWRs denominated in U.S. dollars. It is a correct approach for our analysis whose premise is that capital flows across countries in search of superior profit opportunities. In other words, the relevant return measure should be the one denominated in an internationally convertible currency—such as U.S. dollars—so that the return can be compared across countries (see also, e.g., Brennan and Cao (1997) or Griffin, Nardari, and Stulz (2004)). As a robustness check, however, we repeat the analysis using the local currency-valued data.

This robustness check is useful in understanding the role of currency in the convergence of DWRs across countries. To see this more clearly, consider a country under certain macroeconomic conditions, which can cause its currency to be overvalued. A fixed exchange-rate regime can be one example. In such a case, it is possible that the country has a positive return opportunity but foreign capital does not flow into the country and exploit it (which would lower the return subsequently). It is because international investors worry about possible "correction" of currency overvaluation—i.e., currency devaluation. If devaluation indeed occurs during our study period, the country's DWR in U.S. dollars will be lower than the DWR in its own currency. In words, the difference between the two sets of DWRs can reveal the role of currency. Alternatively, a country may have an undervalued currency for some reasons. In that case, the possibility of currency revaluation is itself a profit

opportunity. If the revaluation materializes during our study period, then the DWR in U.S. dollars will be higher than the DWR denominated in local currency. Again, the differential DWRs address the role of currency.

We begin by repeating the mean and median tests with the DWRs denominated in local currency. Table 5, Panel A, shows that there is a significant difference in mean and median DWRs between rich and poor countries and between financially open and closed countries. Specifically, poor countries have a mean DWR of 12.4%, which is significantly higher than the mean DWR in rich countries of 8.3%. Financially closed countries have a mean DWR of 12.2%, while financially open countries have a significantly lower mean DWR of 8.5%. However, there is no difference in mean DWRs between high-GDP-growth countries (10.7%) and low-GDP-growth countries (10.2%). All the test results remain qualitatively unchanged when we use median DWRs instead of mean.

The test results in Panel A of Table 5 indicate that, without currency values and their changes in DWR computation, countries have significantly different DWRs from one another. More precisely, some of the poor and financially closed countries experience currency devaluation, which offsets their higher DWRs in local currency. As a result, the DWRs in U.S. dollars become similar across countries.

We further investigate the dispersion in DWRs in local currency using the regression analysis. Specifically, we estimate the same regressions as those in Table 4, except that the dependent variable is now the deviation of the local-currency DWRs from their median. The results in Panel B of Table 5 are dramatically different from those based on U.S. dollars in Table 4. First, with just one exception, our proxy for financial openness is always significantly related to the DWR variation with a negative coefficient. It thus means that financially closed countries have a DWR that deviates more from the global median, a finding that makes a perfect economic sense.

The exception is when our proxy for financial openness is augmented by a measure of political stability. This augmenting variable is significantly (at the 10% level) and negatively related to the DWR deviation at the expense of the significance of our openness proxy. Thus, the cross-country variation in DWRs (denominated in local currency) has to do with the aspect of financial openness

that is related to political uncertainty. For example, countries with volatile political environments may well have limited cross-border capital flows and have a DWR that deviates a lot from the global benchmark.

Of other augmenting variables besides political stability, the GDP growth is significantly and negatively related to the DWR deviations without affecting the significance of the financial openness proxy. It thus means that the cross-country variation in local-currency DWRs exists mostly among low-growth countries. When we examine the relationship between the GDP growth rate and the DWRs in local currency, the counties with low growth rate are evenly split into lower-than-median-DWR and higher-than-median-DWR groups, just as in Figure 1 (not reported). This pattern of "no relation" is also consistent with the mean/median test reported in Panel A of Table 5.

In an unreported result, we estimated a cross-sectional regression of the DWR in local currency—not the cross-sectional deviation but the DWR in local currency itself—on various country characteristics. The local-currency DWR is negatively related to financial openness, GDP per capita, stock and credit markets size, trade openness, and political stability, all in a univariate regression. In words, countries with "undesirable" qualities (i.e., financially closed, poor, financially ill-developed, politically unstable, etc.) have a higher DWRs in local currency. Given that the DWRs in U.S. dollars are already found to be similar across countries, it follows that those "undesirable-quality" countries have a negative return on their currencies. Put differently, their higher DWRs in local currency and their low return on the currency itself *combined* produce a parity in DWR in US dollars across countries.

Figure 2 summarizes this implication. Specifically, Panels A and B respectively show the relationships between the DWR denominated in local currency and financial openness and between the DWR *on* local currency and financial openness. Finally, Panel C plots the relationship between the DWR in U.S. dollars and financial openness. The DWR *on* local currency is the difference between the DWR in U.S. dollars and the DWR in local currency. We use financial openness for this summary as it survives various controls in the earlier regressions (Table 5, Panel B). Across the three

panels, it is evident that countries with negative qualities—as represented here by financial closedness—have a higher DWR in local currency but a lower return on currency itself, as a result of which their DWRs in U.S. dollars are similar to those in other countries.

5. Dynamics of convergence in DWR

The similarity in DWR in U.S. dollars is obtained from a long estimation period from 1994 to 2013. We thus expect to be able to observe the dynamics of this convergence. We also expect financial openness to remain relevant in the convergence process, as it is so in a single cross-sectional snapshot.

5.1. Convergence – First look

We begin with a simple yet straightforward idea about the dynamics of convergence. As noted by Blanchard (1991; p.167), to the extent that convergence progresses over time, the DWRs across countries "should become more similar as they are computed over longer periods of time." To operationalize this idea, we repeat our estimation of DWRs by increasing the estimation period. Specifically, we begin by estimating the DWR of a given country for the first 10 years of the estimation period (1994-2003) and then increase the estimation period by one year (1994-2004, 1994-2005, 1994-2006, etc.) until we reach the full sample period of 1994-2013. By doing so, we obtain 11 DWRs for the country. The same procedure is repeated for other countries.

Using the resulting country-year panel of DWRs, we compute the cross-country dispersion in DWRs estimated over the same period, and see whether the dispersion is smaller for the DWRs estimated over a longer period. For example, are the DWRs estimated for the 1994-2003 period distributed over a wider range than the DWRs estimated for the 1994-2008 period? To the extent that convergence advances over time, we expect that to be the case.

Figure 3 confirms this prediction. With two alternative measures of cross-sectional dispersion, we find that the dispersion in DWRs decreases with the length of the estimation period. Specifically, both the cross-sectional standard deviation and the difference between the 90^{th} and the 10^{th} percentiles

of the DWRs decrease nearly by half from the estimation period of 1994-2003 to the estimation period of 1994-2013. While the reduction in cross-sectional dispersion is not perfectly monotonic, it is quite indisputable that the DWRs are distributed over a narrower range across countries, the longer is the estimation period for those DWRs.

5.2. Convergence – Second look

Using the same set of DWRs, we examine another version of convergence, which sheds light on the dynamics in a country's own time-series.[8] Specifically, we estimate the following equation:

$$\Delta DWR_{i,t+k} = \alpha + \beta \ dev_{i,t} + \varepsilon_{i,t}\,, \tag{3}$$

where $\Delta DWR_{i,t+k}$ is the change in DWR of country i from year t to year $t+k$ (i.e., $DWR_{t+k} - DWR_t$) and $dev_{i,t}$ is the deviation of country i's DWR from the cross-country median, both in year t (i.e., median DWR_t across i – $DWR_{i,t}$).

The regression coefficient, β, quantifies how much of the initial deviation is corrected over the next k years. A positive coefficient would mean that a country whose *DWR* is below the global median in year t (i.e., a positive value for *dev*) will see its *DWR* rise over the next k years and converge to the global benchmark (i.e., a positive value for ΔDWR). If the coefficient is, say, 0.7, then it would further mean that as much as 70% of the initial deviation is recovered for the next k years. In words, this regression not only shows the existence of convergence but also gauges its speed. We use 1, 2, or 3 for the value of k.

Table 6, Panel A, reports the results. Across the three values of k (i.e., 1, 2, and 3), we find the coefficient to be significant and positive. Further, the magnitude of the coefficient is 0.624 for the

[8] One can view the first look at convergence in Section 5.1 as σ-convergence and the second look at convergence in this section as β-convergence. See, e.g., Barro and Sala-i-Martin (1991; p.112).

next 1 year, 0.796 for the next 2 years, and 0.963 for the next 3 years. In other words, 62.4% of the deviation from the global median is restored next year and this catching-up is nearly completed by the end of the three-year period.

We examine the robustness of our regression results by modifying the specification. First, we exclude the global financial crisis period. During this time-period, security prices plunged and then rebounded in many countries. If the DWRs of some individual countries are affected by the crisis more than the global median, the observed convergence might be driven at least in part by those price fluctuations. We thus exclude the year 2009 as year t+1 in Eq. (3) above. That way, the price rebound immediately following the crisis in 2008 is not included in the one-year-horizon analysis. In the same spirit, we exclude 2010 for the two-year-horizon analysis, and 2011 for the three-year-horizon analysis. Panel B of Table 6 shows that the exclusion of the crisis-prone years only modestly lowers the regression coefficient. Specifically, the 1-year convergence coefficient is 0.589, which is smaller than the full-sample estimate of 0.624. Still, the coefficient continues to show the increasing pattern across the value of k, and over the next 3 years, 97.9% of deviation is recovered, which is qualitatively the same as the magnitude of correction for the full-sample estimation (i.e., 96.3%).

Second, we repeat the analysis only using the DWRs between the 5th and the 95th percentiles, which are then distributed from 1.9% and 16.1% and have a similar range to the full-period estimates of 1.1% through 15.1%. Panel C of Table 6 shows that, again, this modification lowers the regression coefficients somewhat. However, the message of the results remains unchanged qualitatively. During the first year, as much as 50.6% is corrected and through the 3-year period, 92.3% of the initial deviation disappears.

Third, instead of the first 10 years of our sample (1994-2003), we use the first 15 years (1994-2008) as the initial estimation period, and then examine the dynamics of convergence during the remaining 5 years. This modification will reduce any noise in the initial DWRs, so that the regression coefficients are determined more by convergence and less by noise being washed away. Panel D of Table 6 shows that this modification *increases* the regression coefficient for the first-year

convergence, as it rises to 0.768 from 0.624. As in other specifications, the regression coefficient increase with the value of *k*, and at the end of the three-year horizon, more than 92% of the initial deviation is caught up.

5.3. Convergence of DWR and financial openness

Recall the premise of our hypothesis: capital flows to where the expected return is higher (or equivalently, the price is lower) until the return is no longer higher (i.e., the price is no longer lower) than elsewhere. If the convergence observed above is an outcome of capital flows across countries, then the speed of convergence should be positively related to how efficiently capital can flow across borders—i.e., financial openness. The openness itself may well be an outcome of some underlying macroeconomic situations and conditions. Thus, we may not be able to prove that capital flows across countries *cause* convergence. At least, however, there should be a positive association between the speed of convergence and the degree of financial openness.

We first incorporate financial openness into the cross-sectional dispersion in DWRs (i.e., the first look at convergence in Section 5.1). Specifically, each year we rank the sample countries by their financial openness and weight their DWR by the openness rankings. We then compute the difference between the 10^{th} and the 90^{th} percentiles of those weighted DWRs. By construction, the percentiles of the weighted DWRs are higher in openness rankings than those of the unweighted—or more precisely, equally weighted—DWRs. As a result, the difference is computed by the DWRs associated with greater financial openness. Figure 4 shows that the reduction in cross-sectional dispersion in DWRs is more pronounced when the dispersion is based on the weighted ones. Unlike the unweighted (i.e., equally weighted) data, the decrease in dispersion is now monotonic except for the very last year.

We now incorporate financial openness into the regression-based convergence analysis. Specifically, we estimate the following equation:

$$\Delta DWR_{i,t+k} = \alpha + \beta \cdot dev_{i,t} + \sum_{\substack{k=open,\\ closed}} \delta_k \cdot D_{k,t} + \sum_{\substack{k=open,\\ closed}} \gamma_k \cdot dev_{i,t} \cdot D_{k,t} + \varepsilon_{i,t}, \quad (4)$$

where $D_{k,t}$ is a 0/1 dummy variable representing the group of countries that are deemed to be financially open (when k=open) or closed (when k=closed) in year t. Other variables remain unchanged from Eq. (3). By estimating Eq. (4), we see whether the convergence occurs faster (slower) when the country is financially more open (closed). That is, we examine whether γ_{open} is significantly positive and γ_{closed} is significantly negative.

To be consistent with the dependent variable, we use the first difference of our openness measure, which then measures the gross capital flows during the year, to define financially open or closed countries. Specifically, each year we sort our sample countries into 2, 3, or 5 groups by their gross capital flows during the year. The countries in the bottom half, tercile, or quintile are defined as financially closed for that year. Similarly, those in the top half, tercile, or quintile are defined as financially open for that year. When sample countries are separated into two groups, Eq. (4) does not employ the terms for financial closed countries as their impact is captured by the intercept and *dev* itself. In conducting this analysis, we use the 1-year convergence using the full sample.

Table 7 shows the results. With all three definitions of financially open and closed countries, we find that the convergence is faster, the more open is the country, which is evidenced by the significant and positively coefficient on the interactive term between *dev* and D_{open}. The other interactive term, $dev*D_{\text{closed}}$, does not have a significant coefficient. Thus, we cannot state that the convergence occurs more slows in financial closed countries.

Specifically, when the open and closed economies are defined by the tercile sorting, the coefficient on dev is 0.575, meaning that 57.5% of the benchmark countries' deviation is recovered over the next year. Financially closed countries are not different from this benchmark group, as the coefficient on $dev*D_{\text{closed}}$ is infinitesimal in magnitude (0.001) and statistically insignificant. In contrast, financially open counties—i.e., those that experience the largest increase in gross cross-

border capital flows—experience a faster convergence. The coefficient on *dev* and D_{open} is 0.127 and is statistically significant at the 5% level. Thus, the speed of convergence in those countries is as fast as 70.2% of the initial deviation (57.5% + 12.7%). When we use the quintile sorting, the contrast between financially open countries and the rest is more pronounced. The speed of convergence in those open countries is 76.1% of the initial deviation, whereas the rest of the sample countries have 56.9% of the initial deviation—a difference of nearly 20%. Financially closed countries remain indistinguishable from the benchmark countries, as the coefficient on $dev*D_{closed}$ is infinitesimal in magnitude (-0.039) and statistically insignificant.

6. Conclusions

This paper computes the so-called dollar-weighted return (DWR) on a country's publicly traded companies as a whole and compare it across countries. We find no systematic pattern in the DWRs denominated in U.S. dollars. However, the DWRs in local currency are found to differ across countries, indicating that currency plays an important role in the convergence of DWRs across countries, Specifically, countries with undesirable qualities (e.g., financially closed) have a higher DWR in local currency but a lower return on their currencies. As a result, DWRs in U.S. dollars are similar across countries. The observed parity in DWRs in U.S. dollars—but not in local currency—supports a version of efficient international capital markets where capital flows to (from) countries with better (worse) profit opportunities and the barriers to such cross-border capital flows are taken care of by currency value changes. Eventually, the marginal product of capital is equalized across countries.

Appendix I: Definitions of firm-level variables

Variables (DS/WorldScope code)	**Definitions**
Market value (mv)	Share price multiplied by number of ordinary shares in issue
Total assets (WC02999)	The sum of total current assets, long-term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets
Total liability (WC03351)	All short and long-term obligations expected to be satisfied by the company
Short-term debt and current portion of long-term debt (WC03051)	Portion of debt payable within one year, including current portion of long-term debt and sinking fund requirements of preferred stock or debentures
Current liabilities (WC03101)	Debt or other obligations that the company expects to satisfy within one year
Long-term debt (WC03251)	All interest bearing financial obligations, excluding amounts due within one year
Preferred stocks (WC03451)	A claim prior to the common shareholders on the earnings of a company and on the assets in the event of liquidation
Balance sheet deferred taxes (WC03263)	The accumulation of taxes which are deferred as a result of timing differences between reporting sales and expenses for tax and financial reporting purposes
Net income before extraordinary items (WC01551)	Income before extraordinary items and preferred and common dividends, but after operating and non-operating income and expense, reserves, income taxes, minority interest and equity in earnings
Extraordinary items and gain/loss sale of assets (WC01601)	Gains and losses resulting from nonrecurring or unusual events
Interest expenses (WC01251)	The service charge for the use of capital before the reduction for interest capitalized
Depreciation, depletion and amortization (WC01151)	Depreciation represents the process of allocating the cost of a depreciable asset to the accounting periods covered during its expected useful life to a business. Depletion refers to cost allocation for natural resources such as oil and mineral deposits. Amortization relates to cost allocation for intangible assets such as patents and leasehold improvements, trademarks, bookplates, tools and film cost.
Income statement deferred taxes (WC18188, WC18189)	Deferred domestic income tax represents the portion of deferred taxes due to the government of the country where the company is domiciled that have been expensed during the year. Deferred foreign income tax represents the portion of deferred taxes that are due to the government of the country where the company generates income but is not domiciled that have been expensed during the year.
Nation (WC06026)	It represents the country in which the company is domiciled.
Nation code (WC06027)	It represents the country under which the company is followed on Worldscope.
SIC code (WC07021)	SIC codes, a standard industry classification provided by the U.S. government, are assigned to both U.S. and non U.S. companies according to the type of business in which they are engaged.

Appendix II: Definitions of country characteristics

Variable	Label	Description	Source
GDPgrw	Growth rate of GDP per capita	Logarithm of Average growth rate of GDP per capita over 1994-2013.	The World Bank
Politic	Political risk index	It is the logarithm of the average index over 1996-2013. The index consists of 6 components, which are voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. A higher value of the index means better country governance.	The Political Risk Service of the International Country Risk Guide (ICRG)
Inv_prt1	Revised anti-director index	Summation of Vote by mail, Shares not deposited, Cumulative voting, Oppressed minority, Preemptive rights, and Capital to call meeting	Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008)
Inv_prt2	Anti-self-dealing index	Average of ex-ante and ex-post private control of self-dealing	Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008)
Info	Information transparency	It is the logarithm of the disclosure index. The index measures the strength of auditing and reporting standards. It is scaled between 1 and 7, with a higher value indicating stronger information transparency.	The Global Competitiveness Report
Fin_open	Financial liberalization	It is a ratio of foreign assets and foreign liabilities, including direct investments and portfolio investments from the International Investment Positions, over GDP. The ratio is averaged over 1994-2013.	The IFS of IMF
Fin_dev1	Stock market size	It is a ratio of market capitalization of listed shares to GDP. The ratio is averaged over 1994-2013.	The world bank
Fin_dev2	Credit market size	It is a ratio of domestic credit to private sector over GDP. The ratio is averaged over 1994-2013.	The world bank
Fin_dev3	Stock market turnover ratio	Ratio of the value of total shares traded to average market capitalization. The ratio is averaged over 1994-2013.	The world bank
Trd_open	Imports and exports	A ratio of imports and exports of goods and services over GDP. The ratio is averaged over 1994-2013.	The World Bank

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Table 1. Number of firms and aggregate variables of sample countries

This table presents the number of all publicly traded nonfinancial firms in 43 countries (21 developed market countries and 22 emerging market countries) along with the average aggregate variables in the sample for the period of 1994-2013. Data of U.S. companies are collected from the COMPUSTAT and data of non-U.S. companies are collected from the WorldScope. Only those countries that are initially introduced into the WorldScope before 1994 and have at least 30 publicly traded companies are included in our sample. Financial firms whose SIC codes belong to 6000-6999 are excluded from the sample. Firms in the sample are required to have data on the market and book value of capital for any two years between 1994 and 2013. We assume that a firm enters the sample at the end of the first year for which it has market and book value data and that it leaves the sample at the end of the last year for which it has market and book value data. The variable of Firm in this table represents the average number of firms each year for each country. Entering is the annual average number of firms entering the sample after year 1994. Exiting is the annual average number of firms leaving the sample before the year 2013. *BCAP* (in billions of dollars) is the average end-of-year aggregate book capital, computed as the summation of the end-of-year book value of long-term debt, short-term debt, and equity across all firms. Short-term debt is measured by debt in current liabilities; if it is not available, then short-term debt is measured by current liabilities. *MCAP* (in billions of dollars) is the average end-of-year aggregate market capital, computed as the sum of the market value of common stocks, the book value of long-term debt, short-term debt, and preferred stock across all firms. *CE* (in billions of dollars) is the average annual aggregate cash earnings, computed as the sum of income before extraordinary items, extraordinary items and discontinued operations, interest expenses, income statement deferred taxes, and depreciation and amortization. *INV* (in billions of dollars) is the mean of annual aggregate investment, computed as the change in book capital from year t to year t+1, plus depreciation.

Country	# of Sample firm	# of entering firms	# of exiting firms	*BCAP*	*MCAP*	*CE*	*INV*
Developed markets							
Australia	1,033	117	39	365	644	53	52
Austria	67	6	4	60	76	9	8
Belgium	101	8	6	180	259	26	28
Canada	1,535	189	84	666	995	96	107
Denmark	127	10	7	88	153	15	12
Finland	118	7	4	125	219	18	13
France	615	47	43	1,310	1,761	171	173
Germany	577	40	34	1,014	1,421	159	143
Hong Kong	640	50	8	634	818	77	91
Ireland	58	4	4	45	97	5	5
Italy	189	14	10	546	647	73	73
Japan	3,140	137	70	4,002	4,915	385	292
Netherlands	137	8	10	243	475	45	31
New Zealand	89	9	5	34	44	4	3
Norway	149	15	12	136	179	22	21
Singapore	411	36	12	177	222	19	22
Spain	119	6	6	411	574	62	55
Sweden	305	30	16	188	348	30	24
Switzerland	182	10	7	329	721	55	36
United Kingdom	1,362	108	112	1,646	2,855	267	211
United States	5,171	360	435	7,360	22,633	1,033	909

Table 1. cont.

Country	# of Sample firm	# of entering firms	# of exiting firms	*BCAP*	*MCAP*	*CE*	*INV*
Emerging markets							
Argentina	61	7	3	39	58	7	3
Brazil	102	11	4	292	360	38	32
Chile	139	9	5	133	165	15	17
China	1,434	167	17	1,107	1,815	138	225
Colombia	33	4	3	38	57	5	6
Czech Republic	30	8	5	24	29	4	3
Greece	218	16	10	64	102	7	8
India	1,087	126	20	328	574	51	49
Indonesia	249	18	4	79	141	12	10
Israel	197	24	8	77	107	9	10
Korea, Republic of	989	98	24	737	760	94	103
Malaysia	655	52	19	205	249	23	25
Mexico	99	7	5	191	306	32	25
Pakistan	132	10	13	17	25	3	2
Peru	74	8	4	22	39	4	4
Philippines	124	9	3	47	67	7	7
Poland	184	25	7	49	58	7	7
Portugal	56	5	4	74	94	10	10
South Africa	251	25	19	117	208	23	14
Sri Lanka	77	12	13	4	5	1	1
Thailand	347	21	5	104	156	16	14
Turkey	175	15	4	80	113	11	10

Table 2. Estimates of dollar-weighted return (DWR)

This table presents dollar-weighted return (DWR) of the aggregate corporate sector for 21 developed market countries and 22 emerging market countries (Panel A) and summary statistics of DWR estimates (Panel B). We compute the DWR as the internal rate of return on the aggregate market capital over the period of 1994-2013, assuming that firms are acquired at market value when they enter the sample and then sold at market value when they leave the sample or when the sample is liquidated in 2013. The *DWR* is thus obtained from the following equation:

$$0 = -MCAP_{1994} - \sum_{t=1994}^{T=2013} \frac{INV_t - CE_t}{(1+DWR)^{(t-1994)}} - \sum_{t=1994}^{T=2013} \frac{Enter_t - Exit_t}{(1+DWR)^{(t-1994)}} + \frac{MCAP_{2013}}{(1+DWR)^{20}}$$

where $MCAP_{1994}$ is the initial market capital of all firms entering the sample in year 1994; CE_t and INV_t are respectively the aggregate cash earnings and gross investments in year t of all firms entering the sample before *t*; $Exit_t$ is the terminal market capital of firms who leave the sample in year t, while $Enter_t$ is the initial market capital of firms who enter the sample in year *t*. Finally, $MCAP_{2013}$ is the final market capital of firms observed in year 2013. All inputs of the DWR computation equation are denominated in U.S. dollar.

Panel A: DWR estimates by country

Country	DWR	Country	DWR
Developed markets		**Emerging markets**	
Australia	10.30%	Argentina	5.20%
Austria	7.10%	Brazil	15.10%
Belgium	11.50%	Chile	5.70%
Canada	10.20%	China	8.40%
Denmark	11.20%	Colombia	11.00%
Finland	9.50%	Czech Republic	9.90%
France	7.30%	Greece	1.80%
Germany	7.60%	India	9.20%
Hong Kong	9.20%	Indonesia	8.70%
Ireland	9.20%	Israel	7.70%
Italy	6.50%	Korea, Republic of	5.80%
Japan	1.10%	Malaysia	4.10%
Netherlands	9.10%	Mexico	10.80%
New Zealand	6.50%	Pakistan	8.80%
Norway	8.40%	Peru	11.70%
Singapore	5.70%	Philippines	8.30%
Spain	9.60%	Poland	6.70%
Sweden	11.20%	Portugal	6.40%
Switzerland	11.80%	South Africa	10.40%
United Kingdom	9.10%	Sri Lanka	10.10%
United States	14.50%	Thailand	7.10%
		Turkey	8.00%

Table 2. cont.

Panel B: Summary statistics of DWR estimates			
	Developed markets	**Emerging markets**	**All countries**
Mean	8.9%	8.2%	8.5%
Stdev	2.8%	2.9%	2.8%
Min	1.1%	1.8%	1.1%
Q1	7.3%	6.5%	6.9%
Median	9.2%	8.4%	8.8%
Q3	10.3%	10.1%	10.3%
Max	14.5%	15.1%	15.1%

Table 3. Mean and median differences in DWR between country group pairs

This table reports mean and median difference tests for DWR between three different country group pairs. DWRs are denominated in U.S. dollars. Sample countries are categorized into poor and rich countries based on the average GDP per capita (Panel A), growing and stagnant countries based on average annual growth rate of GDP per capita (Panel B), and financially open and closed countries based on the sum of foreign assets and foreign liabilities scaled by GDP (Panel C). We test the mean and median differences in DWR between each country group pair. *P*-value is reported in parentheses. For the median difference test, *p*-value is based on the Wilcoxon test statistics.

Country groups	Obs.	Mean	Median
Panel A: Poor vs. rich countries			
Poor	22	8.2%	8.3%
Rich	21	8.9%	9.2%
Difference		-0.7%	-0.8%
		(p=0.446)	(p=0.313)
Panel B: Growing vs. stagnant countries			
Stagnant	22	8.6%	8.9%
Growing	21	8.5%	8.7%
Difference		0.2%	0.2%
		(p=0.832)	(p=0.780)
Panel C: Financially open vs. closed countries			
Closed	22	8.0%	8.3%
Open	21	9.1%	9.2%
Difference		-1.2%	-0.8%
		(p=0.178)	(p=0.239)

Table 4. Regression results of the DWR deviation on country-level variables

This table reports regression results of the deviation of a country's DWR from the cross-country median on a bunch of country-level variables. The dependent variable is the absolute value of (DWR_{median} - DWR_i), which are both denominated in U.S. dollars. Country-level variables are defined in Appendix II. Briefly, **Fin_open** is the mean ratio of foreign assets and foreign liabilities to GDP for the period of 1994-2013. **Ln_GDP** is the logarithm of average GDP per capita over 1994-2013. **GDPgrw** is the logarithm of the average growth rate of GDP per capita over 1994-2013. **Fin_dev1** is the mean ratio of market capitalization of listed companies over GDP for the period of 1994-2013. **Fin_dev2** is the mean ratio of domestic credit to private sector over GDP over 1994-2013. **Fin_dev3** is the average turnover ratio of stocks traded in the market during 1994-2013. **Trd_open** is the average ratio of imports and exports of goods and services over GDP over 1994-2013. **Inv_prt1** is the revised anti-director rights index and **Inv_prt2** is the anti-self-dealing index, both constructed by Djankov et al. The higher the indices are, the better is the protection of minority shareholder rights. **Politic** is the logarithm of the average political risk index. The higher the index is, the more stable is the political environment. **Info** is a measure of information transparency. The higher the index is, the more transparent is the information environment. Heteroscedasticity-consistent *p*-values are reported in parentheses.

Dependent variable: the absolute value of (DWR_{median} - DWR_i)											
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fin_open	0.000	-0.008	-0.002	-0.001	-0.002	0.000	0.003	0.000	0.000	-0.002	0.001
	(0.981)	(0.094)	(0.465)	(0.639)	(0.568)	(0.854)	(0.240)	(0.938)	(0.878)	(0.631)	(0.689)
Ln_GDP		0.009									
		(0.070)									
GDPgrw			-0.370								
			(0.082)								
Fin_dev1				0.004							
				(0.429)							
Fin_dev2					0.006						
					(0.469)						
Fin_dev3						-0.004					
						(0.269)					
Trd_open							-0.012				
							(0.152)				
Inv_prt1								-0.003			
								(0.785)			
Inv_prt2									-0.013		
									(0.512)		
Politic										0.014	
										(0.580)	
Info											-0.021
											(0.417)
R^2	0.001	0.113	0.079	0.013	0.027	0.021	0.115	0.004	0.012	0.009	0.017
Obs.	43	43	43	43	43	43	43	43	43	43	43

Table 5. Analysis of DWR in local currency

Panel A of this table reports mean and median difference tests for DWR (denominated in local currency) between three different country group pairs. Sample countries are categorized into poor and rich countries based on the average GDP per capita, growing and stagnant countries based on average annual growth rate of GDP per capita, and financially open and closed countries based on the sum of foreign assets and foreign liabilities scaled by GDP. We test the mean and median differences in DWR (denominated in local currency) between each country group pair. *P*-value is reported in parentheses. For the median difference test, *p*-value is based on the Wilcoxon test statistics.

Panel A. Comparison between country-group pairs

Country groups	Obs.	Mean	Median
Poor vs. rich countries			
Poor	22	12.4%	12.5%
Rich	21	8.3%	8.6%
Difference		4.1%	3.9%
		(p=0.011)	(p=0.040)
Growing vs. stagnant countries			
Stagnant	22	10.2%	8.6%
Growing	21	10.7%	9.4%
Difference		-0.5%	-0.8%
		(p=0.766)	(p=0.552)
Financially open vs. closed countries			
Closed	22	12.2%	12.5%
Open	21	8.5%	8.6%
Difference		3.7%	3.9%
		(p=0.022)	(p=0.048)

Table 5. cont.

Panel B of this table reports regression results of the deviation of a country's DWR (in local currency) from the cross-country median on a bunch of country-level variables. The dependent variable is the absolute value of (DWR_{median} - DWR_i), both of which are denominated in local currency. Country-level variables are defined in Appendix II. Briefly, **Fin_open** is the mean ratio of foreign assets and foreign liabilities to GDP for the period of 1994-2013. **Ln_GDP** is the logarithm of average GDP per capita over 1994-2013. **GDPgrw** is the logarithm of the average growth rate of GDP per capita over 1994-2013. **Fin_dev1** is the mean ratio of market capitalization of listed companies over GDP for the period of 1994-2013. **Fin_dev2** is the mean ratio of domestic credit to private sector over GDP over 1994-2013. **Fin_dev3** is the average turnover ratio of stocks traded in the market during 1994-2013. **Trd_open** is the average ratio of imports and exports of goods and services over GDP over 1994-2013. **Inv_prt1** is the revised anti-director rights index and **Inv_prt2** is the anti-self-dealing index, both constructed by Djankov et al. The higher the indices are, the better is the protection of minority shareholder rights. **Politic** is the logarithm of the average political risk index. The higher the index is, the more stable is the political environment. **Info** is a measure of information transparency. The higher the index is, the more transparent is the information environment. Heteroscedasticity-consistent *p*-values are reported in parentheses.

Panel B. Regression analysis

Dependent variable: the absolute value of (DWR_{median} - DWR_i) (in local currency)											
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fin_open	-0.016	-0.016	-0.021	-0.015	-0.010	-0.016	-0.011	-0.016	-0.016	-0.003	-0.016
	(0.000)	(0.074)	(0.001)	(0.003)	(0.045)	(0.001)	(0.015)	(0.001)	(0.001)	(0.699)	(0.003)
Ln_GDP		0.000									
		(0.959)									
GDPgrw			-0.821								
			(0.035)								
Fin_dev1				-0.003							
				(0.734)							
Fin_dev2					-0.016						
					(0.133)						
Fin_dev3						-0.003					
						(0.712)					
Trd_open							-0.020				
							(0.131)				
Inv_prt1								0.002			
								(0.934)			
Inv_prt2									-0.027		
									(0.435)		
Politic										-0.093	
										(0.075)	
Info											0.007
											(0.887)
R^2	0.253	0.253	0.339	0.254	0.292	0.255	0.324	0.253	0.263	0.337	0.253
Obs.	43	43	43	43	43	43	43	43	43	43	43

Table 6. Dynamics of the convergence in DWR

This table reports regression results of the change in DWR of country i from year t to year t+k (i.e., $DWR_{i,t+k} - DWR_{i,t}$, where k takes the value of 1, 2, or 3) on the deviation (i.e., *dev*) of country i's DWR from the cross-country median DWR in year t (i.e., $DWR_{median,t} - DWR_{i,t}$). $DWR_{i,t}$ is country i's DWR estimated for the period from the start of our study period to year t. The value for t increases from 2003 to 2013. The regression coefficient quantifies how much of the initial deviation is corrected over the next k years. Panel A presents the results using the full sample of DWR estimates. Panel B reports the results using a subsample excluding DWR estimates in 2008 and DWR changes from 2009-2011. Panel C is based on a subsample excluding DWR estimates beyond the 5th and 95th percentile. Finally, Panel D contains results from a subsample of DWR estimated from 2008 onwards. Heteroscedasticity-consistent p-values are reported in parentheses.

Dept. var.	$DWR_{t+1} - DWR_t$		$DWR_{t+2} - DWR_t$		$DWR_{t+3} - DWR_t$	
	Coeff	(p-val)	Coeff	(p-val)	Coeff	(p-val)
Panel A: Full sample of DWR estimates						
dev	0.624	(<.0001)	0.796	(<.0001)	0.963	(<.0001)
Year FE	yes		yes		yes	
Country FE	yes		yes		yes	
R^2	0.652		0.744		0.812	
Obs.	430		387		344	
Panel B: Subsample excluding DWR estimates in 2008 and DWR changes in subsequent three years (2009-2011)						
dev	0.589	(<.0001)	0.771	(<.0001)	0.979	(<.0001)
Year FE	yes		yes		yes	
Country FE	yes		yes		yes	
R^2	0.662		0.741		0.820	
Obs.	387		344		301	
Panel C: Subsample excluding DWR estimates below 5th and above 95th percentiles						
dev	0.506	(<.0001)	0.730	(<.0001)	0.923	(<.0001)
Year FE	yes		yes		yes	
Country FE	yes		yes		yes	
R^2	0.672		0.794		0.850	
Obs.	376		326		278	
Panel D: Subsample of DWR estimated up to 2008 as the initial value						
dev	0.768	(<.0001)	0.848	(<.0001)	0.923	(<.0001)
Year FE	yes		yes		yes	
Country FE	yes		yes		yes	
R^2	0.619		0.845		0.838	
Obs.	215		215		215	

Table 7. Convergence in *DWR* and financial openness

This table reports regression results of the change in DWR of country i from year t to year t+1 (i.e., $DWR_{i,t+1} - DWR_{i,t}$) on the deviation (i.e., *dev*) of country i's DWR from the cross-country median DWR in year t (i.e., $DWR_{median,t} - DWR_{i,t}$), financial openness, and their interactive terms. $DWR_{i,t}$ is country i's DWR estimated for the period from the start of our study period to year t. The value for t increases from 2003 to 2013. A country's financial openness is measured by the first difference of the sum of its foreign assets and foreign liabilities (scaled by GDP). Each year, we sort sample countries into 2, 3, or 5 groups, respectively, by their financial openness and construct three sets of dummy variables measuring a country's financial openness. Specifically, we define countries above the median cross-border capital flows as *D1_open*, countries in the top tercile as *D2_open* and countries in the bottom tercile as *D2_close*, and countries in the top quintile as *D3_open* and countries in the bottom tercile as *D3_close*. We define interactive terms between *dev* and dummy variables of financial openness as *dev*D1_open, dev*D2_open, dev*D2_close, dev*D3_open,* and *dev*D3_close*. Heteroscedasticity-consistent p-values are reported in parentheses.

Dept. var.	$DWR_{t+1} - DWR_t$		$DWR_{t+1} - DWR_t$		$DWR_{t+1} - DWR_t$	
	Coeff	(p-val)	Coeff	(p-val)	Coeff	(p-val)
dev	0.576	(<.0001)	0.575	(<.0001)	0.569	(<.0001)
D1_open	0.000	(0.928)				
dev*D1_open	**0.089**	**(0.068)**				
D2_close			-0.001	(0.635)		
D2_open			0.000	(0.904)		
*dev*D2_close*			0.001	(0.984)		
dev*D2_open			**0.127**	**(0.031)**		
D3_close					-0.002	(0.381)
D3_open					-0.003	(0.282)
*dev*D3_close*					-0.039	(0.528)
dev*D3_open					**0.192**	**(0.033)**
Year FE	yes		yes		yes	
Country FE	yes		yes		yes	
R^2	0.657		0.660		0.665	
Obs.	430		430		430	

Figure 1. DWR in U.S. dollars on aggregate corporate sector in 43 countries

This figure plots the dollar-weighted return (DWR) denominated in U.S. dollars, against the average growth rate of GDP per capita over the period of 1994 to 2013.

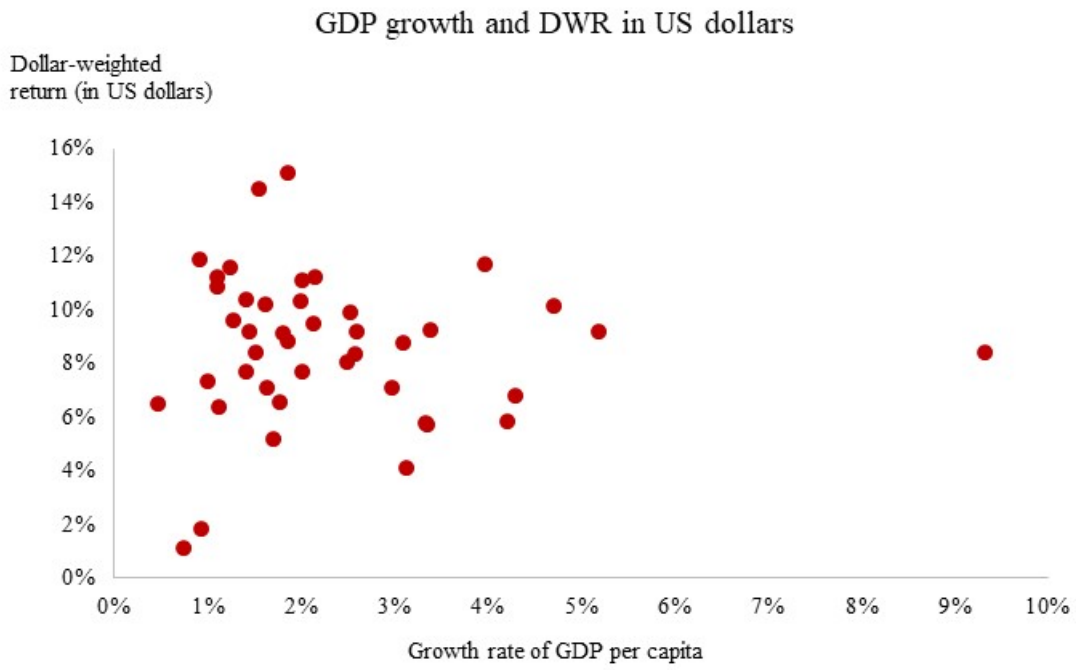
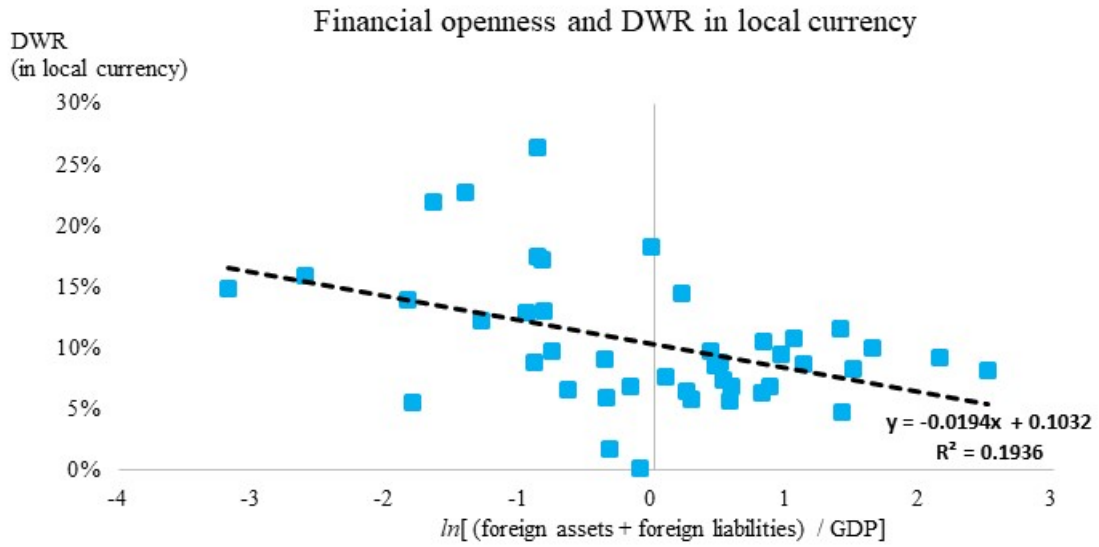


Figure 2. DWR and financial openness

This figure plots the dollar-weighted return (DWR) in relation to financial openness. A country's financial openness is the sum of the country's foreign assets and foreign liabilities, divided by its GDP. We then average the measure over the period of 1994 to 2013 and put it in log. DWRs are denominated in U.S. dollars (Panel C) or in local currency (Panel A). The difference between the two DWRs for a given country is the DWR on the country's currency itself (Panel B).

Panel A. Financial openness and DWR denominated in local currency



Panel B. Financial openness and DWR on local currency itself (relative to US dollars)

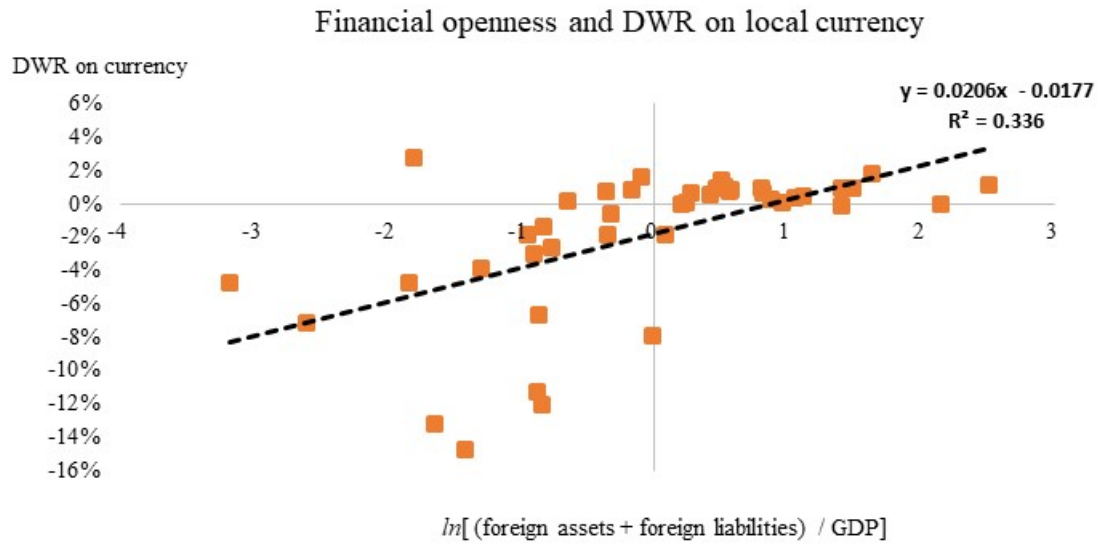


Figure 2. cont.

Panel C. Financial openness and DWR denominated in U.S. dollars

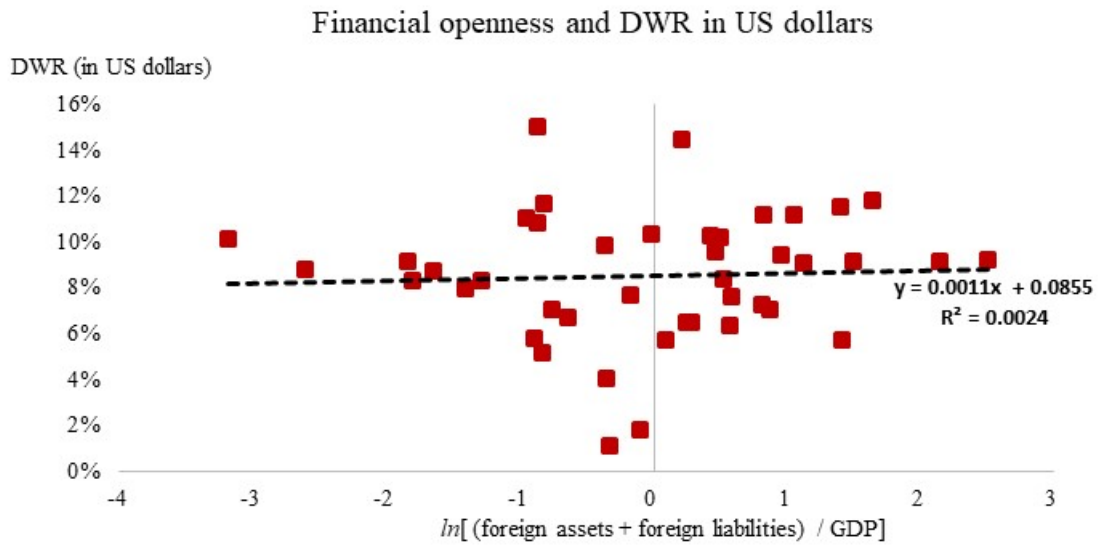


Figure 3. Cross-sectional dispersion in DWR in U.S. dollars

This figure plots the dispersion in dollar-weighted returns (DWRs) denominated in U.S. dollars across countries. The DWRs are estimated for different periods. Specifically, we begin by estimating the DWR of a given country for the first 10 years of the estimation period (1994-2003) and then increase the estimation period by one year (1994-2004, 1994-2005, 1994-2006, etc.) until we reach the full sample period of 1994-2013. By doing so, we obtain 11 DWRs for the country. This exercise is repeated for other countries. The cross-sectional dispersion is then computed for a set of DWRs that are estimated over the same period.

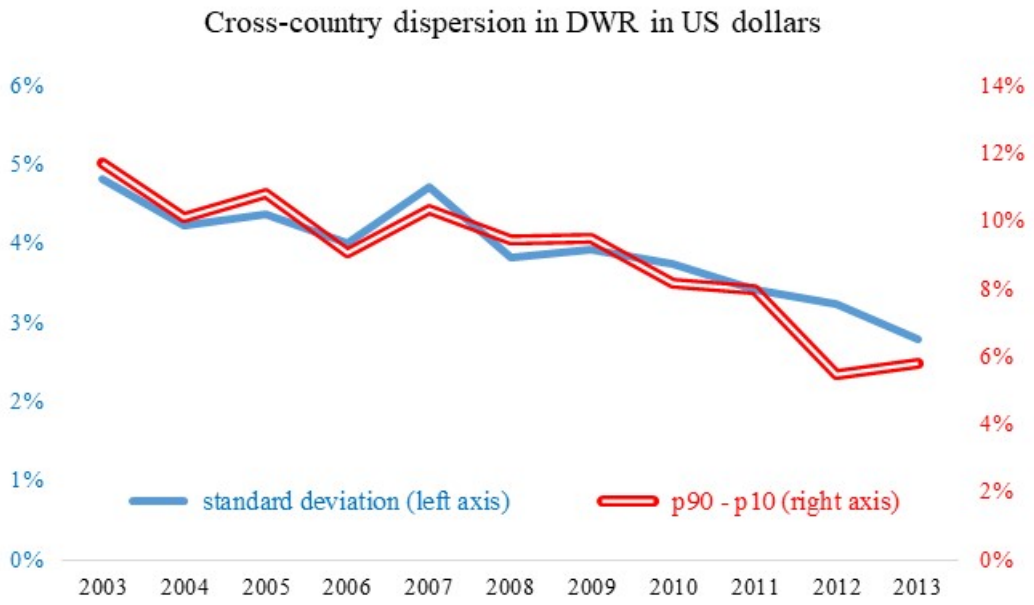
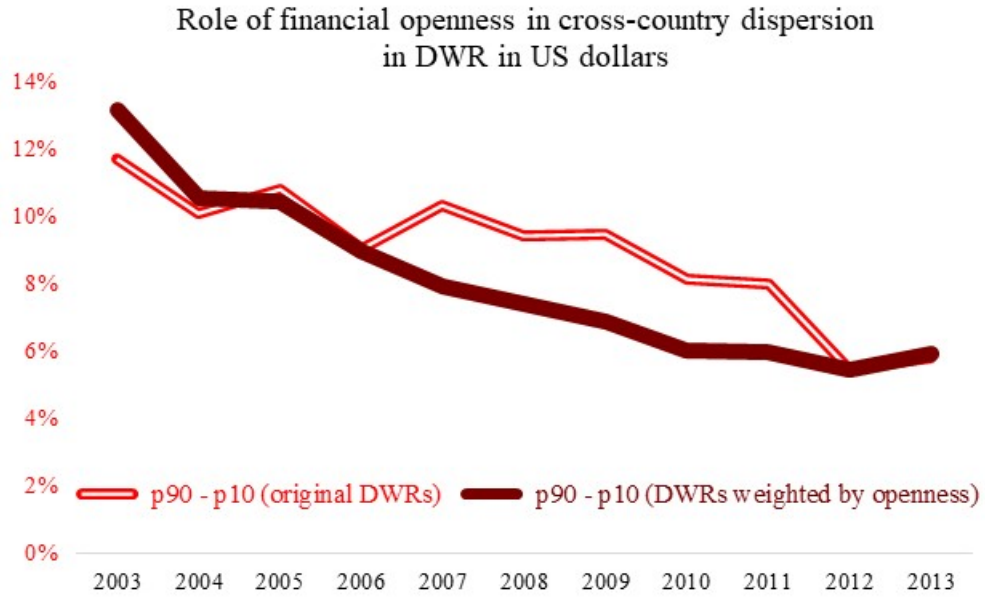


Figure 4. Cross-sectional dispersion in DWR in U.S. dollars – Weighted by financial openness

This figure plots the dispersion in dollar-weighted returns (DWRs) denominated in U.S. dollars across countries. The method used for this figure is the same as the one for Figure 3, except: (1) we only use the difference between the 90th and the 10th percentiles of DWRs and (2) the difference between the 90th and the 10th percentiles of DWRs is computed in two different ways—either based on original DWRs (i.e., those used in Figure 2) or based on the DWRs weighted by the rankings of the country's financial openness during the year.