The use of the R^2 as a measure of firm-specific information: A cross-country critique

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Abstract: Recent research uses the degree of stock returns co-movement as a measure of the quality of a country's information environment. It has been argued that stronger property rights, better corporate governance regimes and more efficient enforcement mechanisms lead to prices incorporating more firm-specific information and, therefore, co-moving less with the market. In this paper, we use a much more comprehensive international data set than in prior research, encompassing forty countries over twenty years, to evaluate the reliability of this approach in a cross-country setting and to analyse the behaviour of the measure used. Our results demonstrate severe limitations in the use of co-movement as a measure of information quality. We highlight the instability of the measure and show that it can produce results that are often difficult to reconcile with such an informational explanation.

Keywords: Information; R^2; firm-specific information; market-wide information; volatility; disclosures; co-movement; cross-country information environment; synchronicity.

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1. INTRODUCTION

Morck et al. (2000: 215) claim that "stock prices move together more in poor economies than in rich economies". Rich economies tend to have stronger property rights, better corporate governance regimes and more efficient enforcement mechanisms, all of which promote arbitrage trading based on information about a firm's fundamentals. In the presence of such an information environment, they argue, prices will incorporate more firm-specific information and, therefore, co-move less with the market.

The study of the quality of information environments at the cross-country level is of major relevance to both the investing community and regulators. Barriers to international trade are vanishing and at the same time capital mobility has been increasing and, therefore, investors need more country-specific information and a better understanding of international stock markets. At the same time, regulators are endeavouring to make strong efforts to harmonise both capital market regulations and financial reporting rules. The study of these matters helps us to understand the information dynamics, both within a country and at the cross-country level, and therefore hopefully will facilitate the formulation of more informed regulation.

Morck et al.'s (2000) approach uses the average R^2 for a country of a regression of a company's stock returns on overall stock market returns as a proxy for the quality of a country's information environment. The appeal of this approach is that it seems to provide a simple measure to evaluate the complex concept of information quality. The R^2 methodology has an intuitive logic behind it. In the extreme case

where firm-level information is so poor that investors cannot distinguish between companies, they will be forced to treat them as essentially the same. Market-wide information will then be the major factor driving price changes, with consequently high R^2s being observed.[1] High R^2s might also be observed in a market where firms are generally large and well-diversified. On the other hand, if firms are generally focused in particular lines of business or where good sources of reliable firm-specific information are available then firms will not be viewed as substitutes by investors, and R^2s should be small. This intuition underpins the use of R^2 as a metric for ranking countries according to the quality of their information environments.

Most subsequent research in this area takes for granted the reliability of R^2 as a measure of information. This paper critically analyses such use of R^2 at the cross-country level. We show that such an informational interpretation of R^2 has to be treated with great care. We apply the R^2 methodology in a cross-country setting using a very comprehensive data set we have collected based on forty countries over the twenty-year period 1985-2004. Our results demonstrate clearly the inadequacy of the R^2 as a measure of the quality of the information environment. When attempting to measure the quality of firm-specific information at the country-level, there are many confounding factors to be accounted for,[2] raising severe doubts as to whether it is possible to encapsulate such a multiplicity of factors in a single measure.

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[1] In the limit, a pooling equilibrium would prevail, with attendant risks of a 'market for lemons' that might cause a breakdown in the market (Akerlof, 1970). Very poor information environments are thus likely to limit the growth of stock markets. In keeping with prior research in this area, we do not consider such endogeneity issues any further in the present study.

[2] For instance: size of the country, size of capital markets, type of economy, investor property rights, corruption levels and the role of government in the economy.

Our approach can be summarized as follows. First, we rank countries according to their average R^2 for the whole period. We then consider whether the resulting ranking can be reconciled with what is generally known about the financial environments of the countries involved. Whilst the ranking presented by Morck et al. (2000) for the *single* year of 1995 is certainly plausible in terms of its association with particular country economic and legal variables, our ranking based on the average for the whole 20 years is very different and presents a puzzling picture. Furthermore, the annual R^2 for a single country changes considerably from year to year, a fact which is hard to reconcile with the argument that corporate governance and investor protection regimes are driving its behaviour. Such a relationship would only be possible if these factors change with rapidity and frequency, improving one year and falling back again in the next, circumstances which are highly unlikely.

To explore the implausible behaviour of R^2 further, we examine the spurious effects of aggregation and decomposition on the measure. We do this by artificially aggregating and decomposing real countries to create pseudo-countries and analyse their impact on R^2. When we create a bigger 'country' by 'merging' two smaller ones, we find that the resultant R^2 falls dramatically. We also explore the converse, by breaking a single country, the USA, into smaller pseudo-countries defined by the particular US stock market in which a firm is listed. We find that the R^2 of each pseudo-country is larger than that for the USA as a whole. By construction, these effects cannot be explained in terms of changes in the quality of the information environment or in the factors that Morck et al. (2000) claim to be driving R^2, i.e. corporate governance and investor protection regimes.

Our study adds to the small but growing body of empirical work that examines the reliability of R^2, also commonly referred to as stock return

synchronicity, as a measure of stock price informativeness. Pantzalis and Xu (2008) show that whilst large firms in the USA have greater price informativeness, synchronicity reveals nothing further when size is taken into account. Other studies examine the effects of noise on R^2 and reach different conclusions. Teoh and Yang (2008) show that R^2 is negatively correlated with noise and Shen (2008) finds that synchronicity is more driven by information than noise. However, Hou, Peng and Xiong (2006) find that stocks with low R^2 could suffer from greater market inefficiency because they exhibit stronger long-run price reversals, a finding more consistent with the noise interpretation. It is worth noting in this context that Evans (2009) finds that US stocks with lower R^2s are traded more heavily by individual investors and Chan, Hameed and Kang (2007) report that synchronicity is positively associated with liquidity. All these studies use US data; as such, they can provide only limited insight into the use of R^2 in an international setting. In contrast, Ashbaugh-Skaife, Gassen and LaFond (2006) regress, country by country, R^2 on a battery of information measures, finding inconsistent relationships across countries between R^2 and the information measures. Our work complements their study by assessing the plausibility of the behaviour of R^2, both across countries and time.[3] Furthermore, we examine the sensitivity of the measure to arbitrary re-definitions of what constitutes a country.

The remainder of the paper is organised as follows: The next section reviews the literature. Section 3 discusses our sample and the metrics used in the paper. Section 4 empirically explores the cross-country setting, by analysing in the different

[3] Mention should also be made of the work of Karolyi, Lee and van Dijk (2009) which examines both supply-side and demand-side explanations for how the commonalities in the co-movement of stock returns, liquidity and turnover varies across countries and over time.

ways described above, anomalies in the behaviour of R^2 as a measure of information environment quality. Conclusions appear in the final section.

2. PRIOR RESEARCH

In this section, we outline the rationale underlying the R^2 methodology as a measure of information quality and explain how it has been used in empirical research. We then establish a context for the present study by summarising the growing body of work criticising the R^2 methodology.

Morck et al. (2000) argue that strong property regimes provide the economic conditions conducive to information-driven arbitrage trading based on firms' fundamentals. As these conditions are generally found in developed countries and less so in developing ones, the stock prices of the former are likely to incorporate more firm-specific information than are the latter. Their study uses a methodology first introduced by Roll (1988) to test the ability of asset pricing theory to explain ex-post stock returns based on pervasive factors, industry influences and events unique to the firm.

Roll (1988) uses a regression of company returns on market and industry returns[4] and interprets the coefficient of determination (R^2) of this regression as an inverse proxy for firm-specific information. High (low) R^2s indicate that company returns are being explained more (less) by pervasive factors compared to firm-specific factors. To test if the unexplained component was the result of firm-specific information, Roll ran the regression again excluding observations on the dates on

[4] Roll's (1988) initial model has only market returns as an explanatory variable. The industry factor is added to improve the model's coefficient of determination and, therefore, results in a more refined measure of firm-specific information. Roll (1988) uses the one factor CAPM and the multi-factor APT model; both models produce similar results.

which information about the firm or its industry appeared in the public domain. If the residuals were capturing firm-specific information, the R^2 of the second regression should be considerably higher. However, he found that deleting those dates did not increase R^2 significantly. Roll (1988: 566) concludes that an "occasional frenzy unrelated to concrete information" was driving the results. Despite subsequent attempts to improve the methodology (Brown, 1999; Cornell, 1990; Robin, 1993), his conclusion remains uncontested.

A new and developing stream of research uses the R^2 methodology. Morck et al. (2000: 216, emphasis added) state that "[a]s Roll (1988) *makes clear*, the extent to which stocks move together depends on the relative amounts of firm-level and market-level information capitalized into stock prices". A close reading of Roll's paper suggests that this is a questionable interpretation of his findings. Nevertheless, Morck et al. (2000) show that R^2s are higher in countries with poorer economies that are often characterised by weaker corporate governance and investor protection mechanisms, as measured by a 'good government index' based on La Porta et al. (1998).[5] In the presence of weak property rights, information-based trading becomes less attractive, less firm-specific information is capitalised and, therefore, more stock price synchronicity is observed.

[5] Morck et al.'s (2000) research finds a significant and negative association between R^2 and countries' GDP. They hypothesise that GDP might be proxying for specific economic characteristics affecting stock price synchronicity. To test this hypothesis, the R^2 stock price synchronicity measure is regressed on the following structural variables: the natural log of the number of shares traded in the market, the country's GDP and a vector of structural economic characteristic (macroeconomic volatility, country size, economy diversification, and earnings co-movement). Inclusion of these structural variables fails to mitigate the statistical significance of GDP. In contrast, the inclusion of the 'good government index' renders the GDP coefficient statistically insignificant.

Subsequent cross-country and firm-level research appears to corroborate these results.[6] Jin and Myers (2006) find that countries where firms tend to be more opaque[7] have higher R^2 and higher frequencies of crashes. Control rights and the opaqueness of information affect managerial behaviour and, therefore, higher R^2s are associated with countries having less developed capital markets and weaker corporate governance regimes.

There is also a growing body of literature using the R^2 measure at the firm-level (e.g. Durnev et al., 2001; Durnev et al., 2003; Fox et al., 2003; Piotroski and Roulstone, 2004). Most of this literature uses the R^2-methodology as proposed by Morck et al. (2000) without questioning its reliability. More recently, the informational interpretation of R^2 has been subjected to detailed scrutiny at this level. Ashbaugh-Skaife et al. (2006) confirm Morck et al.'s (2000) findings for a smaller set of countries but strongly disagree with their interpretation of the results. They document the non-existence of a relationship between R^2 and a set of firm-specific variables, such as analyst forecast errors, firm size and stock turnover, which might be expected to capture aspects of the quality of the firm's information environment. Their results lead them to conclude that R^2 is not associated with firm-specific information and, therefore, cannot be used to compare countries from an informational

[6] These studies have applied the R^2 methodology in a variety of settings and contexts. For example, it has been used by Beuselinck, Joos, Khurana and Van der Meulen (2009), Ding, Hope, Jeanjean and Stolowy (2006), Kim and Shi (2007) and Wang and Yu (2009) to examine the informativeness of changes resulting from the adoption of International Financial Reporting Standards (IFRS). It has been used by Li, Morck, Young and Yeung (2003), Durnev, Li, Morck and Yeung (2004), Khanaker and Heaney (2008), Chan and Hameed (2006), and Hsin and Liao (2003) to address various issues regarding the information and governance environments of stock markets in emerging markets. It is used by Ting (2008) to assess corporate disclosure policy and by Chung, Huang and Tseng (2007) regarding the impact of investor protection. In relation to the impact of cross listing, see Fernandes and Ferreira (2008).

[7] In their model, opaqueness refers to the lack of transparency between managers and investors.

perspective. These results are reinforced by Kelly (2007), who arrives at similar conclusions, showing that the R^2 is not related to firm-level fundamentals that theory and evidence suggest are predictive of the quality of a firm's information environment (e.g. firm size, age, institutional ownership, analyst coverage and liquidity).

Little theoretical work has been carried out on the suitability of R^2 as a measure of informativeness. Two exceptions are Jin and Myers (2006) and Dasgupta, Gan and Gao (2009), both of which posit a simple cash flow generating process that includes information shocks. Jin and Myers (2006) allow for lack of transparency between managers and investors in their model, thereby generating the prediction that opaque stocks with high R^2s are more likely to deliver large negative returns.[8] This setup provides a theoretical basis for the informational interpretation of R^2. The model of Dasgupta et al. (2009) allows for firms with good information environments to have news about future events already impounded in their stock prices, thereby resulting in little price reaction when those events finally take place. Such firms will display greater synchronicity than firms where news about future events is revealed more slowly. This would lead to reliance on R^2 yielding erroneous conclusions about the quality of the firms' disclosure policies.

While most of the criticism has focused on the use of R^2 at the firm level, the results at the cross-country level have received less attention. Our study focuses on the plausibility of the behaviour of the R^2 measure *per se* in a cross-country setting and the sensitivity of the measure to how a 'country' is defined. We impose on our research design no constraints of the kind developed in the above theoretical models.

[8] For an accounting application using the Jin-Myers approach, see Hutton, Marcus and Tehranian (2008).

3. METRICS AND SAMPLE CONSTRUCTION

In order to assess the validity of R^2 as a measure of firm-specific information, we use regression to capture the level of stock returns explained by the market. We adopt the usual practice in cross-country studies using the R^2 methodology of not including an industry variable in the model because of the attendant difficulties in defining industries in countries with small capital markets (the majority of the sample). Unlike Morck et al. (2000), we do not include US stock market returns as a variable because a firm's exposure to the US market is better viewed as having two components, one being firm-specific and the other market-wide, the latter being captured by the market variable and the former by the residuals.

Our model, expressed in Equation (1), regresses company *j's* returns (RC_{jwt}) on the market's returns (RM_{jwt}) and yields an R^2 value per company-year.

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt} \tag{1}$$

To mitigate thin trading problems, all returns are measured on a weekly basis (*w*) for each year (*t*). To prevent spurious correlations – more severe in countries with few companies – market returns are value-weighted averages excluding company *j*, as follows:

$$RM_{jwt} = \sum_{\substack{i=1 \\ i \neq j}}^{n} \left(\frac{MV_{iwt}}{\sum_{\substack{i=1 \\ i \neq j}}^{n} MV_{iwt}} \times RC_{iwt} \right) \tag{2}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

R^2 is the proportion of the regression sum of squares (*SSR*) to the total sum of squares (*SST*), which is in turn the sum of *SSR* and the sum of squared errors (*SSE*).

$$R_{jt}^2 = \frac{SSR_{jt}}{SST_{jt}} = \frac{SSR_{jt}}{SSR_{jt} + SSE_{jt}} \tag{3}$$

An annual R^2 value for the entire sample is then computed by weighting individual R^2s within country *c* by *SST*, as in Equation (4) below. We adopt this approach for purposes of comparison with prior work and because it allows us to apply the same rationales as in Equation (3) at the country level and to facilitate the decomposition of the aggregate R^2 into its components:

$$R_{ct}^2 = \frac{\sum_{j \in c} \left(R^2{}_{jt} \times SST_{jt} \right)}{\sum_{j \in c} SST_{jt}} \tag{4}$$

A large R^2 for a firm indicates that the market explains a substantial proportion of its returns. Under the informational interpretation used by Morck et al. (2000) and Durnev et al. (2001), a small R^2 means that such pervasive factors poorly explain the company's returns and, therefore, firm-specific information is driving the measure. These rationales, when applied at the country-level, suggest that in countries with high (low) R^2s, market-wide factors are more (less) relevant in explaining stock returns relative to firm-specific information.

To aid comparability, our sample comprises data for the same forty countries used in Morck et al. (2000), but covering a much longer period, 1985-2004. These countries form a comprehensive set of active capital markets that are representative of capital markets worldwide.

For each country, we select the most comprehensive list of companies available in the database. We eliminate all duplicate records, both within and across

countries (i.e., cross-listed companies). When deleting cross-country duplicates, we retain the observation from the country of origin. We exclude secondary issues of shares, companies where we cannot obtain all the required information, and companies that for a particular year have less than 26 weekly observations for returns. Finally, to mitigate the influence of extraneous environmental and governance factors, we exclude companies classified as foreign for a particular market. Table 1 presents details of the composition of the final sample.

Table 2 shows the number of companies per year in each country. The number of firms varies significantly across countries. Poland has the least firms, with an average of only 27 companies, and the USA has the most, with an average of 6,624 companies. The overall average per country is 342 companies (181 if we exclude the USA) and the median is 96 companies. There are missing data for earlier years for some countries. We deal with this missing-data problem by running our tests both for the whole period and for the period for which common data are available for all countries (1997-2004). We delete years when the number of firms in a country is below 20% of its average for the whole period.[9] All information was retrieved directly from *CRSP* for the US firms and from *Datastream* for all other countries. Our sample includes dead firms and financial companies.

A final difference between our sample and Morck et al.'s (2000) is that we do not exclude extreme returns. In their study, all bi-weekly stock returns higher than 25% in absolute value are excluded as data errors. Prior detailed investigations on our UK sample, untabulated here, suggest that such extreme retunrs are much more likely

[9] As a robustness check, we also replicate this sample selection criterion at 10% and 25%. Our results are not statistically sensitive to the choice of cutoff point.

to reflect important new information and as such are not simply due to measurement error.[10] Our reason for not excluding such extreme observations is to ensure all information effects are properly captured.

Table 3 compares results for the year of 1995 used in Morck et al.'s study to check consistency between our results and their's. It shows, as expected, R^2s in our sample are considerably lower than Morck et al.'s. We rank the two sets of results and run two nonparametric measures of association (Sheskin, 2004). Both Kendall's *tau* and Spearman's *rho* show a high degree of concordance, 0.75 and 0.83, respectively, both significant at the 0.01 level, allowing us to conclude that there is a monotonic positive relation between the ranks in our study and that of Morck et al.'s (2000). As a further sensitivity check, we also re-ran all the analyses reported below, using a model identical to Morck et al.'s that included US returns with exactly the same trimming of extreme returns at 25%. Untabulated results indicate that our overall results reported later in this paper remain substantially unaffected.

4. RESULTS

(i) Ranking Countries

We rank countries by their mean R^2 over the sample period to see if such rankings accord with commonly-held preconceptions of the quality of countries' information environments. In Table 4 Panel A, we can immediately determine that the rank produced based on the mean (last column) is inconsistent with an informational

[10] In particular, we examined actual information releases for our complete sample of UK companies during the weeks in which the extreme returns were observed. We used the *Perfect Information* database and selected all returns above 200%. In 87% of the cases there was an information release about the company.

explanation. The Czech Republic and Portugal are in the top five and as such almost as good as the USA. Peru would be interpreted as having better corporate governance and investors' protection regimes than the UK, with Pakistan as being near equal to Japan, and both far better than Hong Kong. Table 4 Panel B ranks countries by individual year. The rankings exhibit considerable variability across time.

As a robustness test, Table 5 ranks the countries according to the R^2 average for the common data period (1997-2004) rather than the whole period. Conclusions are even more puzzling for this sub-sample. Now the USA, generally acclaimed as the strongest capital market in the world, is only in eleventh place, behind countries like Austria, Belgium, Czech Republic, Ireland, Peru and Portugal.

Clearly, whichever data set is used, the cross-country ranking of R^2 is extremely sensitive to the choice of year. Furthermore, one can observe from Table 4 Panel B that for some countries R^2 is erratic over time.[11] If corporate governance and other macro-economic factors are deemed mainly to explain the behaviour of the R^2 measure, then we would not expect to observe such extreme fluctuations as the ones shown. There are 696 adjacent-year-country possible paired combinations. In 171 pairings we observe either an increase of at least 100% or decrease of more than 50% in annual R^2. The number goes up to 324 pairings if we consider increases of at least 50% and decreases of 33% or more in R^2.

To test if the overall differences in R^2 from year to year are statistically significant, we apply a Single-Factor Within-Subjects Analysis of Variance based on

[11] As stated earlier, as a check we have also carried out this analysis using the same procedures followed in Morck et al. (2000). Untabulated results indicate similar sensitivity to the choice of year and similar erratic behaviour.

the null hypothesis that the mean R^2 between years in the sample is constant.[12] Untabulated results show that, after removing the country effect, the null hypothesis is rejected at both the 0.05 and 0.01 levels, confirming that that there is a significant difference between the mean R^2 for at least two of the years. These results hold both for the whole sample and for the common sample. [13]

We also examine whether there are significant changes between overall average R^2 for adjacent years. Untabulated results reveal that for 14 (10) out of the 19 year pairs the null hypothesis that overall average R^2s remain stable is rejected at the 0.05 (0.01) level. Again, applying the same test to the common data years results in the rejection of the null hypothesis for 5 (4) out of the 7 year pairs at the 0.05 (0.01) level, respectively.

(ii) Effects of Aggregation and Decomposition

If R^2 is to serve as a reliable measure of the information environment it should not be affected unduly by the arbitrary aggregation of or subdivision of countries when selecting a measure of market returns. We address this issue by presenting the results of creating R^2 for 'pseudo-countries' obtained by aggregating real countries based on different criteria described below and comparing them with the average of the R^2 for the original non-aggregated countries. We then explore the inverse approach by decomposing the American market into its three main stock exchanges.

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[12] This test is a multivariate analogue of the paired sample *t* test for means and it increases the power of the test by examining the extent of the differences in mean annual R^2 for years (between 'conditions') after removing the effect of the countries (between 'subjects').

[13] We also apply the non-parametric Friedman Two-Way Analysis of Variance by Ranks test (Sheskin, 2004) to the country ranks shown in Table 4 Panel B in order to test if at least two medians are different, with essentially the same results.

Equation (5) represents the baseline we use to compute the R^2 for a single country. In this equation, the returns of firm *i* in country *j* (R_{ij}) are regressed on the market returns of country *j*, and then weighted by SST for the combined countries together to get the R^2 for the whole pseudo-country:

$$R_{ij} = \alpha_j + \beta_j RM_j + \varepsilon_{ij}. \quad (5)$$

The same equation is used to compute the R^2 for a given pseudo-country. In this case, the pseudo-market return, *RM*, is generated using all companies in the *n* original country markets included in the pseudo-country. Fitting one model for *n* combined countries would result in a single composite index analogous to a value-weighted average of the individual countries, as shown in Equation (6):

$$R_i = \alpha + \beta\left[w_1 RM_1 + \ldots + w_{n-1} RM_{n-1} + \left(1 - w_1 - \ldots - w_{n-1}\right) RM_n\right] + \varepsilon_i. \quad (6)$$

In concept, fitting separate models for each country could be viewed as analogous to (but not quite the same as) fitting a single regression model with dummy intercepts and slopes for each country, as in Equation (7):

$$R_i = \alpha_1 + \alpha_2 D_1 + \ldots + \alpha_n D_{n-1} + \beta_1 RM_1 + \beta_2 RM_2 D_1 + \ldots + \beta_n RM_n D_{n-1} + \varepsilon_i. \quad (7)$$

To the extent that the dummy variables are significant, and the explanatory power of the markets is differentiated, this model would result in a better fit. On the other hand, only if all the dummy variables were insignificant and the different markets had no differential explanatory power, would the resulting R^2 be similar to the one yielded by Equations (5) and (6).[14]

[14] Fitting a separate model for each country assumes country effects are independent of each other. It could be the case, for example, that returns in one country may be affected by the index in another, resulting in the following equation.

(Continues next page)

(a) Examples of the Effects of Aggregation

Based on our data set, we provide some numerical examples to illustrate the effects of aggregation of countries on R^2 discussed above. First, Table 6 Panel A illustrates the effects of combining pairs of geographically neighbouring countries to form a larger pseudo-country. Morck et al.'s analysis would not lead us to expect a significant change in R^2 as a result of this merger because the information environments remain constant. Therefore, if R^2 is a good measure of such a quality, we would expect R^2s pre- and post-merging to be an average of the two. However, when we perform such a procedure based on our data, we consistently observe a drop in R^2. Consider for instance Belgium and Netherlands with R^2s of 10% and 9%, respectively. The merging of these two capital markets decreases R^2 by 53% to 5%. If we follow Morck et al.'s (2000) interpretation, the merging of the two countries would be interpreted as a significant increase in the strength of corporate governance and investor protection regimes and, therefore, in the overall quality of the information environment. For illustrative purposes, we applied the same procedure to other geographically neighbouring countries with similar results: China and Taiwan would apparently 'increase' the quality of their information environment by 36%, Malaysia and Singapore would observe an 'improvement' of 24% and, finally, Australia and New Zealand of 34%, for example.

Second, the same effect is observed if we combine countries instead of by geographical proximity, by similarity in R^2, details of which are given in Table 6 Panel B. Pseudo-country E, for example, includes six countries (Ireland, New

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$$R_i = \alpha_1 + \alpha_2 D_1 + ... + \alpha_n D_{n-1} + \beta_1 RM_1 + ... + \beta_n RM_n + \varepsilon_i .$$

This aspect is not considered in this paper.

Zealand, Peru, United Kingdom, Brazil, and Australia), all with an R^2s between 0.06 and 0.07; by merging them we observe a 40% reduction in R^2. Other combinations selected by similarity in R^2 show even larger reductions in merged R^2. Pseudo-country F (Germany, India, South Africa, Finland, Indonesia and Sweden), for example, which also has a variation in R^2 between the original constituent countries of only 0.01, has a 74% reduction in R^2.

Finally, we also examine the behaviour of R^2 where pseudo-countries are created by merging actual countries based on an external and non-R^2-based selection criterion. In particular we combine countries based on similarity of S&P transparency and disclosure rating scores (Doidge et al., 2004). The results, reported in Table 6 Panel C, show similarly declining merged R^2 scores. This final basis for constructing pseudo-countries could be regarded as particularly compelling, given that it provides us with an externally determined measure of some common dimensions of each country's corporate governance quality. Again, the aggregation of these information-environmentally similar countries has resulted in approximately a 50% reduction in R^2.

The above examples demonstrate that aggregation does indeed reduce R^2. The reason is that instead of fitting *n* models, one per country, to determine R^2 we are now fitting only one model to *n* countries. We are effectively forcing the parameters to be the same across the *n* populations, as outlined and discussed analytically in the previous section. If the parameters in the separate models are significantly different, the aggregated model loses part of its ability to fit the data and a lower R^2 results. In

all the above examples, untabulated Wald tests reveal that these parameter restrictions are highly significant.[15]

(b) An Example of the Effects of Disaggregation

We now do the opposite by disaggregating one country, the USA, into three pseudo-countries, each corresponding to one of its three major stock exchanges (AMEX, NASDAQ and NYSE). We know in advance, of course, that each pseudo-(subdivided) country has almost the same institutional framework. Needless to say, we might still expect some differences. A large portion of the companies listed in the AMEX are smaller than those in the other two stock exchanges. The NASDAQ is the largest stock exchange in terms of number of companies listed and number of shares traded per day. It has a strong focus on new technology and R&D intensive firms. The NYSE is by far the largest in dollar traded volume and second largest by number of companies listed. The NYSE is often considered as representing the *Old Economy* and the NASDAQ as representing the *New Economy*. Table 7 Panel A presents the number of companies per year and per stock exchange.[16]

In spite of these differences, all are under the regulatory umbrella of the SEC and apply the same accounting rules. All have a similar analyst environment and corporate governance and investors' protection regimes. However, if we look at Table 7 Panel B without prior knowledge of the name of the particular stock exchange (as if the R^2s were from different countries), we would conclude that the country called NYSE has the worst information environment of the three pseudo-countries because it

[15] Significance levels are high. 70% are significant at the 1% level.

[16] Bennett and Sias (2006) attribute the increase in firm-specific risk over the last three decades to the growth of riskier industries, the increase of small stocks in the market and a decline in industry concentration. Firms with these attributes are much more frequently found in AMEX or NASDAQ.

has the highest R^2. The other two 'countries' have somewhat similar R^2s. It could be argued that we ought to observe the opposite ranking: the NASDAQ and AMEX pseudo-countries comprise smaller and more technology-intensive companies. Smaller companies will be less closely followed by analysts and might have less sophisticated governance regimes. The value of technology-intensive companies will be subject to greater uncertainty because they are more dependent on growth options. For both types of company, these factors might lead one to conclude that they have worse information environments and, as such, their pseudo-countries ought to have higher R^2s. In passing, one might also note the similarity in R^2 of the NYSE with the South American country, Colombia (see Table 3 Panel A). It is difficult to believe that the information environments of the NYSE and the Bogota Stock Exchange are of similar quality.

5. CONCLUSIONS

The paper presents a cross-country analysis of the use of R^2 as a measure of information. Our results lead us to conclude that R^2 is inadequate as a measure of the quality of the information environment at a country level. The rationales advanced in the literature for the use of country R^2 as a measure of information have been based on the implicit assumption of stability of country corporate governance and investor protection regimes. It is inconceivable that such factors could change as rapidly and unpredictably as do the changes in country R^2. Our study also reveals substantial aggregation and disaggregation problems with interpreting R^2 as a measure of the quality of the information environment at a country level.

The usefulness of a single indicator of the quality of a firm's information environment across countries is beyond question. However, our research indicates that R^2 is an unreliable metric for this purpose.

Table 1 –Number of companies per country (1985-2004)

Country	Datastream or CRSP list (no duplicates)	Data unavailable	Insufficient observations	Foreign companies	Final sample
Australia	1,510	-609	-86	-362	453
Austria	237	-49	-3	-41	144
Belgium	753	-186	-59	-344	164
Brazil	908	-463	-59	-20	366
Canada	5,140	-831	-431	-1.026	2.852
Chile	76	-21	0	-2	53
China	96	-16	-2	-4	74
Colombia	201	-80	-13	-42	66
Czech Republic	39	0	0	-7	32
Denmark	288	-26	-8	-61	193
Finland	206	-25	-17	-55	109
France	1,742	-257	-53	-567	865
Germany	5,703	-2.049	-540	-2.493	621
Greece	204	-26	-3	-18	157
Hong Kong	312	-47	-7	-69	189
India	1,086	-569	-39	-172	306
Indonesia	365	-227	-1	-40	97
Ireland	149	-30	-1	-31	87
Italy	651	-144	-36	-107	364
Japan	2,434	-1.109	-35	-217	1.073
Korea (South)	797	-91	-45	-50	611
Malaysia	570	-244	-29	-174	123
Mexico	255	-44	-13	-45	153
Netherlands	715	-181	-18	-259	257
New Zealand	298	-66	-30	-87	115
Norway	408	-31	-22	-141	214
Pakistan	141	-41	-5	-5	90
Peru	140	-79	-4	-7	50
Philippines	274	-170	-3	-18	83
Poland	51	-6	-3	0	42
Portugal	247	-75	-6	-27	139
Singapore	948	-720	-18	-40	170
South Africa	1,354	-967	-26	-68	293
Spain	272	-49	-3	-66	154
Sweden	903	-140	-34	-358	371
Taiwan	243	-11	-8	-6	218
Thailand	613	-332	-21	-30	230
Turkey	149	-38	-3	-24	84
United Kingdom	5,869	-2.189	-36	-961	2.683
United States	21,085	-751	-419	-1.941	17.974

Note:
For the US, secondary issues of shares were, for presentation reasons, classified as “data unavailable”.

Table 2 –Number of companies per year (1985-2004)

Country	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean
Australia	75	75	78	81	114	135	148	157	181	199	236	255	292	300	292	279	277	270	243	244	217	204
Austria	24	24	26	34	39	43	48	61	73	86	94	101	100	100	103	94	90	90	80	73	59	71
Belgium	46	48	71	76	79	81	84	90	91	92	97	98	104	111	118	121	126	123	117	109	99	97
Brazil							17	35	45	50	64	196	189	245	241	242	234	202	171	142	112	146
Canada	284	322	366	433	475	975	1,285	1,284	1,155	1,136	1,231	1,235	1,223	1,262	1,345	1,296	1,261	1,131	847	612	419	965
Chile							30	31	34	38	39	40	40	44	46	45	45	45	46	47	47	41
China									5	11	21	26	31	49	56	57	59	57	49	50	47	40
Colombia									25	33	34	43	47	49	48	44	48	44	44	44	42	42
Czech Republic											7	30	31	31	32	32	32	32	32	32	30	29
Denmark	40	41	44	44	105	118	121	125	149	153	155	161	170	161	160	143	129	108	85	73	62	115
Finland				3	29	34	39	49	49	53	60	73	77	84	89	92	82	74	67	59	51	59
France	99	103	107	113	153	353	374	427	439	450	495	530	559	655	628	501	476	456	408	337	269	392
Germany	130	133	142	150	157	285	323	349	373	386	396	411	448	434	438	449	472	454	431	367	294	345
Greece					55	59	69	85	88	88	101	112	114	116	114	101	99	96	80	69	59	89
Hong Kong	46	49	51	57	80	84	85	87	98	114	122	126	132	138	139	137	139	137	135	126	128	108
India							128	143	153	186	229	237	253	246	227	194	141	129	126	118	109	175
Indonesia							29	38	43	46	51	61	67	75	78	73	68	65	62	57	56	58
Ireland	32	34	36	41	51	58	60	62	63	62	63	62	63	65	68	70	70	66	60	54	53	58
Italy	53	54	139	187	199	214	224	231	241	242	248	249	254	245	230	231	230	216	207	181	159	209
Japan	356	356	357	359	528	581	703	746	767	778	807	844	872	883	885	874	830	791	734	654	581	697
Korea (South)	2	119	123	133	160	206	274	283	286	288	293	296	305	367	362	332	366	336	307	256	178	264
Malaysia	12	12	58	62	65	66	72	77	84	92	95	98	101	110	111	108	103	102	98	93	90	85
Mexico					31	37	47	53	79	88	102	102	99	84	83	73	76	80	84	85	88	76
Netherlands	104	112	119	133	140	146	154	159	164	167	172	176	185	196	214	220	207	179	163	148	138	165
New Zealand			5	6	36	36	38	38	45	53	66	72	71	65	69	69	68	74	67	61	58	52
Norway	31	37	41	44	43	47	65	68	70	76	92	104	119	132	146	132	114	99	90	60	50	81
Pakistan								3	4	56	60	67	71	71	81	80	77	74	65	61	49	59
Peru								2	12	18	21	30	35	36	38	38	42	47	46	42	42	32
Philippines					6	6	32	38	43	49	56	64	70	70	63	60	53	53	51	48	45	47
Poland												3	5	13	22	32	35	39	40	41	42	27
Portugal					46	57	70	76	82	91	96	103	105	103	111	101	90	72	62	56	51	81
Singapore	58	58	59	62	68	74	80	88	94	101	109	112	114	119	122	119	123	116	100	98	93	95
South Africa	33	33	34	40	41	45	161	177	187	195	200	208	228	228	215	163	122	92	81	78	71	130
Spain			5	43	46	71	82	87	90	97	98	100	101	106	119	130	134	140	135	127	121	96
Sweden	36	39	43	46	48	104	129	136	143	152	168	190	204	212	220	221	205	186	163	111	88	140
Taiwan					18	23	57	62	75	91	97	100	124	132	139	153	157	154	138	119	95	102
Thailand				30	45	70	93	107	130	148	168	189	199	188	140	110	82	74	67	60	57	109
Turkey					22	24	32	45	50	53	54	58	58	65	69	68	74	73	71	51	49	54
United Kingdom	786	839	903	990	1,097	1,171	1,225	1,252	1,276	1,333	1,464	1,556	1,705	1,818	1,819	1,682	1,657	1,688	1,689	1,580	1,512	1,413
United States	5,907	5,832	6,007	6,470	6,452	6,225	6,167	6,050	6,254	6,551	7,237	7,361	7,820	8,034	7,917	7,348	7,137	6,520	6,006	5,594	5,495	6,624

Table 3 – Comparison of R²'s computed in the current study with those of Morck et al. (2000) based on the only year used by that study, 1995

	R²		Rank	
	Sample	**Morck**	**Sample**	**Morck**
Ireland	0.01	0.06	1	2
Portugal	0.02	0.07	2	7
Austria	0.02	0.09	3	10
Canada	0.02	0.06	4	3
New Zealand	0.03	0.06	5	5
Spain	0.03	0.19	6	27
United States	0.03	0.02	7	1
Australia	0.04	0.06	8	5
United Kingdom	0.04	0.06	9	3
France	0.04	0.08	10	8
Netherlands	0.04	0.10	11	11
Denmark	0.04	0.08	12	8
Norway	0.05	0.12	13	13
South Africa	0.05	0.20	14	29
Brazil	0.05	0.16	15	19
Germany	0.08	0.11	16	12
Czech Republic	0.09	0.19	17	24
Italy	0.10	0.18	18	23
Belgium	0.10	0.15	19	17
Sweden	0.10	0.14	20	15
India	0.11	0.19	21	25
Finland	0.11	0.14	22	15
Indonesia	0.11	0.14	23	14
Philippines	0.12	0.16	24	20
Greece	0.12	0.19	25	27
Colombia	0.14	0.21	26	30
Korea (South)	0.15	0.17	27	21
Peru	0.15	0.29	28	34
Mexico	0.18	0.29	29	35
Pakistan	0.18	0.18	30	22
Singapore	0.19	0.19	31	26
Japan	0.20	0.23	32	32
Chile	0.22	0.21	33	30
Thailand	0.26	0.27	34	33
Hong Kong	0.27	0.15	35	18
China	0.28	0.45	36	39
Turkey	0.32	0.39	37	36
Malaysia	0.34	0.43	38	38
Taiwan	0.37	0.41	39	37
Poland		0.57		40

Notes:

The R²'s for each country-year in 1995 are based on individual company R^2's computed using the equation:

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

The annual R² value for 1995 for the entire country c, is then computed as a weighted average of the individual company R^2s. The weights used for that period are of the individual company's regression total sum of squares SST_{jt} in the above equation, to $SST_{ct.}$ which is the country aggregate of the individual company regression total sum of squares for all companies in that country for year t, here 1995.

Poland was excluded from our analysis above since in 1995 it had less than 20% of the average number of companies for the whole of our study period.

Table 4 – R^2 by country-year

Panel A: Rank by average R^2 – Whole sample

Nr	Country	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Median	Mean
1	Canada	0.03	0.03	0.10	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
2	United States	0.03	0.04	0.09	0.03	0.03	0.04	0.04	0.03	0.02	0.04	0.03	0.03	0.03	0.06	0.03	0.11	0.08	0.06	0.05	0.08	0.04	0.05
3	Czech Republic										0.03	0.09	0.04	0.05	0.10	0.08	0.05	0.03	0.03	0.03	0.04	0.04	0.05
4	Portugal				0.11	0.03	0.07	0.07	0.02	0.06	0.03	0.02	0.02	0.04	0.11	0.06	0.06	0.07	0.07	0.03	0.04	0.06	0.05
5	Ireland	0.04	0.07	0.17	0.09	0.03	0.08	0.08	0.07	0.04	0.08	0.01	0.03	0.05	0.08	0.02	0.03	0.06	0.04	0.03	0.03	0.04	0.06
6	New Zealand				0.07	0.06	0.05	0.07	0.04	0.06	0.07	0.03	0.03	0.07	0.14	0.04	0.05	0.05	0.05	0.03	0.04	0.05	0.06
7	Peru								0.04	0.02	0.04	0.15	0.04	0.04	0.16	0.06	0.02	0.04	0.03	0.04	0.05	0.04	0.06
8	United Kingdom	0.06	0.08	0.23	0.11	0.09	0.07	0.07	0.06	0.03	0.04	0.04	0.03	0.03	0.06	0.03	0.05	0.10	0.04	0.05	0.02	0.05	0.06
9	Brazil							0.03	0.02	0.03	0.03	0.05	0.03	0.02	0.10	0.06	0.05	0.12	0.13	0.07	0.19	0.05	0.07
10	Australia	0.11	0.11	0.32	0.09	0.05	0.06	0.03	0.05	0.05	0.08	0.04	0.04	0.05	0.05	0.03	0.04	0.05	0.04	0.03	0.06	0.05	0.07
11	Netherlands	0.08	0.11	0.18	0.09	0.07	0.12	0.08	0.06	0.03	0.09	0.04	0.04	0.11	0.18	0.06	0.06	0.17	0.08	0.10	0.11	0.08	0.09
12	Colombia								0.09	0.10	0.14	0.14	0.07	0.05	0.09	0.11	0.03	0.07	0.05	0.10	0.16	0.09	0.09
13	Belgium	0.17	0.16	0.26	0.14	0.03	0.25	0.10	0.08	0.08	0.08	0.10	0.05	0.10	0.03	0.04	0.08	0.08	0.04	0.07	0.04	0.08	0.10
14	Denmark	0.20	0.31	0.29	0.05	0.09	0.12	0.05	0.08	0.06	0.06	0.04	0.03	0.07	0.05	0.04	0.05	0.18	0.06	0.07	0.08	0.07	0.10
15	Austria	0.17	0.12	0.25	0.04	0.16	0.42	0.26	0.27	0.03	0.05	0.02	0.06	0.04	0.11	0.01	0.02	0.02	0.02	0.02	0.04	0.05	0.11
16	France	0.16	0.26	0.30	0.27	0.10	0.13	0.08	0.04	0.04	0.06	0.04	0.03	0.04	0.08	0.04	0.09	0.13	0.11	0.08	0.08	0.08	0.11
17	Norway	0.11	0.06	0.26	0.07	0.10	0.24	0.20	0.14	0.10	0.13	0.05	0.03	0.14	0.21	0.15	0.05	0.09	0.06	0.07	0.13	0.11	0.12
18	Spain			0.27	0.07	0.06	0.30	0.10	0.14	0.06	0.06	0.03	0.02	0.16	0.23	0.11	0.07	0.23	0.09	0.11	0.11	0.10	0.12
19	Germany	0.14	0.21	0.33	0.23	0.09	0.27	0.12	0.09	0.06	0.08	0.08	0.03	0.09	0.14	0.07	0.07	0.17	0.11	0.07	0.07	0.09	0.13
20	India						0.20	0.12	0.24	0.13	0.09	0.11	0.10	0.06	0.06	0.04	0.09	0.22	0.10	0.11	0.26	0.11	0.13
21	South Africa	0.30	0.35	0.37	0.30	0.32	0.08	0.06	0.08	0.07	0.06	0.05	0.04	0.04	0.10	0.08	0.06	0.06	0.05	0.08	0.09	0.08	0.13
22	Finland				0.13	0.20	0.11	0.19	0.26	0.19	0.15	0.11	0.09	0.12	0.19	0.07	0.10	0.10	0.09	0.04	0.12	0.12	0.13
23	Indonesia						0.12	0.19	0.22	0.09	0.11	0.11	0.05	0.20	0.15	0.18	0.11	0.10	0.18	0.10	0.18	0.12	0.14
24	Sweden	0.18	0.25	0.34	0.22	0.11	0.26	0.09	0.11	0.08	0.16	0.10	0.08	0.11	0.26	0.05	0.07	0.10	0.11	0.10	0.08	0.11	0.14
25	Japan	0.05	0.11	0.10	0.10	0.07	0.37	0.18	0.29	0.21	0.16	0.20	0.11	0.11	0.19	0.07	0.07	0.14	0.13	0.12	0.14	0.12	0.15
26	Pakistan									0.14	0.15	0.18	0.10	0.11	0.17	0.09	0.14	0.15	0.19	0.25	0.18	0.15	0.15
27	Philippines						0.16	0.06	0.10	0.09	0.13	0.12	0.06	0.13	0.31	0.09	0.19	0.38	0.13	0.22	0.14	0.13	0.15
28	Mexico				0.31	0.17	0.14	0.10	0.18	0.12	0.19	0.18	0.07	0.17	0.37	0.18	0.24	0.14	0.13	0.07	0.09	0.17	0.17
29	Korea (South)	0.10	0.20	0.19	0.30	0.27	0.46	0.27	0.18	0.19	0.05	0.15	0.18	0.19	0.11	0.06	0.10	0.17	0.15	0.12	0.05	0.18	0.18
30	Chile						0.19	0.18	0.18	0.20	0.22	0.22	0.15	0.12	0.23	0.18	0.24	0.24	0.14	0.20	0.12	0.19	0.19
31	Greece				0.09	0.11	0.20	0.07	0.08	0.08	0.20	0.12	0.09	0.21	0.22	0.19	0.41	0.39	0.26	0.29	0.19	0.19	0.19
32	Italy	0.11	0.33	0.39	0.29	0.19	0.44	0.25	0.26	0.11	0.18	0.10	0.08	0.09	0.18	0.09	0.19	0.43	0.20	0.17	0.13	0.19	0.21
33	Poland													0.28	0.34	0.25	0.25	0.22	0.10	0.18	0.11	0.23	0.22
34	Hong Kong	0.19	0.20	0.52	0.22	0.43	0.30	0.22	0.26	0.20	0.30	0.27	0.13	0.25	0.31	0.10	0.11	0.18	0.14	0.17	0.23	0.22	0.24
35	Thailand			0.49	0.36	0.10	0.43	0.25	0.11	0.24	0.20	0.26	0.23	0.21	0.22	0.18	0.23	0.26	0.24	0.14	0.30	0.23	0.25
36	Singapore	0.42	0.32	0.54	0.33	0.26	0.47	0.30	0.26	0.13	0.20	0.19	0.15	0.20	0.43	0.22	0.12	0.21	0.22	0.17	0.11	0.22	0.26
37	Turkey				0.17	0.21	0.34	0.37	0.28	0.22	0.44	0.32	0.20	0.36	0.47	0.06	0.10	0.15	0.11	0.49	0.25	0.25	0.27
38	Malaysia		0.35	0.45	0.35	0.22	0.44	0.23	0.11	0.12	0.32	0.34	0.13	0.37	0.56	0.37	0.26	0.24	0.11	0.13	0.25	0.26	0.28
39	Taiwan					0.46	0.59	0.45	0.33	0.32	0.18	0.37	0.19	0.24	0.35	0.21	0.20	0.24	0.19	0.16	0.21	0.24	0.29
40	China									0.33	0.67	0.28	0.26	0.23	0.39	0.27	0.20	0.20	0.23	0.35	0.45	0.27	0.32

Panel B: Rank by individual years

Nr	Country	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Median	Mean
1	Canada	1	1	3	1	1	1	1	3	2	1	4	3	2	2	3	5	2	2	3	2	2	2
2	Ireland	3	4	4	8	2	8	14	11	8	16	1	7	10	9	2	3	8	5	2	3	6	6
3	United States	2	2	1	2	5	2	4	4	3	7	7	8	4	6	6	28	11	13	11	16	6	7
4	United Kingdom	5	5	7	13	12	5	10	10	6	6	9	11	3	5	5	8	16	7	10	1	7	8
5	Portugal				14	3	6	9	2	12	4	2	1	5	16	16	14	9	15	4	4	6	8
6	Australia	8	8	14	10	6	4	2	8	10	15	8	13	11	4	4	6	6	6	6	11	8	8
7	New Zealand				5	8	3	8	7	11	14	5	9	16	18	9	10	5	10	7	8	8	9
8	Peru								5	1	5	28	16	6	20	17	1	4	4	9	10	6	10
9	Czech Republic										3	17	14	13	11	23	12	3	3	5	6	11	10
10	Austria	13	9	8	3	19	27	30	33	7	8	3	20	8	14	1	2	1	1	1	5	8	11
11	Denmark	17	16	12	4	11	12	5	15	14	13	12	10	15	3	8	7	27	14	15	14	13	12
12	Brazil							3	1	4	2	15	12	1	12	15	11	18	29	16	33	12	12
13	Belgium	14	10	10	16	4	20	17	12	17	17	19	18	19	1	7	20	12	8	14	7	14	13
14	France	12	15	13	21	15	13	12	6	9	11	10	6	9	8	10	21	19	22	18	15	13	13
15	Netherlands	6	7	5	9	9	10	13	9	5	19	11	17	21	22	13	15	25	16	23	21	13	14
16	South Africa	18	20	17	23	27	7	7	14	16	12	14	15	7	13	22	13	7	11	19	18	15	15
17	Germany	11	13	15	20	13	22	20	16	15	18	16	4	17	17	19	16	24	21	17	12	17	16
18	Norway	9	3	9	7	16	19	25	23	23	23	13	5	27	26	30	9	13	12	13	26	15	17
19	Spain			11	6	7	23	18	22	13	10	6	2	28	29	28	19	33	18	25	20	19	18
20	Colombia								17	22	24	26	23	12	10	29	4	10	9	20	29	20	18
21	Sweden	15	14	16	18	17	21	15	20	18	27	20	24	23	31	12	17	15	25	21	13	18	19
22	Japan	4	6	2	12	10	26	22	35	34	28	32	30	20	25	21	18	20	26	27	27	24	21
23	Finland				15	22	9	24	29	31	26	22	27	25	24	20	25	14	17	8	24	24	21
24	India						17	19	28	28	20	21	28	14	7	11	22	31	19	24	38	21	22
25	Korea (South)	7	11	6	24	26	31	31	25	30	9	27	35	30	15	14	23	26	32	26	9	26	22
26	Indonesia						11	23	27	21	21	23	19	32	19	32	27	17	33	22	31	23	24
27	Mexico				25	20	14	16	26	25	31	29	22	29	36	31	36	21	27	12	17	25	25
28	Philippines						15	6	18	20	22	24	21	26	32	24	31	38	28	36	28	24	25
29	Italy	10	18	18	22	21	30	28	31	24	30	18	25	18	23	26	32	40	36	33	25	25	25
30	Greece				11	18	18	11	13	19	33	25	26	33	27	35	40	39	40	38	32	27	27
31	Pakistan									29	25	30	29	22	21	25	30	22	34	37	30	29	28
32	Hong Kong	16	12	21	19	28	24	26	30	33	36	35	31	37	33	27	26	28	31	32	35	29	28
33	Singapore	19	17	22	26	25	32	32	32	27	32	31	34	31	38	37	29	30	37	31	22	31	29
34	Chile						16	21	24	32	35	33	33	24	30	34	37	34	30	35	23	32	29
35	Malaysia		19	19	27	24	29	27	21	26	37	38	32	40	40	40	39	35	23	28	36	29	31
36	Turkey				17	23	25	33	34	35	38	37	37	39	39	18	24	23	24	40	37	34	31
37	Thailand			20	28	14	28	29	19	36	34	34	38	34	28	33	35	37	39	29	39	34	31
38	Poland													38	34	38	38	32	20	34	19	34	32
39	Taiwan					29	33	34	36	37	29	39	36	36	35	36	34	36	35	30	34	35	34
40	China									38	39	36	39	35	37	39	33	29	38	39	40	38	37

Notes:
The R^2's for each country-year in the period 1985-2004 are based on individual company R^2's computed using the equation:

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

The annual R^2 value for period t for the entire country c, is then computed as a weighted average of the individual company R^2s. The weights used for that period are of the individual company's regression total sum of squares SST_{jt} in the above equation, to $SST_{ct.}$ which is the country aggregate of the individual company regression total sum of squares for all companies in that country.

In Panel A of Table 4, countries are ranked by the mean country R^2 for the whole period for which data about that country is available.

In Panel B, within each year countries are assigned a rank for that year based on the country R^2's calculated as in Panel A (where '1' = lowest country R^2 for that year). Countries are ranked according to the mean annual rank ('1' = lowest rank).

Table 5 - Rank by average R^2 for common sample period (1997-2004)

Nr	Country	Median	Mean
1	Canada	0.03	0.03
2	Austria	0.02	0.04
3	Ireland	0.04	0.04
4	Australia	0.04	0.04
5	United Kingdom	0.04	0.05
6	Czech Republic	0.05	0.05
7	Peru	0.04	0.06
8	New Zealand	0.05	0.06
9	Portugal	0.06	0.06
10	Belgium	0.05	0.06
11	United States	0.06	0.06
12	South Africa	0.07	0.07
13	Denmark	0.06	0.07
14	France	0.08	0.08
15	Colombia	0.08	0.08
16	Brazil	0.09	0.09
17	Germany	0.08	0.10
18	Finland	0.10	0.10
19	Netherlands	0.11	0.11
20	Sweden	0.10	0.11
21	Norway	0.11	0.11
22	India	0.09	0.12
23	Korea (South)	0.12	0.12
24	Japan	0.12	0.12
25	Spain	0.11	0.14
26	Indonesia	0.16	0.15
27	Pakistan	0.16	0.16
28	Mexico	0.16	0.17
29	Chile	0.19	0.18
30	Italy	0.18	0.19
31	Hong Kong	0.18	0.19
32	Philippines	0.16	0.20
33	Singapore	0.20	0.21
34	Poland	0.23	0.22
35	Thailand	0.22	0.22
36	Taiwan	0.21	0.22
37	Turkey	0.20	0.25
38	Greece	0.24	0.27
39	Malaysia	0.26	0.29
40	China	0.25	0.29

Notes:
The R^2's for each country-year in the period 1997 -2004 (the common sample period for which data is

available for all the countries) are based on individual company R^2's computed using the equation:

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

The annual R^2 value for period t for the entire country c, is then computed as a weighted average of the individual company R^2s. The weights used for that period are of the individual company's regression total sum of squares SST_{jt} in the above equation, to $SST_{ct.}$ which is the country aggregate of the individual company regression total sum of squares for all companies in that country.

Table 5 ranks countries according to the mean annual R^2 ('1' = lowest company R^2) for the common sample period 1997-2004.

Table 6 –The R^2 of the aggregated pseudo-countries by year

Panel A: Countries grouped by geographical proximity

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean	Change
China									0.33	0.67	0.28	0.26	0.23	0.39	0.27	0.20	0.20	0.23	0.35	0.45	0.32	
Taiwan									0.32	0.18	0.37	0.19	0.24	0.35	0.21	0.20	0.24	0.19	0.16	0.21	0.24	
Average									**0.33**	**0.42**	**0.32**	**0.23**	**0.24**	**0.37**	**0.24**	**0.20**	**0.22**	**0.21**	**0.25**	**0.33**	**0.28**	
Pseudo-country A									**0.29**	**0.09**	**0.26**	**0.11**	**0.14**	**0.24**	**0.16**	**0.15**	**0.19**	**0.18**	**0.13**	**0.20**	**0.18**	**-36%**
Malaysia		0.35	0.45	0.35	0.22	0.44	0.23	0.11	0.12	0.32	0.34	0.13	0.37	0.56	0.37	0.26	0.24	0.11	0.13	0.25	0.28	
Singapore		0.32	0.54	0.33	0.26	0.47	0.30	0.26	0.13	0.20	0.19	0.15	0.20	0.43	0.22	0.12	0.21	0.22	0.17	0.11	0.25	
Average		**0.33**	**0.50**	**0.34**	**0.24**	**0.45**	**0.26**	**0.19**	**0.13**	**0.26**	**0.26**	**0.14**	**0.28**	**0.50**	**0.29**	**0.19**	**0.23**	**0.16**	**0.15**	**0.18**	**0.27**	
Pseudo-country B		**0.30**	**0.40**	**0.32**	**0.19**	**0.40**	**0.16**	**0.12**	**0.11**	**0.26**	**0.23**	**0.11**	**0.27**	**0.40**	**0.21**	**0.07**	**0.18**	**0.07**	**0.03**	**0.04**	**0.20**	**-24%**
Australia				0.09	0.05	0.06	0.03	0.05	0.05	0.08	0.04	0.04	0.05	0.05	0.03	0.04	0.05	0.04	0.03	0.06	0.05	
New Zealand				0.07	0.06	0.05	0.07	0.04	0.06	0.07	0.03	0.03	0.07	0.14	0.04	0.05	0.05	0.05	0.03	0.04	0.06	
Average				**0.08**	**0.06**	**0.06**	**0.05**	**0.04**	**0.05**	**0.08**	**0.03**	**0.03**	**0.06**	**0.10**	**0.04**	**0.05**	**0.05**	**0.04**	**0.03**	**0.05**	**0.05**	
Pseudo-country C				**0.03**	**0.04**	**0.05**	**0.03**	**0.01**	**0.01**	**0.06**	**0.04**	**0.03**	**0.04**	**0.04**	**0.05**	**0.04**	**0.03**	**0.04**	**0.03**	**0.05**	**0.03**	**-34%**
Belgium	0.17	0.16	0.26	0.14	0.03	0.25	0.10	0.08	0.08	0.08	0.10	0.05	0.10	0.03	0.04	0.08	0.08	0.04	0.07	0.04	0.10	
Netherlands	0.08	0.11	0.18	0.09	0.07	0.12	0.08	0.06	0.03	0.09	0.04	0.04	0.11	0.18	0.06	0.06	0.17	0.08	0.10	0.11	0.09	
Average	**0.13**	**0.13**	**0.22**	**0.11**	**0.05**	**0.18**	**0.09**	**0.07**	**0.05**	**0.09**	**0.07**	**0.04**	**0.11**	**0.11**	**0.05**	**0.07**	**0.13**	**0.06**	**0.08**	**0.08**	**0.10**	
Pseudo-country D	**0.07**	**0.02**	**0.05**	**0.06**	**0.03**	**0.10**	**0.10**	**0.06**	**0.01**	**0.04**	**0.03**	**0.03**	**0.05**	**0.02**	**0.02**	**0.01**	**0.04**	**0.05**	**0.05**	**0.06**	**0.05**	**-53%**

Panel B: Countries grouped by similarity of overall country mean R^2

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean	Change
Ireland	0.04	0.07	0.17	0.09	0.03	0.08	0.08	0.07	0.04	0.08	0.01	0.03	0.05	0.08	0.02	0.03	0.06	0.04	0.03	0.03	0.06	
New Zealand				0.07	0.06	0.05	0.07	0.04	0.06	0.07	0.03	0.03	0.07	0.14	0.04	0.05	0.05	0.05	0.03	0.04	0.06	
Peru								0.04	0.02	0.04	0.15	0.04	0.04	0.16	0.06	0.02	0.04	0.03	0.04	0.05	0.06	
United Kingdom	0.06	0.08	0.23	0.11	0.09	0.07	0.07	0.06	0.03	0.04	0.04	0.03	0.03	0.06	0.03	0.05	0.10	0.04	0.05	0.02	0.06	
Brazil							0.03	0.02	0.03	0.03	0.05	0.03	0.02	0.10	0.06	0.05	0.12	0.13	0.07	0.19	0.07	
Australia	0.11	0.11	0.32	0.09	0.05	0.06	0.03	0.05	0.05	0.08	0.04	0.04	0.05	0.05	0.03	0.04	0.05	0.04	0.03	0.06	0.07	
Average	**0.07**	**0.08**	**0.24**	**0.09**	**0.06**	**0.07**	**0.06**	**0.05**	**0.04**	**0.06**	**0.05**	**0.03**	**0.04**	**0.10**	**0.04**	**0.04**	**0.07**	**0.05**	**0.04**	**0.07**	**0.06**	
Pseudo-country E	**0.03**	**0.05**	**0.17**	**0.05**	**0.04**	**0.05**	**0.01**	**0.03**	**0.02**	**0.01**	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**	**0.04**	**0.08**	**0.03**	**0.03**	**0.03**	**0.04**	**-40%**
Germany	0.14	0.21	0.33	0.23	0.09	0.27	0.12	0.09	0.06	0.08	0.08	0.03	0.09	0.14	0.07	0.07	0.17	0.11	0.07	0.07	0.13	
India						0.20	0.12	0.24	0.13	0.09	0.11	0.10	0.06	0.06	0.04	0.09	0.22	0.10	0.11	0.26	0.13	
South Africa	0.30	0.35	0.37	0.30	0.32	0.08	0.06	0.08	0.07	0.06	0.05	0.04	0.04	0.10	0.08	0.06	0.06	0.05	0.08	0.09	0.13	
Finland				0.13	0.20	0.11	0.19	0.26	0.19	0.15	0.11	0.09	0.12	0.19	0.07	0.10	0.10	0.09	0.04	0.12	0.13	
Indonesia						0.12	0.19	0.22	0.09	0.11	0.11	0.05	0.20	0.15	0.18	0.11	0.10	0.18	0.10	0.18	0.14	
Sweden	0.18	0.25	0.34	0.22	0.11	0.26	0.09	0.11	0.08	0.16	0.10	0.08	0.11	0.26	0.05	0.07	0.10	0.11	0.10	0.08	0.14	
Average	**0.21**	**0.27**	**0.35**	**0.22**	**0.18**	**0.17**	**0.13**	**0.17**	**0.10**	**0.11**	**0.09**	**0.06**	**0.10**	**0.15**	**0.08**	**0.08**	**0.12**	**0.10**	**0.08**	**0.13**	**0.13**	
Pseudo-country F	**0.06**	**0.07**	**0.16**	**0.07**	**0.03**	**0.01**	**0.03**	**0.01**	**0.02**	**0.02**	**0.03**	**0.01**	**0.02**	**0.04**	**0.03**	**0.02**	**0.02**	**0.03**	**0.02**	**0.03**	**0.04**	**-73%**
Korea (South)	0.10	0.20	0.19	0.30	0.27	0.46	0.27	0.18	0.19	0.05	0.15	0.18	0.19	0.11	0.06	0.10	0.17	0.15	0.12	0.05	0.18	
Chile						0.19	0.18	0.18	0.20	0.22	0.22	0.15	0.12	0.23	0.18	0.24	0.24	0.14	0.20	0.12	0.19	
Greece				0.09	0.11	0.20	0.07	0.08	0.08	0.20	0.12	0.09	0.21	0.22	0.19	0.41	0.39	0.26	0.29	0.19	0.19	
Italy	0.11	0.33	0.39	0.29	0.19	0.44	0.25	0.26	0.11	0.18	0.10	0.08	0.09	0.18	0.09	0.19	0.43	0.20	0.17	0.13	0.21	
Poland													0.28	0.34	0.25	0.25	0.22	0.10	0.18	0.11	0.22	
Average	**0.11**	**0.27**	**0.29**	**0.23**	**0.19**	**0.32**	**0.19**	**0.17**	**0.14**	**0.16**	**0.14**	**0.12**	**0.18**	**0.21**	**0.16**	**0.24**	**0.29**	**0.17**	**0.19**	**0.12**	**0.20**	
Pseudo-country G	**0.07**	**0.17**	**0.10**	**0.13**	**0.09**	**0.20**	**0.12**	**0.08**	**0.01**	**0.05**	**0.05**	**0.06**	**0.08**	**0.09**	**0.04**	**0.13**	**0.08**	**0.08**	**0.11**	**0.05**	**0.09**	**-54%**

Panel C: Countries grouped based on similarity of S&P transparency and disclosure rating scores

	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean	Change
Finland	0.13	0.20	0.11	0.19	0.26	0.19	0.15	0.11	0.09	0.12	0.19	0.07	0.10	0.10	0.09	0.04	0.12	0.13	
Ireland	0.09	0.03	0.08	0.08	0.07	0.04	0.08	0.01	0.03	0.05	0.08	0.02	0.03	0.06	0.04	0.03	0.03	0.05	
United Kingdom	0.11	0.09	0.07	0.07	0.06	0.03	0.04	0.04	0.03	0.03	0.06	0.03	0.05	0.10	0.04	0.05	0.02	0.05	
Greece	0.09	0.11	0.20	0.07	0.08	0.08	0.20	0.12	0.09	0.21	0.22	0.19	0.41	0.39	0.26	0.29	0.19	0.19	
Average	**0.10**	**0.11**	**0.12**	**0.11**	**0.12**	**0.08**	**0.12**	**0.07**	**0.06**	**0.10**	**0.14**	**0.08**	**0.15**	**0.16**	**0.11**	**0.10**	**0.09**	**0.11**	
Pseudo-country H	**0.07**	**0.04**	**0.05**	**0.01**	**0.02**	**0.02**	**0.05**	**0.04**	**0.02**	**0.04**	**0.01**	**0.02**	**0.04**	**0.09**	**0.03**	**0.03**	**0.02**	**0.04**	**-67%**
Singapore	0.33	0.26	0.47	0.30	0.26	0.13	0.20	0.19	0.15	0.20	0.43	0.22	0.12	0.21	0.22	0.17	0.11	0.23	
Norway	0.07	0.10	0.24	0.20	0.14	0.10	0.13	0.05	0.03	0.14	0.21	0.15	0.05	0.09	0.06	0.07	0.13	0.12	
Italy	0.29	0.19	0.44	0.25	0.26	0.11	0.18	0.10	0.08	0.09	0.18	0.09	0.19	0.43	0.20	0.17	0.13	0.20	
New Zealand	0.07	0.06	0.05	0.07	0.04	0.06	0.07	0.03	0.03	0.07	0.14	0.04	0.05	0.05	0.05	0.03	0.04	0.06	
Average	**0.19**	**0.15**	**0.30**	**0.20**	**0.18**	**0.10**	**0.15**	**0.09**	**0.07**	**0.12**	**0.24**	**0.13**	**0.10**	**0.19**	**0.13**	**0.11**	**0.10**	**0.15**	
Pseudo-country I	**0.03**	**0.05**	**0.17**	**0.09**	**0.10**	**0.02**	**0.11**	**0.03**	**0.04**	**0.06**	**0.08**	**0.08**	**0.07**	**0.19**	**0.06**	**0.04**	**0.08**	**0.08**	**-50%**
Philippines					0.10	0.09	0.13	0.12	0.06	0.13	0.31	0.09	0.19	0.38	0.13	0.22	0.14	0.16	
Mexico					0.18	0.12	0.19	0.18	0.07	0.17	0.37	0.18	0.24	0.14	0.13	0.07	0.09	0.16	
Peru					0.04	0.02	0.04	0.15	0.04	0.04	0.16	0.06	0.02	0.04	0.03	0.04	0.05	0.06	
Taiwan					0.33	0.32	0.18	0.37	0.19	0.24	0.35	0.21	0.20	0.24	0.19	0.16	0.21	0.24	
Average					**0.16**	**0.14**	**0.13**	**0.21**	**0.09**	**0.15**	**0.30**	**0.13**	**0.16**	**0.20**	**0.12**	**0.12**	**0.12**	**0.16**	
Pseudo-country J					**0.07**	**0.01**	**0.01**	**0.08**	**0.05**	**0.10**	**0.18**	**0.10**	**0.12**	**0.14**	**0.12**	**0.10**	**0.17**	**0.09**	**-43%**

Notes:

The R^2's for each country (pseudo-country)-year in the period 1985 -2004 are based on individual company R^2's computed using the equation:

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

The annual R^2 value for period t for the entire country c, is then computed as a weighted average of the individual company R^2s. The weights used for that period are of the individual company's regression total sum of squares SST_{jt} in the above equation, to $SST_{ct.}$ which is the country aggregate of the individual company regression total sum of squares for all companies in that 'country'.

The 'average' row for each grouping indicates the average values for that year of the individual countries' R^2's which comprise each 'pseudo country', and overall average R^2 for the full sample period for that grouping.

The "Pseudo-country" row for each grouping indicates the R^2's for that year for the pseudo-country itself, computed on the basis as described above. These are based on all companies in the particular combined pseudo-country, and overall average pseudo-country R^2 for the full sample period for that grouping.

The column headed "Change" shows the percentage change (always a decrease) between the particular pseudo-country's whole period R^2 and the whole period average R^2 for the countries in the pseudo-country grouping, taking the latter as 100%.

Table 7 – The R^2 of the USA disaggregated into separate stock-exchange determined pseudo-countries

Panel A: Number of companies per stock exchange and year

Exchange	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean
AMEX	694	703	746	798	764	757	740	725	697	696	660	641	656	658	634	679	659	661	653	665	694
NASDAQ	3,700	3,874	4,255	4,180	3,991	3,898	3,739	3,804	3,956	4,453	4,558	4,920	5,039	4,888	4,433	4,357	3,888	3,425	3,073	2,944	4,069
NYSE	1,438	1,430	1,469	1,474	1,470	1,512	1,571	1,725	1,898	2,088	2,143	2,259	2,339	2,371	2,281	2,101	1,973	1,920	1,868	1,886	1,861
United States	**5,832**	**6,007**	**6,470**	**6,452**	**6,225**	**6,167**	**6,050**	**6,254**	**6,551**	**7,237**	**7,361**	**7,820**	**8,034**	**7,917**	**7,348**	**7,137**	**6,520**	**6,006**	**5,594**	**5,495**	**6,624**

Panel B: R2 per stock exchange and year

Exchange	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	Mean	Change
AMEX	0.03	0.07	0.17	0.04	0.04	0.07	0.05	0.05	0.03	0.03	0.02	0.02	0.02	0.07	0.06	0.09	0.06	0.03	0.03	0.03	0.050	
NASDAQ	0.03	0.03	0.08	0.03	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.06	0.04	0.14	0.09	0.05	0.05	0.08	0.049	
NYSE	0.10	0.07	0.23	0.09	0.05	0.07	0.06	0.05	0.02	0.06	0.03	0.05	0.07	0.14	0.05	0.07	0.11	0.11	0.13	0.13	0.085	
Average	**0.05**	**0.06**	**0.16**	**0.05**	**0.04**	**0.06**	**0.05**	**0.04**	**0.03**	**0.04**	**0.03**	**0.04**	**0.04**	**0.09**	**0.05**	**0.10**	**0.08**	**0.07**	**0.07**	**0.08**	**0.061**	
United States	**0.03**	**0.04**	**0.09**	**0.03**	**0.03**	**0.04**	**0.04**	**0.03**	**0.02**	**0.04**	**0.03**	**0.03**	**0.03**	**0.06**	**0.03**	**0.11**	**0.08**	**0.06**	**0.05**	**0.08**	**0.049**	**-20%**

Notes:

The R^2's for each stock exchange year / pseudo-country year, and the R^2 for the United States, in the period 1985-2004 are based on individual company R^2's computed using the equation:

$$RC_{jwt} = \alpha_{jt} + \beta_{jt} RM_{jwt} + \varepsilon_{jwt}$$

where RM_{jwt} is the market return in week *w* of year *t*, excluding firm *j*, MV_{iwt} is company *i's* market value for the same period and *n* is the number of companies in the market. RC_{iwt} is company *i*'s returns in week *w* of year *t*.

The annual R^2 value for period t for the stock exchange / pseudo-country / United States, c, is then computed as a weighted average of the individual company R^2s. The weights used for that period are of the individual company's regression total sum of squares SST_{jt} in the above equation, to $SST_{ct.}$ which is the country aggregate of the individual company regression total sum of squares for all companies in that 'country'.

The 'average' row indicates the average values for that year of the individual pseudo-countries' / stock exchanges' R^2's and overall average R^2 for the full sample period for that grouping.

The column headed "Change" shows the percentage change (always a decrease) between the whole period R^2 for the United States and the whole period average R^2 for the stock exchanges in the USA, taking the latter as 100%.

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