Free Flows, Limited Diversification: Openness and the Fall and Rise of Stock Market Correlations, 1890-2001*

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ABSTRACT: Using a new dataset on capital account openness, we investigate why equity return correlations changed over the last century. Based on a new, long-run dataset on capital account regulations in a group of 16 countries over the period 1890-2001, we show that correlations increase as financial markets are liberalized. These findings are robust to controlling for both the Forbes-Rigobon bias and global averages in equity return correlations. We test the robustness of our conclusions, and show that greater synchronization of fundamentals is not the main cause of increasing correlations. These results imply that the home bias puzzle may be smaller than traditionally claimed.

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That international diversification is good for stock market investors is a key result of modern portfolio theory. As early as 1909, Henry Lowenfeld, in his *The Geographical Distribution of Capital*, argued along similar lines. A long lineage of papers demonstrates that international equity market correlations are lower than industry correlations within one country. Consequently, investors should be able to improve the risk/return profile of their portfolio significantly if they put part of it into foreign equities (Grubel 1968, Levy and Sarnat 1970).

At the same time, a growing body of literature shows that international equity market correlations are not constant over time. The *Economist* ("Dancing in Step," March 24, 2001) highlighted that stock market correlations grew sharply in the 1990s. Goetzmann et al. (2005) were among the first to examine return correlations over the long run. They find major changes during the period 1860-2000. The risk reduction achievable by sending funds abroad has fallen from 90 percent in the 1950s to 65 percent at the end of the twentieth century (Goetzmann et al. 2005). Benefits can still be substantial, but they are much smaller than analysts writing in the 1960s believed. Vanishing opportunities for diversification have obvious implications for the "home bias" literature.

Why are equity market correlations changing over time? And why do equity market correlations drop precipitously during the interwar years, only to increase slowly during the postwar period? Figure 1 shows our *explanandum.* We plot both standard correlations and volatility-corrected correlations (using the Forbes-Rigobon method) for a set of 16 developed countries. Our dataset spans the whole period from the 19th century heyday of global capital flows, across the period of turmoil during the interwar period, to the recent, gradual return to growing cross-border flows (Bordo, Eichengreen, and Irwin 1999; Bordo, Eichengreen, and Kim 1998; Obstfeld and Taylor 2002). Independent of the measure we use, equity market correlations were high in the period before World War I, fall to relatively low levels during the world wars and interwar years (with a rebound during the Great Depression), and then gradually increase until they reach unprecedented levels in the postwar period.

A variety of interpretations have been suggested for this pattern, from increased trade linkages to increasing contagion in financial markets, driven by changes in investor composition. There is a common view that liberalized markets show a higher degree of co-movement with world indices (Bekaert and Harvey 2000). In an increasingly connected world, real variables

could start to move in unison as a result of greater trade, co-ordinated policies, etc. Alternatively, growing specialization could lead to growing divergence of economic cycles.

This paper establishes that the liberalization of capital accounts was a major causal factor behind growing return correlations, exploiting a new extension of a long-run dataset on policy-induced openness. We undertake a comprehensive analysis of the fall and rise of return correlations over the last century, using the first consistent, detailed dataset on capital account openness since 1890. Such long-run data, we argue, is crucial for determining the effects of policy for two reasons. First, many papers in the liberalization literature focus on regulatory changes at the frequency of months or, at most, years. Implementation lags can and often are long and variable. This may in turn obscure the true consequences of new rules and regulations. Second, we have detailed information on changes in openness. Over the last century, capital controls often obstructed portfolio diversification. Policy-induced segmentation produced artificially low correlations of equity market returns. As constraints on investors declined and as regulatory rules governing capital accounts converged – especially in the post-war period – share prices began to co-move. Our findings have important implications for sustainable risk-return tradeoffs in international equity portfolios. First, the set of feasible diversification opportunities was always much smaller than simple analysis of correlations from the immediate post-war period suggests. Much of the investment advice derived from the early studies on diversification benefits could not have been followed in practice. Capital accounts in Europe, for example, were largely closed to current and capital account transactions before 1959, and did not become fully open until the 1990s. Second, if greater openness itself is responsible for driving up correlations, investors may be chasing a chimera of greater stability by putting their money into overseas markets. While the benefits for early investors may have been large, the benefits of international diversification have declined rapidly as more and more capital moved overseas. When key investors switch from national to foreign, global factors start to drive national returns. While some benefits remain, optimal international investment diversification in a new equilibrium characterized by massive international capital flows may be less than what the artificially low correlations of the 1950s and 1960s implied. The home bias puzzle may therefore be less puzzling than many authors believe. Investors often could not easily move their investments abroad; when they did, returns started to move in lockstep.

Papers closest in scope to ours are Goetzmann et al. (2005), and Bekaert and Harvey (2000). Goetzmann et al. (2005) assemble a comprehensive dataset on equity return correlations over the last 150 years, and analyze the extent to which they have changed over time. The authors underline the extent to which correlations are time-varying. They also show how the opening up of additional markets has expanded the set of investment choices.[1] Bekaert and Harvey (2000) show that correlations and betas increase after liberalization of capital markets, using a number of case studies from emerging countries in the recent past.[2]

Other papers also touch on the question of equity correlations and financial openness. Dellas and Hess (2005) show that stock market synchronization increases with the liquidity of equity markets and greater financial depth. Bekaert, Hodrick and Zhang (2005) examine correlations over the period 1980-2003, finding no evidence of an upward trend in correlations. De Jong and de Roon (2005) document that integration into world capital markets increases local market betas relative to the world index. At the same time, they find that the cost of capital and expected returns fall by 4.5%, which suggests that diversification opportunities exceeded the increasing influence of the world beta. Carrieri et al. (2007) study eight emerging markets and argue that correlations are an imperfect measure of international market integration. They also conclude that liberalization played a big role in furthering integration for the period 1977-2000. Taylor and Tonks (1989) use cointegration analysis to conclude that the UK exchange control liberalization had no immediate impact on stockmarket correlations, but led to long-run shifts.[3] Hunter (2005) examines Argentine, Mexican and Chilean ADRs. He demonstrates that, following liberalization of capital markets in these countries, integration did not necessarily increase; in some cases, it actually declined. If the increase in integration immediately after liberalization does not necessarily last, we need studies over the long term to determine how changes in policy are related to equity market correlations.

Other related literature contains several important contributions. Time-varying market integration was analyzed by Bekaert and Harvey (1995). Some recent studies find that

[1] For a survey of research on the effects of capital account liberalization, cf. Eichengreen 2002.
[2] In related work that examines the effects of capital account liberalization on macroeconomic stability, Bekaert, Harvey and Lundblad (2004) document a reduction in volatility.
[3] In a similar vein, Dickinson (2000) examines the relative contributions of macroeconomic factors and of financial globalization on the cointegration of stockmarkets.

international diversification benefits for US investors have not declined over the last two decades (DeSantis and Gerard 1997, Lewis 2006). Ang and Bekaert (2002) argue that while correlation patterns shift, diversification benefits are still substantial. Bekaert, Harvey and Lumsdaine (2002) find that increases in market integration take substantial amounts of time after an official change in policy, and that different financial series imply different speeds of transition. Brooks and Del Negro (2004) show that higher correlations in the 1990s were largely driven by the effects of the tech bubble, and conclude that benefits of cross-country diversification should still be substantial after the bubble's demise. The effects of liberalized capital flows on economic performance are analyzed by, inter alia, Henry (2000).[4] Coeurdacier and Guibaud (2004) argue that shocks to wealth and portfolio-rebalancing are responsible for growing co-movements of stock market indices.

Another closely related body of literature analyzes the extent of international capital market integration over the long run. Obstfeld and Taylor (2005) argue that the period since the late 19th century saw a broadly "U-shaped" pattern, with a trough in the interwar period and broadly similar degrees of integration at the beginning and end of the 20th century. Obstfeld and Taylor (2002) examined equity market correlations over the long run, but without an explicit link with policy variables. Volosovych (2005) focuses on international bond markets during the period 1875 to 2002. He employs principal components analysis to conclude that integration in the last period of globalization during the late 19th century was markedly lower than in the last 20 years. Similar data and methods were employed by Mauro et al. (2002), who argue that contagion in modern-day bond markets has become much greater than it was historically. Bordo and Murshid (2002) find the opposite, based on their measure of currency crises.

We proceed as follows. In section 1, we describe the datasets on openness and on equity return correlations, as well as for the various controls. We employ a new version of the widely-used Quinn-Toyoda measure of openness, based on a detailed coding of legal provisions, that now extends back to 1890. The equity return data is from a range of standard sources. The results section examines to what extent we can find a systematic link between openness and returns correlations in our panel, and subject the data to a range of robustness tests and extensions. This

[4] Lewis (2006) also documents that for US investors, the benefits from holding foreign stocks cross-listed in the US have declined sharply.

offers additional support for the hypothesis that higher flows drive up equity return correlations. Section 3 concludes.

1. Data

We use a single, consistently defined measure of de jure capital account openness –*CAPITAL* - for the period 1890-2001. Quinn (1997) and Quinn and Toyoda (2007) derive measures of capital and current account openness for the post-war period from the IMF's *Annual Report on Exchange Restrictions*, based on a coding of the legal provisions governing international financial transactions. To create a measure of capital account openness over the long term (1890-1938), Quinn (2003) used the coding rules described in Quinn (1997), and as data sources League of Nations (1923, 1922). The information in these sources is supplemented by Einzig (1934), Ellis (1939, 1940), IMF (1949), and Palyi (1972). We employ data for 16 of the countries in the sample.[5] The Quinn-Toyoda measures of capital account and current financial account openness are widely used in empirical studies in finance and economics.[6]

CAPITAL measures if capital payments can be received from abroad or sent abroad without restrictions, how likely permissions are to be granted, and if direct and portfolio investment is curtailed. It is therefore a composite of de jure and de facto restrictions on capital flows. It is a more finely graded measure of openness than the dichotomous variables compiled by the IMF itself (which requires an all-or-nothing decision about when a country should be counted as "closed"). Openness on this measure varies from 0 (completely closed) to 100 (no restrictions). Values below 50 generally indicate that international capital transactions are highly restricted.

To fix ideas, we briefly describe how the data was coded with respect to securities in two prominent cases. We take Britain and France in 1965 as illustrative. British controls on potential capital flows in the 1960s were extensive. The IMF (1965) noted the web of British regulations

[5] These are: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, and the United States.

[6] See Eichengreen (2002) and Kose, Prasad, Rogoff, and Wei (2006) for reviews. Recent studies in finance and economics using the Quinn-Toyoda measure have examined whether capital account openness influence corporate tax rates (Devereux, Lockwood, and Redoano 2008; Schwarz 2007), currency risk premia (Lustig and Verdelhan 2007), currency crises (Ranciere, Tornell, and Westermann 2008), economic growth (Bekaert, Harvey, and Lundblad 2005; Quinn and Toyoda 2008), financial integration (Imbs 2006), growth opportunities and market integration (Bekaert, Harvey, and Lundblad 2007), and industry growth (Vlachos and Waldenstrom 2005).

and restrictions on direct and portfolio investments. In particular, the rules governing transfers of securities between UK residents and nonresidents were extensive and targeted at a) inward portfolio flows especially, and b) forcing settlements in currencies other than sterling [IMF 1965, p. 549]:

> [While] transactions in securities of all types may be carried out freely between residents of the United Kingdom. …. permission is required for all transfers of securities in the United Kingdom in which a nonresident is involved as either transferor or transferee, but most transferors are covered by a general authority.
>
> Nonresidents […] may buy any securities on a recognized stock exchange in the United Kingdom [but only] against payment from an External Account; against payment from a Blocked Account, they may buy most sterling securities. Securities so purchased may be exported from the United Kingdom. Foreign currency securities may be sold by nonresidents on a stock exchange in the United Kingdom for settlement only in foreign currency. In no circumstances may settlement be in sterling.

Non-resident access to the UK securities markets for capital-raising was also controlled through a permit system:

> Foreign-owned firms and foreign individuals must obtain Treasury permission in order to raise capital in the United Kingdom, and U.K. resident subsidiaries of foreign companies are required to obtain consent from the Treasury before borrowing in the United Kingdom or before issuing shares or other securities to nonresidents. Such permission is freely given for borrowing for the purpose of financing the company's day-to-day business, but is not normally given for any expansion of manufacturing capacity except for companies whose activities are regarded as bringing special advantages to the U.K. economy.

Similarly, residents faced significant (but fewer) restrictions on the sources of funds for outward portfolio purchases:

> Residents of the United Kingdom may make capital transfers without restriction to other Sterling Area countries, except Hong Kong (see section on Exchange Control Territory, above). All capital transfers by residents to countries outside the Sterling area require approval. …. The purchase of foreign currency securities outside the Sterling Area must also be financed with investment currency or, in some cases, by long-term borrowing outside the Sterling Area.
>
> The permission requirements for nonresident securities purchases, the restrictions on uses and sources of funds by nonresidents, and the general restrictions on the currency used in settlements for nonresident transactions amount to extensive inward restrictions.

> Outward flows, while still restricted, were affected less by onerous restrictions. Britain in 1965 receives a CAPITAL score of 37.5 (out of 100), which implies extensive controls of the form of investments and the way they can be paid for. France in 1965 was, in contrast, much less restrictive. The IMF noted that
> Securities may be imported and exported freely through authorized banks as follows: imported on behalf of residents or nonresidents, exported on behalf of nonresidents […], or exported on behalf of residents for the purpose of selling the securities in accordance with the regulations mentioned in the preceding paragraph. Dealings in securities on a spot or forward basis may be made in France by all nonresidents. Residents may carry out spot forward transactions in securities on foreign stock exchanges.

Nonresidents, in particular, had fewer restrictions on securities and other investments in France compared to Britain:

> "Issues of securities in France by non-residents require the approval of the ministry of Finance…[But], within the limits described below, nonresidents may freely make investments in France and deal in securities in France. They are permitted to repatriate the proceeds accruing from the liquidation of approved investments and from the sale of their securities in France. [IMF 1965, p. 197.]

In general, "nonresidents may freely make direct investments in France and deal in securities in France…". [IMF 1965, p. 198] France, in 1965, received a score of 75 (out of 100), which implies moderate controls.

Figure 2 shows the development of average openness and the distribution within the sample. At the end of the 19th century, openness is high, approaching the maximum of 100 in many cases. Over the 20th century, it follows the "U-shape" identified by Taylor and Obstfeld (2003) for the globalization of capital markets overall. World War I sees a sharp decline, followed by a recovery in the interwar period prior to the Great Depression. After 1929, capital openness declines rapidly, and falls to low levels just after WW II.[7]

The postwar period shows two periods of liberalization – one immediately after the end of hostilities, with average openness recovering to approximately 75 by the early 1960s. The second liberalization wave started after the collapse of the Bretton Woods System, and continued

[7] It is not possible to measure capital account openness from 1940 to 1945 as the main data sources used to construct it either cease to function (League of Nations after December 1939) or have not yet formed (IMF). Information about financial openness for many countries from 1946 onward is found in IMF 1949.

more or less unchecked until the end of our sample period. By the end of the twentieth century, openness was as high as it had been at the end of the nineteenth.

In principle, there are two strategies available to researchers interested in equity return correlations over the long term – using all available markets, with shifting sample composition over time, or focusing on a (much smaller) subset of indices in continuous observation over the very long run. Goetzman et al. (2005) mainly use a stable set of markets for which data for the past century is available. We follow a similar approach, favoring consistency and ease of interpretation over breadth of coverage, and focus on our set of sixteen countries for which we have almost uninterrupted data series spanning the period 1890 to 2001.

We calculate the returns as monthly log differences of the main country return indices, taken from Global Financial Data.[8] Correlations are derived for 29 non-overlapping 4-year periods from 1890 to 2006. With 16 countries, we can draw on 120 country-pairs for each time period. This gives us a theoretical maximum of 3,480 observations. Because of missing observations, our dataset contains a total of 2,263 observations. Table 1 summarizes the main statistics. Real return correlations in our dataset range from -0.48 to 0.905, with an average of 0.31. Corrected for the Forbes-Rigobon bias, the mean falls to 0.16, and the maximum correlation is 0.78.

To control for changes in the co-movements of fundamentals, we use data on GDP growth, interest rates, and trade. From Maddison's (2002) GDP figures, we derive growth correlations. The accuracy and reliability of his figures has been questioned. Discussion mainly centers on Maddison's use of price indices (Prados de la Escosura 2000). Given that no comprehensive alternative data series are available and the majority of researchers accept the Maddison figures as a starting point, we use them for our analysis. In the spirit of Bracker et al. (1999), to examine other real linkages, we employ the Barbieri (2002) dataset on trade volumes to derive bilateral trade intensity. To control for other financial shocks that might drive equity return correlations, we include data on 10-year government bond yields, taken from Global Financial Data. Interest rates are highly correlated – with an average coefficient of 0.4. The range extends from -0.99 to 0.99.

[8] Variable codes for the equity indices used are available from the authors upon request.

Equity market correlations were initially modest, but rose from around 0.1 to 0.2 by the outbreak of WW I (Figure 3). They appear to have more of a "J-shape", similar to the pattern identified by Volosovych (2005). Together with the resumption of free capital flows in the interwar period, they rose in the second half of the 1920s, and peaked during the Great Depression. During the 1930s, they fell to low levels, bottoming out in the period 1942-45. The postwar period saw a recovery and a first peak after the end of Bretton Woods. From the late 1980s, correlations jumped up, reaching levels of 0.5 and above for the past two decades.

As Forbes and Rigobon (2002) demonstrate, measured correlations are affected by the volatility of returns. We use their correction:

$$\rho_{it} = \frac{\rho^{u}_{it}}{\sqrt{1+\delta_{it}\left[1-(\rho^{u}_{it})^{2}\right]}} \qquad (1)$$

where ρ_{it} is the corrected correlation coefficient for country-pair i at time t, ρ^{u}_{it} is the uncorrected correlation, and δ_{it} is the increase in the variance of the returns in any four-year interval relative to the period with the minimum variance. In effect, ρ_{it} is a scaled-down version of ρ^{u}_{it} , with the magnitude of the adjustment depending on the relative increase in the variance of returns relative to a base period. Since the correction is not without difficulties, we will examine both the corrected and uncorrected measures.[9]

Figure 1 contrasts the simple and Forbes-Rigobon corrected series of correlations. The key finding is that, once corrected, equity market correlations in our set of 55 country pairs do not increase much between the early 1900s and the late 1980s. With the exceptions of two dips during the 1920 and the 1940s, share price correlations are broadly stable over almost a century. Higher correlations during the Great Depression are largely driven by the rise in volatility. Much

[9] A problem with the Forbes-Rigobon correction is that it may use data from the future to correct the past data, and does so across differing regimes. For example, the modal year for the minimum variance among the 120 country pairs is 1962-65: 33 pairs experience their lowest variance then. For these 33 pairs, data from 1962-65 is used to adjust data from, e.g. 1958-61 and 1890-93 and 1998-2001, which represent very different regimes. Moreover, economic actors presumably adjusted current behavior in light of past values of variance, leaving the question of whether the adjustment is exogenous. See also Corsetti, Pericoli, and Sbracia (2002), who argue that the Forbes-Rigobon method overstates the upward bias. To the extent that we still find significant effects even with the large correction of the Forbes-Rigobon method, we are establishing a lower bound on the true effect.

of the increase in simple correlations after the 1970s is also the result of higher volatility, and does not signal an increase in equity market interdependence. The rise in the late 1980s, however, is obvious in both series. The final four four-year periods contain the highest average observed levels of equity market correlations during the entire period, for both the Forbes-Rigobon corrected and uncorrected series.

Table I provides descriptive statistics of the main variables in our dataset. Table II gives pairwise correlation coefficients. Most variables are highly correlated with each other. In particular, capital account openness is highly and positively correlated with return correlations, corrected and uncorrected. The correlation coefficient of growth rates is also significantly higher where capital accounts are more open, but the coefficient is not large (0.09). This suggests that fundamentals may be more synchronized in country pairs that allow for free capital flows – an issue to which we will return later. Greater openness to trade, and more bilateral trade, also seems to go hand in hand with a more open capital account, and with higher return correlations.

2. Results

What explains the rise and fall of equity market correlations over the last century? Using uncorrected as well as Forbes-Rigobon corrected correlations as indicators of interdependence between markets, we examine if changes can be explained by policy-driven openness on one hand, and by fundamentals on the other. Results suggest that both factors play a role, but that the impact of regulation-induced financial openness is stronger. Before analysing our data for the last century as a whole, we first return to our earlier case study of France and the UK to examine in more detail these countries' regulatory regime in the postwar era.

A. Case study

During the period 1958-61, equity return correlations between the UK and France were a mere 0.2 (uncorrected, and 0.17 Forbes-Rigobon corrected). This should have made it highly attractive for UK investors to buy French equities, and vice versa. Yet, as noted earlier, capital account openness was low. In 1965, for example, for *CAPITAL*, the scores are 75 for France and 37.5 for Britain, for an average of 56.25. Our earlier detailed look at the regulation in place in 1965 suggests that British investors could not easily have purchased French shares, and French

investors could not have easily invested in Britain. The potential portfolio diversification that beckoned on the other side of the channel was real enough – but tight rules on permissible transactions provided a very effective barrier to actual flows for the British side.

By the late 1960s, with the Bretton-Woods system under increasing strain, France tightened its rules on capital account transaction: openness in France declined in 1966-1969 to 62.5. Combined with a score of 44 for the UK, the average decreased to 53. Outcome measures such as the spread between domestic and external interest rates suggest that tightening regulations lead to increasing market segmentation. The gap between internal and Euromarket interest rates for instruments denominated in pounds and francs became substantial and persisted during this period of tightening capital controls. Between December of 1971 and May of 1979 (the date of Thatcher's election), the correlation between monthly external and internal sterling interest rate instruments was only 0.3. For France post-Bretton Woods, the correlation between domestic and external interest rates was even lower: 0.09 (Quinn and Jacobson 1989). As we would expect if policy-driven openness was a key determinant of equity market correlations, correlations between the two markets fell to a mere 0.12.[10]

It was not until 1979, when Britain under Margaret Thatcher abolished many regulations restricting the free market, that the capital account was fully liberalized (achieving a perfect score of 100). The Conservatives came to power after the May 3rd election: by July 18th, the Thatcher Government had abolished all controls on direct investment, and eased or eliminated most restrictions on portfolio investment, including the onerous "115 percent cover…for overseas portfolios financed by foreign currency." (IMF 1980, 422.) On October 23rd of 1979,

> the Government announced the removal of all remaining exchange controls….Portfolio investments were wholly freed, as was dealing in gold. The requirement that foreign currency securities be deposited with authorized institutions was abolished. (IMF 1980, 422.)

After 1979, the correlation between domestic and Eurosterling interest rate changes rose to 0.96. This suggests that British capital markets were much more integrated with global capital

[10] The British case is examined in Taylor and Tonks (1989).

markets than they had been. At the same time, following the Thatcher reforms, equity market correlations for the CAC-40 and the FTSE-100 also jumped – but only to 0.4 in the period 1982-85, in part due to tightened capital account restrictions by the Socialist Government of President Mitterrand. France, in this instance, changed relative position from leader to laggard in financial openness. It was only during the run-up to EMU that the French capital account was opened comprehensively. By 1990, France had a score of 87.5, indicating a low degree of restriction overall. Return correlations between the British and French indices reached 0.71 (and 0.59 Forbes-Rigobon corrected).

B. Main Results

As a first pass through the argument, we use the mean correlation coefficient and capital account openness over the longest period for each country pair. If the argument that policy-induced openness systematically leads to higher correlations is right, we should find that country-pairs that maintained relatively open capital accounts should show much greater co-movement of equity returns. Figure 3 suggests that our hypothesis receives qualified support from the data. At values below 60, return correlations are around 0.2 or so. As capital flows become easier, correlations increase. Above 80, they generally exceed 0.4.

Capital account openness did not just differ between country-pairs; it also changed dramatically over time. To obtain our main results, we use both sources of variation. We estimate models of the type:

$$\rho_{i,t} = a_i + \beta Q_{i,t} + \gamma X'_{i,t} + \varepsilon \qquad (2)$$

where ρ_{it} is the correlation coefficient (corrected or uncorrected) for country-pair i at time t, *a* is a pair-specific intercept, Q is the capital-account related measure of openness, and X' is a vector of controls. Estimating with fixed effects ensures that confounding factors that may simultaneously produce high values for openness and and for return correlations in a particular country pair are not responsible for our results. As part of our robustness checks, we also estimate with period-dummies.

Table III, model 1 presents the results with uncorrected correlations as the dependent variable, using no time or country dummies. A one percent increase in capital account openness raises correlations of equity markets by half a percent; a twenty five point change in this 0-100 variable predicts an increase in equity market correlations of 12.5%, or 0.125 points in equity correlations on the original scale. As we add pair fixed effects (eq. 2), the coefficient on Q falls slightly, but remains highly significant. When we use country and period dummies, the coefficient declines markedly, to a third or less of the size estimated in eq. 1 and 2. Yet even if a large share of the variation over time and in the cross-section is absorbed by fixed effects, capital account openness emerges as an important and large predictor of changes in equity market correlations.

In eq. (4) to (6), we use the Forbes-Rigobon (FR) corrected returns as the dependent variable. Capital account openness is also a significant predictor of correlations. As the F-R corrected correlations vary less, the coefficient on Q declines in magnitude. A one percent increase rise in openness predicts an increase of FR correlations by 0.071 to 0.22.An obvious concern is that we may simply be capital account openness is simply picking up the effect of other, more important variables that changed in the same way over time and in the dyads in our sample. In table IV, we control for these factors. We add growth rate correlations in eq. 1-7 to take the most basic of fundamentals into account. Growth rate correlations are close to standard levels of significance when included on their own (eq. 1). Combined with other proxies for correlated fundamentals, they do not emerge as consistently significant. Bilateral trade on the other hand emerges as an important and statistically significant predictor of correlations. These findings are in line with the results by Lane and Milesi-Ferretti (2004), who show that cross-border capital flows are higher between countries that trade more with each other. Trade exposure overall is also a good predictor of correlations, but it is not significant in all specifications. When we use country- and period-dummies, and use the full vector of controls, we do not obtain a statistically significant coefficient for the trade variables. The same is true of interest rate correlations. National income differences in general predict lower correlations between equity indices, but again, the effect is not significant in all specifications. In contrast, what emerges as consistently significant is Q – capital account openness. The estimated effects range between .11 and .5, and are highly statistically significant in all specifications.

In panel B, we use F-R corrected correlations. Again, the estimated effects of our capital account measure are always highly statistically significant and substantive. As in the specification using uncorrected correlations, neither the size nor the magnitude of the coefficients on Q in Table IV is reduced by adding control variables (compared to matching models in Table III).. Higher correlations of output growth rates predict higher equity market correlations, but the effect is not significant in all models. Interest rate correlations are consistently significant, as is bi-lateral trade.

Our results in Table III and IV probably understate the extent to which correlations have increased because of greater capital account openness. Measuring capital account openness is not without problems, even with the best indicators available. In the post-war period, for example, the IMF's standard measure (which only indicates if markets are open or closed) is positively correlated with our measure. Where the more finely graded *CAPITAL* measure adds some noise in the explanatory variable, this would induce attrition bias. Also, we miss some of the countries that only liberalized recently, and whose equity markets do not have a long history. A dataset that included them would arguably contain even more identifying variance, and could show larger effects.

3. Robustness

In this section, we examine the robustness of our main finding. We test if the finding that greater openness directly drives up covariances is due to a handful of dominant countries. Next, we turn to the stability of our result by subperiod? Did the strength of the openness-correlation nexus increase over time? Finally, we examine if serial correlation in our explanatory variable produces an upward bias in the significance we report.

The U.S and the U.K. were the two dominant financial markets during the last century and a half. They appear numerous times in our country pairs. If they drove an important part of

our results, this could be cause for concern. How does omitting either or both countries from the analysis influence the results? In Table V, we examine the robustness of our findings to dropping the US and the UK from the sample.

Overall, we find that our results are highly robust to the omission of the US and the UK. The coefficient estimates for average capital account openness are always positive and statistically significant at the 0.01 level. The only exception is for corrected correlation coefficient in Table V, panel B, model 6, in which more than half the sample is lost due to data limitations, and where the coefficient is significant at the 0.05 level. The magnitude of the coefficients does not change markedly. We find a range of 0.12 to 0.47 for the simple return correlations, and of 0.06 to 0.2 for the Forbes-Rigobon corrected ones.

How stable are our results in different subperiods since 1890? Table VII gives the results if we subdivide our dataset into three broad periods – 1890-1917, to examine correlations in the last age of globalization, 1918-1953 for the long interwar period from WWI to the end of immediate reconstruction, and 1954-2001, which covers the Bretton-Woods period and the second period of globalization.

For the period before 1918, we have to estimate without fixed effects, since there is not enough variation over time to use a difference-in-difference approach. For both the uncorrected and the F-R corrected coefficients, we find a positive effect of greater openness. The coefficient is large, but since Q is not cardinal in nature, there is no meaningful way to compare the coefficient on Q across periods. Growth rate correlations once again emerge as significant, and trade, interest rate correlations, and national income differences have the predicted sign even if only growth rates emerge as significant when we use the uncorrected specifications.

For the period of turmoil during the interwar period, and immediately following World War II, we find a statistically significant effect of Q on both dependent variables. Bilateral trade surprisingly appears negatively correlated with equity market co-movements. Since the interwar period saw the collapse of the global trading system, we surmise that the effects of the Great Depression are indirectly responsible for this result.

After 1955, we find large positive and statistically significant coefficients of capital

account openness on both the corrected and uncorrected correlations.[15] Trade appears important in the post-WWII period, and in the FR-corrected estimation, interest rate correlations. Overall, we find a high degree of consistently in our subperiods – independent of the part of the 20th century that we analyze, country pairs with more open capital accounts saw their stockmarkets fluctuate in parallel to a much higher extent.

Duflo et al. (2004) highlight the potential pitfalls of difference-in-difference estimators. If an exogenous variable exhibits serial correlation, the standard errors in typical fixed-effects estimations will be too small, leading us to reject the null of no effect too easily. The problem will be more acute (i) the longer the time span covered (ii) the greater the serial correlation in the dependent variable (iii) the greater the serial correlation of the exogenous variable. Since the autocorrelation coefficient of the Forbes-Rigobon corrected correlation variable is 0.37 (standard error 0.03), and of *CAPITAL* 0.76 (with a standard error of 0.019), there is obvious scope for concern (although the GMM-system estimators do not suffer from this deficiency). Among other remedies, Duflo et al. suggest collapsing the data to a time-averaged cross-section (i.e. abstracting from time-variation). This strategy is particularly powerful in our case since all countries vary their capital market openness over time, and because the number of country pairs is large, giving the test a high degree of power.

Hence, we next regress

$$\rho_i = C + \beta Q_i + \gamma X'_i + \varepsilon \qquad (3)$$

where ρ_i is the average correlation coefficient (corrected or uncorrected) for each country pair I, Q is the Quinn-Toyoda measure of capital account openness, and X' is a vector of control gives the results. Independent of specification, we find a large and significant effect of openness on return correlations.

In the baseline specification (1) in panels A and B of Table VIII, the coefficient on capital account openness is large and significant. So is the correlation of growth rates. The controls for trade volume are in general significant where we use the uncorrected correlations as the dependent variable. Including them causes the growth rate correlations to decline in magnitude or even to change sign (eq. 5, panel A). Interest rate correlations always exhibit

[15] Since we cannot be certain that a rise by 10 points on the Quinn-Toyoda scale should be expected to have the same impact on correlations, independent of starting levels, comparing magnitudes is not straightforward.

positive covariance with equity market returns, and the coefficients are statistically significant in three of four specifications. National income differences appear to reduce correlations in equity markets, but the result is not stable across specifications.

Even in the specification that yields the smallest coefficient on Q in Panel A, increasing openness by 40 points (equivalent to the observed increase in mean openness in our sample between 1954 and 1998) raises the correlation coefficient of stock markets by 0.2. Overall, according to the results from the time-averaged cross-section, we can account for one third of the variation in correlation coefficients with openness.

Panel B uses the Forbes-Rigobon corrected correlations as a dependent variable. Coefficients on openness are generally smaller, as we would expect – the dependent variable has a more limited range, by construction. The significance of our findings is generally not affected, even if the t-statistic in one of our final specifications drops to 3.2. The effect of trade is not as apparent in the Forbes-Rigobon corrected specification, while growth correlations appear to have a similar effect. Overall, there is little evidence that understated standard errors in the standard difference-in-difference setup are responsible for the significant coefficients we obtained in the panel estimation.

4. Discussion

Our results in Table IV and V probably understate the extent to which correlations have increased because of greater capital account openness. Measuring capital account openness is not without problems, even with the best indicators available. In the post-war period, for example, the IMF's standard measure (which only indicates if markets are open or closed) is positively correlated with our measure. Where the more finely graded CAPITAL measure adds some noise in the explanatory variable, this would induce attrition bias. Also, we miss some of the countries that only liberalized recently, and whose equity markets do not have a long history. A dataset that included them would arguably contain even more identifying variance, and could show larger effects.

There is, however, one factor that tends in the opposite direction. The attainable level of diversification with fully open capital accounts will be larger than our study implies. We focus

on a stable set of countries for the last century. However, Goetzman et al. (2002) show that the additional reduction in risk from adding a large number of smaller markets can be substantial. As the number of countries (and stock markets) has surged in the last 100 years, our results will be too pessimistic compared to the full range of investment choices available.

One important limitation of our analysis is the fact that we cannot address the country vs. industry factor debate. Roll (1992) found a large role for industry composition in explaining co-movements between country indices. Cavaglia, Brightman and Aked (2000) called into question Heston and Rouwenhorst's (1994) result that country factors are decisive. In recent work, Bekaert, Hodrick and Zhang (2005) conclude that industry factors mattered only for a relatively short period, and that country factors overall remain crucial.[16]

What reason is there to believe that capital chasing diversification opportunities is responsible for the positive relationship between openness and correlations? We controlled for changes in economic fundamentals, interest rate correlations and the like, but the argument so far has worked by process of elimination. A more direct test should examine how flows react to past correlations, and how correlations in turn react to flows. Data limitations make such a direct test impossible. The IMF's Coordinated Portfolio Investment Survey (CPIS) has collected data on bilateral asset position including equity investments, but it only covers the period 1997-2003. We use the information for 2002 since this is the last year when final estimates are available, and the coverage is broad. Since stocks at the beginning are known to have been very low overall, existing stocks in 2002 must largely be the result of flows (and appreciation) over the postwar period.

If our argument is correct, then the greater bilateral holdings are today, the higher correlations should be as well. Also, greater openness on average, and large increases in openness, should have resulted in increasing bilateral holdings. Both predictions are borne out by the data. Table IX examines the empirical regularities. Countries with greater bilateral holdings saw a marked and statistically significant rise in correlations. Also, greater average openness is strongly correlated with higher bilateral holdings (eq. 2 and 3). Correlations in 1953 are negatively related to the value of bilateral equity holdings, but at -0.025, the effect is weak and

[16] If we could correct for the internet effect identified by Brooks and Del Negro (2004), we would observe less of a rise in the corrected correlations.

insignificant. Correlations in 1997 vary positively with the log of bilateral holdings (0.57, significant at the 1% level).

5. Conclusions

During much of the post-war period, capital flows between advanced capitalist countries were anything but free. Correlations were low, but this did not indicate unexploited investment opportunities. Few investors were allowed to moved funds from one jurisdiction to another. Our analysis suggests that capital controls did not just stand in the way of exploiting diversification opportunities. To a large extent, they created the illusion that they were large in the first place. The mean (uncorrected) correlation during the period 1950-54 in our dataset was 0.26. In 1998-2001, it had risen to 0.63. We conclude that policy changes, and not only greater trade or interest rate linkages per se, played a decisive role in driving them up.[18] Using a set of 120 country pairs over the last century shows that liberalization has tended to increase the covariance of stock market returns. We also report robust evidence that divergent capital account regulatory regimes between a pair of countries decrease correlations. This means that the world described in the seminal papers by Levy and Sarnat (1970), and Grubel (1968) looked promising for international investors precisely because it was *de facto* and *de jure* nearly impossible to invest across borders.[19] Thus, many academic studies and practitioners' beliefs about the benefits of international investing may have been too sanguine – and the home bias inferred from investors' portfolios much too large.[20]

Our paper also contributes to the debate about the nature of financial globalization over the last century. Since corrected and uncorrected correlations diverge strongly, we demonstrate that an important part of the increase in actual equity return correlations has been the result of

[18] Our conclusions differ in part from those in, say, Lewis (2006) because we examine a much longer time period than the last 20 years, and a wider set of countries.

[19] Levy and Sarnat (1970) conclude that, since the optimum country portfolio doesn't contain all countries in the world, there must be substantial barriers to free capital movement.

[20] We focus on a stable set of countries for the last century. As Goetzman et al. (2002), show the additional reduction in risk from adding a large number of smaller markets can be substantial. As the number of countries (and stock markets) has surged in the last 100 years, our results may be too pessimistic compared to the full range of investment choices available.

[22] Keynes 1922.

higher volatility. Diversification benefits are much less today than they were in the more distant past because of high volatility. Yet even after correcting for the upward bias along the lines of Forbes and Rigobon (2002), we find that equity return correlations today are substantially higher than they were a century ago. Interdependence has therefore also grown, but to a smaller extent.

The nineteenth century is widely viewed as a golden age of globalized capital markets. In many dimensions, capital flows across borders and the degree of market integration was as high one hundred years ago as it is today (Taylor and Obstfeld 200). Our findings suggest that global capital markets before 1914 were superior to the present-day equivalents in one regard in particular. When assessing opportunities for risk reduction because of low return correlations, actual levels of capital account openness have to be taken into account. In this regard, the 19th century combined remarkable levels of capital mobility with relatively low correlations, while the most recent era of globalization has brought about a large, rapid, and sustained reductions in diversification opportunities.

The waning of international diversification opportunities is probably driven by a number of factors. Greater openness, the factor we highlighted here, was the result of policy changes following the collapse of Bretton Woods. In addition, the organizational structure of financial intermediaries has changed, as has the median investor in many markets. John Maynard Keynes described investors in the first wave of globalization as "inhabitant(s) of London (who) could … by telephone, sipping … morning tea in bed, adventure his wealth in the natural resources and new enterprises of any quarter of the world, and share, without exertion or even trouble, in their prospective fruits and advantages."[22] By the late 20th century, they have given way to professionals who are managing portfolios on behalf of others; many of these firms operate world-wide, and are advised by global investment banks that also use a single trading book for their proprietary desks. Shocks to net worth, and the resulting changes in risk appetite, now simultaneously drive changes in equity values from Toyko to Johannesburg. As the influence of local factors has declined, global ones play an increasing role in the pricing of shares. The next stage of our project will examine if greater openness to global flows has systematically increased the variability of stock returns.

FIGURES

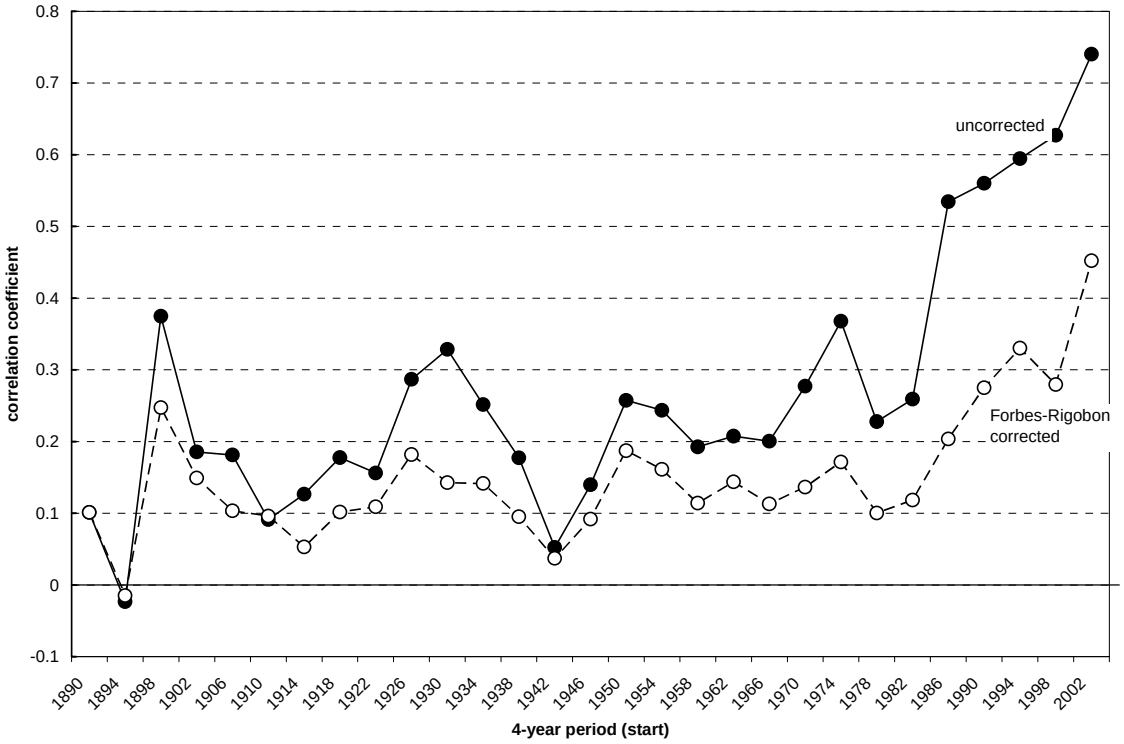

Figure 1: Two measures of equity market correlations

Legend: Each observation represents average equity market correlation coefficient in a group of 16 countries, for a four-year panels, 1890-2001. The sixteen countries in our dataset are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, and the United States. "Uncorrected" is the equity market correlation of a pair of countries, and is taken from Global Financial Data. The Forbes-Rigobon volatility adjusted equity correlation is proposed in Forbes and Rigobon (2002), and used here.

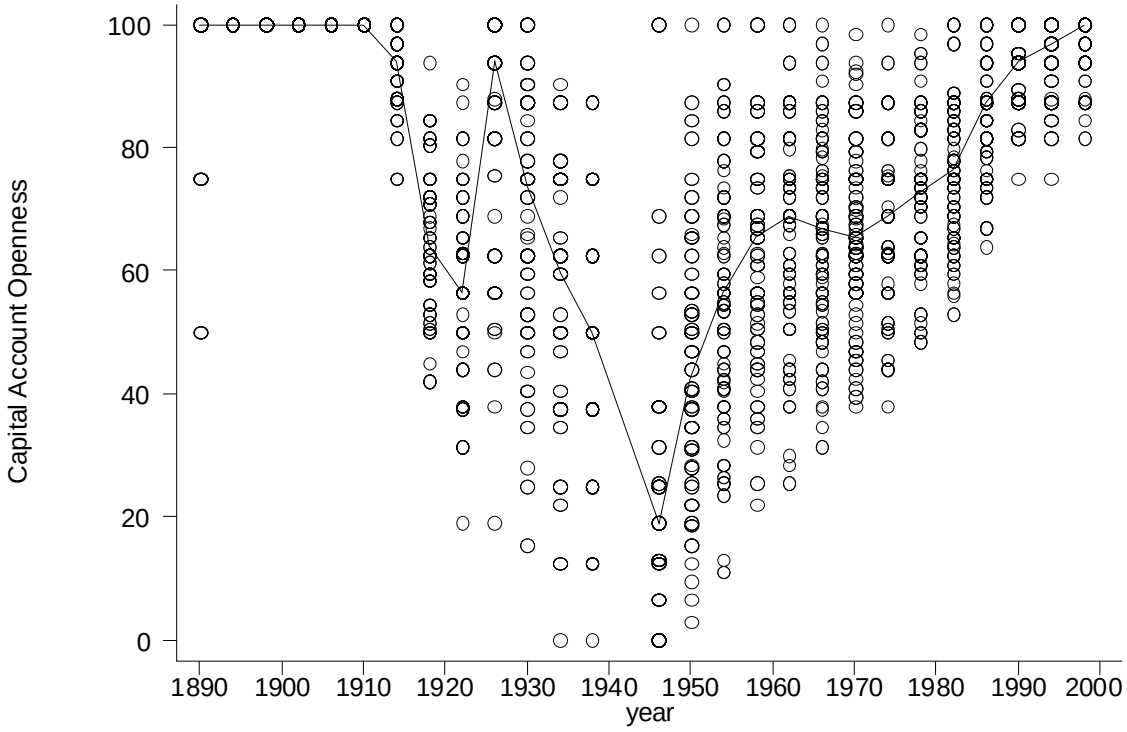

Figure 2: Average Capital account openness, 1890-2001 (line) with dots indicating the pairwise capital account openness for each country pair in the sample.

Legend: The line connects median capital account openness in our sample of 16 countries. Each circle represents openness for a country in our sample during non-overlapping four-year periods, 1890-2001. The sixteen countries are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, and the United States. Capital account openness measures the intensity of regulatory restrictions on capital movements between a pair of countries, and is from Quinn (2003) and extended here. The measure is scaled 0-100 with larger values indicating greater openness.

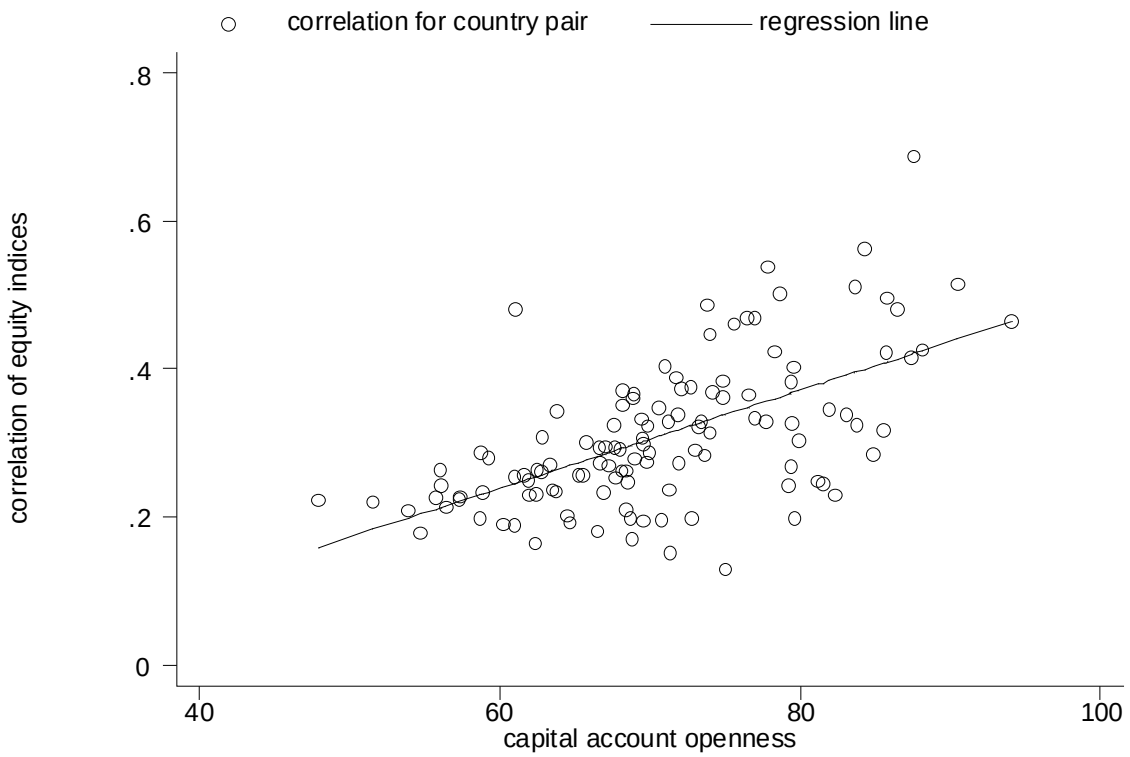

Figure 3: Average capital account openness and equity market correlations, 1890-2001, by country pair

Legend: These data are the averages for capital account openness and equity market correlations for dyads in our sample, 1890-2001. The sixteen countries are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, and the United States. The pairing of these 16 countries yields 120 unique country pairs. Capital account openness measures the intensity of regulatory restrictions on capital movements between a pair of countries, and is from Quinn (2003) and extended here. The measure is scaled 0-100 with larger values indicating greater openness. "Return correlation" is the equity market correlation of a pair of countries, and is taken from Global Financial Data.

TABLES

Table I: Descriptive statistics

	mean	p50	sd	N
Capital account openness (capital)	69.328	72	23.323	2,263
Return correlation* (return)	31.023	29.602	23.784	2,263
F-R corrected return correlation* (returnfr)	16.257	13.253	15.415	2,263
Growth correlation* (growth)	0.188	0.291	0.577	2,263
Interest Rate Correlations (interest)	0.393	0.532	0.482	2,263
Income Differences (IncDif)	0.642	0.565	0.456	2,263
Bi-Lateral Trade/GDP (bitrade)	0.019	0.009	0.029	2,165
Trade volume/GDP (trade)	0.004	0.001	0.008	1,061

* indicates that the variable was multiplied with 100

Notes: These data are descriptive statistics for 120 country pairs, observed for non-overlapping four year periods, during 1890-2001. The sixteen countries are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Italy, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, and the United States. Capital account openness measures the intensity of regulatory restrictions on capital movements between a pair of countries, and is from Quinn (2003) and extended here. The measure is scaled 0-100 with larger values indicating greater openness. "Return correlation" is the equity market correlation of a pair of countries, and is taken from Global Financial Data. The Forbes-Rigobon volatility adjusted equity correlation is proposed in Forbes and Rigobon (2002), and used here. We use Maddison's (2002) GDP figures to compute pair growth correlations and national income differences. The Barbieri (2002) dataset on trade volumes is used to derive bilateral trade intensity and average total trade volumes. Interest rate correlations are the pair's correlation on 10-year government bond yields, taken from Global Financial Data.

Table II: Pairwise correlations

	capital	return	returnfr	growth	Interest	Inc.Dif.	Bitrade	Trade
Capital	1							
Return	0.492*	1						
Returnfr	0.332*	0.81*	1					
Growth	0.093*	0.1*	0.082*	1				
Interest	0.213*	0.239*	0.214*	0.064*				
IncDif	0.112*	-0.066*	-0.084*	-0.078*	-0.036			
BiTrade	0.228*	0.251*	0.200*	0.124*	0.152*	0.167*	1	
Trade	0.270*	0.338*	0.209*	0.049*	0.170*	-0.141*	0.569*	1

* indicates significance at the .05 level or beyond

Notes: The pairwise correlations of the variables listed in Table I are reported here. See Table I for definitions and descriptive statistics.

Table III

Financial openness and stock market correlations – (dependent variable: standard and Forbes-Rigobon correlation coefficients)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Return	Return	Return	Return-FR	Return-FR	Return-FR
***CAPITAL* account openness**	**0.502** (27.13)	**0.477** (25.21)	**0.144** (4.933)	**0.22** (16.9)	**0.192** (15.97)	**0.071** (3.354)
Constant	-3.389 (-2.816)	0.173 (0.035)	50.369** (511.29)	1.032 (1.107)	0.915 (0.302)	19.833** (6.129)
Pair Fixed effects	N	Y	N	N	Y	N
Country dummies	N	N	Y	N	N	Y
Period dummies	N	N	Y	N	N	Y
Adjusted R^2	0.24	0.32	0.51	0.11	0.33	.35

Notes: We estimate OLS regressions of capital account openness' effect on the correlation of equity market returns for a pair of countries. The dependent variable is either the correlation of the returns between a pair of countries' equity markets (Return) or the correlations adjusted for volatility using the Forbes-Rigobon correction (Return-FR). T-statistics computed from panel corrected standard errors are in parentheses below the coefficients: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. Sixteen countries comprising 120 country-pairs totaling 2,263 observations comprise the sample. The observations are non-overlapping four year averages of the data, 1890-2001. Models 1 and 4 are random effects models; models 2, 3, 5, and 6 contain pair, period, or country unit effects. The coefficient estimates of the pair, period, and country dummies are not reported to save space, but are available from the authors. Hausman tests (not reported here) strongly reject the use of random effects in favor of pair fixed effects.

Table IV

Panel A: Financial openness and stock market correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Return	Return	Return	Return	Return	Return	Return
***CAPITAL* account openness**	**0.474** (25.21)**	**0.293** (9.841)**	**0.502** (25.1)**	**0.300** (9.976)**	**0.486** (24.17)**	**0.105* (2.389)**	**0.145** (4.896)**
Growth rate correlation	1.263 (1.727)	0.609 (0.617)	1.053 (1.44)	0.492 (0.497)	0.887 (1.209)	1.474 (0.928)	1.334* (2.097)
Bi-lateral Trade			74.655** (3.389)		68.837** (3.227)		91.661** (4.866)
Trade		564.26** (6.744)		522.34** (5.961)		102.26 (1.157)	
Interest Rate Correlation				-0.038 (-0.031)	4.105** (4.66)	2.028 (1.277)	3.088** (3.402)
National Income differences				-12.735 (-1.803)	-12.336** (-2.73)	-2.188 (-1.447)	-4.333** (-4.213)
Constant	-3.389 (-2.816)	11.319* (2.007)	-4.641 (-0.902)	17.707** (2.662)	2.369 (0.407)	48.632** (6.916)	51.362** (10.47)
Pair Fixed effects	Y	Y	Y	Y	Y	N	N
Country dummies	N	N	N	N	N	Y	Y
Period dummies	N	N	N	N	N	Y	Y
Obs/Pairs	2263/120	1061/73	2165/120	1061/73	2165/120	1061/73	2165/120
Adjusted R^2	0.32	0.31	0.35	0.31	0.36	0.43	0.53

Notes: OLS regressions with controls for capital account openness' effect on the correlation of equity market returns for a pair of countries. The description of the control variables is found in Table I. The dependent variable is the correlation of the returns between a pair of countries' equity markets (Return). These OLS models are panel fixed effects models with either pair-fixed effects or period and country fixed effects. T-statistics using panel corrected standard errors in parentheses below coefficient: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. Sixteen countries in 120 country-pairs comprise the sample for models 1, 3, 5, and 7, and sixteen countries in 73 country pairs comprise the sample for models 2, 4, and 6. The observations are non-overlapping four year averages of the data, 1890-2001. The coefficient estimates of the pair, period, and country dummies are not reported to save space, but are available from the authors.

Table IV

Panel B: Financial openness and stock market correlations FR adjusted

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR
***CAPITAL* account openness**	**0.187** (15.48)**	**0.098** (5.147)**	**0.202** (15.33)**	**0.101** (5.528)**	**0.202** (15.46)**	**0.061* (1.996)**	**0.075** (3.441)**
Growth rate correlation	3.65*** (2.96)	0.089 (0.046)	3.212** (2.639)	0.183 (0.094)	3.121** (2.579)	2.437 (1.244)	2.259 (1.878)
Bi-lateral Trade			49.193** (2.752)		49.71** (2.789)		69.53** (4.394)
Trade		94.704 (1.696)		66.353 (1.164)		126.47 (1.958)	
Interest Rate Correlation				5.463* (2.035)	10.105** (4.655)	5.564* (2.824)	8.817** (4.011)
National Income differences				-9.45* (-2.185)	-4.442 (-1.573)	-0.07 (-0.069)	-1.645* (-2.161)
Constant	0.957 (0.314)	7.642* (2.097)	-2.084 (-0.674)	11.948** (2.902)	0.005 (0.002)	14.625** (3.119)	17.538** (4.957)
Pair Fixed effects	Y	Y	Y	Y	Y	N	N
Country dummies	N	N	N	N	N	Y	Y
Period dummies	N	N	N	N	N	Y	Y
Obs/Pairs	2263/120	1061/73	2165/120	1061/73	2263/120	1061/73	2165/120
Adjusted R^2	0.33	.26	34	.29	.35	.30	.38

Notes: We estimate OLS regressions with controls of capital account openness' effect on the correlation of equity market returns for a pair of countries. The dependent variable is the correlation of the returns between a pair of countries' equity markets adjusted for volatility using the Forbes-Rigobon correction. The description of the control variables is found in Table I. These OLS models are panel fixed effects models with either pair-fixed effects or period and country fixed effects. T-statistics using panel corrected standard errors in parentheses below coefficient: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. Sixteen countries in 120 country-pairs comprise the sample for models 1, 3, 5, and 7, and sixteen countries in 73 country pairs comprise the sample for models 2, 4, and 6. . The observations are non-overlapping four year averages of the data, 1890-2001. The coefficient estimates of the pair, period, and country dummies are not reported to save space, but are available from the authors.

Table V: Pooled, Cross-Section, Time-Series Regressions – no US or UK

Panel A: Financial openness and stock market correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Return	Return	Return	Return	Return	Return	Return
***CAPITAL* account openness**	**0.455** (21.52)**	**0.256** (6.851)**	**0.473** (21.04)**	**0.26** (6.616)**	**0.453** (19.64)**	**0.117* (2.075)**	**0.148** (4.383)**
Growth rate correlation	0.409 (0.478)	-0.408 (-0.301)	0.166 (0.192)	-0.395 (-0.292)	-0.081 (-0.095)	0.73 (0.6)	1.058 (1.416)
Bi-lateral Trade			81.166** (3.139)		74.793** (3.014)		47.006* (2.014)
Trade		467.05** (4.333)		460.84** (4.175)		-101.32 (-0.957)	
Interest Rate Correlation				-0.232 (-0.15)	4.568** (4.509)	1.229 (0.776)	3.365** (3.239)
National Income differences				-3.441 (-0.295)	-5.967 (-1.022)	-2.442 (-0.664)	-3.792** (-2.747)
Constant	7.107 (1.832)	19.33** (4.528)	5.069 (-0.902)	19.231** (4.459)	4.894 (1.272)	54.662** (6.93)	54.453** (11.29)
Pair Fixed effects	Y	Y	Y	Y	Y	N	N
Country dummies	N	N	N	N	N	Y	Y
Period dummies	N	N	N	N	N	Y	Y
Obs/Pairs	1683/ 91	616/45	1604/91	616/45	1604/91	616/45	1604/91
Adjusted R^2	0.30	0.31	32	0.31	0.33	0.43	0.52

Notes: The dependent variable is the correlation of the returns between a pair of countries' equity markets, omitting all observations containing data for either the U.S. or the U.K. The description of the control variables is found in Table I. These OLS models are panel fixed effects models with either pair-fixed effects or period and country fixed effects. T-statistics using panel corrected standard errors in parentheses are reported below the coefficient estimates: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. Fourteen countries in 91 country-pairs comprise the sample. The observations are non-overlapping four year averages of the data, 1890-2001. The coefficient estimates of the pair, period, and country dummies are not reported to save space, but are available from the authors.

Table V – no US or UK
Panel B: Financial openness and stock market correlations FR adjusted

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR
***CAPITAL* account openness**	**0.178** (13.14)	**0.058*** (2.498)	**0.192** (12.873)	**0.063** (2.601)	**0.189** (12.64)	**0.08*** (2.108)	**0.079** (3.129)
Growth rate correlation	3.578** (2.551)	-0.201 (0.079)	3.253** (2.639)	-0.185 (0.073)	3.157* (2.291)	3.118 (1.256)	2.455 (1.849)
Bi-lateral Trade			35.078 (1.716)		35.299 (1.728)		24.845 (1.226)
Trade		14.969 (0.236)		5.64 (0.086)		126.47 (1.958)	
Interest Rate Correlation				1.544 (0.434)	10.095** (3.837)	5.564* (2.824)	8.041** (2.577)
National Income differences				-4.619 (-0.691)	-0.999 (-0.0274)	-0.07 (-0.069)	-3.298** (-2.935)
Constant	11.29** (3.6)	20.187** (6.021)	9.912** (3.101)	19.839** (5.908)	9.18 (3.002)	14.625** (3.119)	25.821** (3.821)
Pair Fixed effects	Y	Y	Y	Y	Y	N	N
Country dummies	N	N	N	N	N	Y	Y
Period dummies	N	N	N	N	N	Y	Y
Obs/Pairs	1683/ 91	616/45	1604/91	616/45	1604/91	616/45	1604/91
Adjusted R^2	0.31	.16	31	.16	.32	.22	.36

Notes: The dependent variable is the correlation of the returns between a pair of countries' equity markets adjusted for volatility using the Forbes-Rigobon correction. The description of the control variables is found in Table I. All observations containing data for either the U.S. or the U.K are omitted. These OLS models are panel fixed effects models with either pair-fixed effects or period and country fixed effects. T-statistics using panel corrected standard errors in parentheses below coefficient: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. Fourteen countries in 91 country-pairs comprise the sample. The observations are non-overlapping four year averages of the data, 1890-2001. The coefficient estimates of the pair, period, and country dummies are not reported to save space, but are available from the authors.

Table VII: Panel Regressions – by Historical Subperiods
Panel A: Financial openness and stock market correlations

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Return	Return	Return	Return-FR	Return-FR	Return-FR
Period	1890-1917	1918-1953	1954-2001	1890-1917	1918-1953	1954-2001
***CAPITAL* account openness**	**23.706*** **(2.588)**	**0.243**** **(8.291)**	**0.849**** **(28.0)**	**20.08*** **(2.843)**	**0.118**** **(5.546)**	**0.323**** **(18.52)**
Growth rate correlation	24.891* (2.006)	0.921 (0.813)	0.271 (0.323)	54.409 (1.805)	3.311 (1292)	2.189 (1.732)
Bi-lateral Trade	244.20 (0.623)	-36.675* (-2.267)	154.02** (4.463)	111.27 (0.401)	-13.529 (-0.822)	55.631* (2.101)
Interest Rate Correlation	0.185 (0.015)	-1.216 (-0.857)	1.593 (1.627)	1.606 (0.099)	2.28 (0.582)	12.847** (4.905)
National Income differences	-11.711 (-0.638)	-49.218** (4.958)	5.687 (0.719)	-12.679 (-1.043)	-22.677** (-3.366)	5.101 (1.096)
Constant	-2340.9* (-2.547)	11.319* (2.007)	-20.63** (-4.241)	-1977.6* (-2.798)	13.652* (2.469)	-22.177** (-5.556)
Obs/Pairs	15/6	709/19	1440/120	15/6	709/19	1440/120
Adjusted R^2	.28	.24	.50	.33	.22	.52

Notes: We estimate OLS regressions with controls of capital account openness' effect on the correlation of equity market returns for a pair of countries. The dependent variable is either the correlation of the returns between a pair of countries' equity markets (models 1-3), or the correlation adjusted for volatility using the Forbes-Rigobon correction (models 4-6). The description of the control variables is found in Table I. OLS models 2, 3, 5, and 6 use pair-fixed effects, which are not reported to save space. Data are missing for the WWII years in models 2 and 5. OLS models 1 and 4 have insufficient degrees of freedom to use pair fixed effects. Results using trade instead of Bi-lateral trade are substantively identical, but are not reported to save space. T-statistics using panel corrected standard errors in parentheses are reported below the coefficient estimates: see Beck and Katz 1995. * p-value < .05; ** p-value < .01. The observations are non-overlapping four year averages of the data for a given period.

Table VIII: Cross-Section Regressions

Panel A: Financial openness and stock market correlations

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Return	Return	Return	Return	Return
***CAPITAL* account openness**	**0.572** (7.658)**	**0.501** (6.622)**	**0.51** (9.946)**	**0.541** (7.335)**	**0.542** (8.304)**
Growth rate correlation	11.795** (2.832)	1.888 (0.299)	6.261 (1.464)	1.57 (0.257)	-5.1 (-1.29)
Bi-lateral Trade			120.73** (3.521)		136.34** (4.186)
Trade		1010.9** (3.44)		781.25** (2.647)	
Interest Rate Correlation				30.407 (1.33)	19.536** (3.768)
National Income differences				-4.648 (-2.885)	-7.364** (-4.846)
Constant	-10.974* (-2.144)	-9.085 (-1.807)	-7.878 (-1.587)	-9.097 (-1.83)	-11.142** (-2.625)
Obs.	120	73	120	73	120
Adjusted R^2	0.40	.52	.45	.56	.62

Panel B: Financial openness and stock market correlations FR adjusted

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Return-FR	Return-FR	Return-FR	Return-FR	Return-FR
***CAPITAL* account openness**	**0.3** (4.377)**	**0.256** (3.586)**	**0.28** (3.959)**	**0.237** (3.192)**	**0.281** (4.210)**
Growth rate correlation	23.716*** (2.763)	24.522 (1.817)	20.29* (2.498)	24.129 (1.770)	8.832 (0.911)
Bi-lateral Trade			41.268 (1.223)		59.795 (1.557)
Trade		369.74 (1.404)		112.26 (0.442))	
Interest Rate Correlation				53.561** (26295)	51.43** (3.64)
National Income differences				-2.345 (-1.649)	-4.459** (-2.835)
Constant	-5.928 (-1.338)	-5.418 (-1.198)	-5.091 (-1.139)	-4.022** (-0.926)	-4.606 (-1.148)
Obs.	120	73	120	73	120
Adjusted R^2	0.20	.23	.21	.29	.33

Notes: In this table, we estimate the cross-sectional determinants of equity market correlations between a pair of countries. The dependent variable is either the correlation of the returns between a pair of

countries' equity markets (Panel A) or the correlations adjusted for volatility using the Forbes-Rigobon correction (Panel B). These OLS models are cross-sectional models with heteroskedasticity-consistent matrices. T-Statistics are in parentheses below the coefficient estimates: * p-value < .05; ** p-value < .01. Sixteen countries comprising 120 country-pairs are represented in models 1, 3, and 5. Because of data limitations, models 2 and 4 contain data for sixteen countries and 73 country pairs. The data are averaged across all periods.

Table IX: Bilateral holdings, correlations and openness

	(1)	*(2)*	*(3)*
Dependent variable	Δcorrelation		Bilateral holdings
Bilateral holdings/total holdings (2 countries)	1.41** (4.1)		
Average openness		0.0017** (4.03)	0.003** (3.6)
Initial correlation			-0.025 (0.7)
Change in openness			0.0007* (2.25)
Constant	0.31** (14.4)	-0.08* (2.7)	-0.19** (3.1)
N	120	120	120
Adj. R^2	0.12	0.11	0.14
Effect of moving from the 25th to the 75th percentile of the exogenous variable (relative to the mean of the dependent variable)	0.06 (+16%)	0.02 (+98.5%)	

Absolute value of t statistics in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

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