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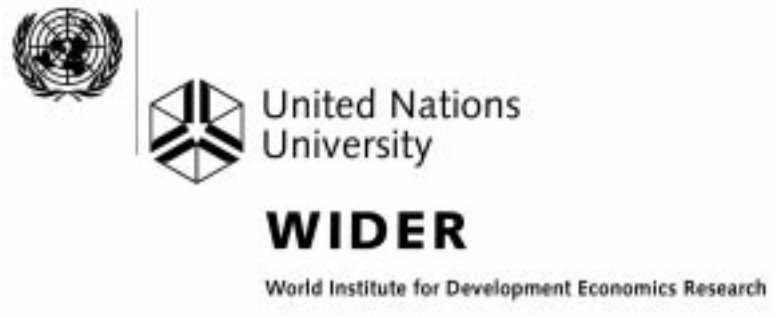

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The Pattern and Valuation Effects of Corporate Diversification

A Comparison of the United States, Japan, and other East Asian Economies

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Abstract

We document that firms in eight East Asian countries and Japan diversify into more segments and engage into more related businesses—as measured by the degree of vertical relatedness and complementarity—than firms in the USA. Using data for the 1990-6 period, we observe a trend towards complementary diversification in the United States and the eight East Asian countries, and a trend towards more vertical integration in Japan. The increase in relatedness for US firms is due to the divestiture of unrelated assets. In contrast, the increase in relatedness for firms in Japan and East Asia is due to expansion into related businesses. We also document the valuation effects of the diversification level, vertical relatedness and complementarity. We observe that diversification hurts the valuation of East Asian firms less than the valuation of firms in the Unites States and Japan. However, vertical diversification hurts the valuation of companies in East Asian more than the valuation of USA and Japanese firms. Complementary diversification is not detrimental to corporate value, and even enhances value in the USA, Japan, Korea, and Singapore.

Keywords: corporate diversification, valuation effects, East Asia, USA, Japan

JEL classification: G32, G34, L22

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1. Introduction

While a substantial literature has emerged on the valuation effects of corporate diversification in developed as well as developing countries, we still know little about how firms diversify and which types of diversification have the largest effect on corporate value. In light of the strong evidence that corporate diversification hurts firm valuation in the US,[1] a number of recent studies have investigated the effects of diversification and found mixed evidence on the valuation effects of diversification in the international context.[2] A criticism of these studies is that they do not document the precise nature of diversification, both across countries and over time. In this paper we offer two extensions to the literature. First, using data for the United States as a benchmark, we document the diversification patterns of corporations in Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand. Prior studies for the US and other countries have only used the number of segments to measure diversification levels. In this study, we distinguish between vertical and complementary diversification and study the differences in the types of diversification across the eight East Asian countries, Japan, and the United States, and the changes over time. Second, we investigate which types of diversification influence firm valuation in these countries, and what the magnitude of this valuation effect is.

We accomplish the first objective by documenting the degree of vertical and complementary diversification in the ten sample countries. We use the inter-industry commodity flow data in the 1992 input-output table for the US as a common benchmark to construct vertical relatedness and complementarity indices between the primary and the secondary businesses of all firms. These measures allow us to describe the degree of vertical diversification, joint procurement, and/or sharing marketing and distribution channels for any pairs of businesses in each firm.[3]

We find that firms in East Asia and Japan diversify into more segments and gear towards more related diversification, as measured by vertical relatedness and complementarity, than US firms. We show that corporations in the United States have adopted more focused corporate strategies over time. We also observe a trend towards complementary diversification for US and East Asian firms and vertical diversification for Japanese firms. The increase in relatedness for US firms is due to the divestiture of unrelated assets. In contrast, the increase in relatedness for firms in Japan and East Asia is due to expansion into related businesses. To accomplish the second objective of the paper, we analyze the impact of the number of segments, vertical relatedness and complementarity on firm valuation. A monotonically decreasing valuation as a function of the number of segments is documented for US and, to a lesser degree, Japanese firms. Our regression results also show significant diversification discounts for Singapore, Taiwan and Indonesia. We find

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[1] See Lang and Stulz (1994), Comment and Jarrell (1995), Berger and Ofek (1995), Servaes (1996), Scharfstein and Stein (1997), Denis, Denis and Sarin (1997), and Rajan, Servaes and Zingales (1999), among others.

[2] See, for example, Fauver et al., 1999 and Lins and Servaes (1999a, 1999b).

[3] Complementarity is broader than horizontal diversification in that the latter only covers diversification in the same industry.

no evidence of diversification discounts for the other East Asian countries, especially for firms with more than two segments. The overall results suggest that diversification of East Asian firms does not necessarily diminish value as it does for US firms. These findings challenge the conventional wisdom on the costs and benefits of diversification, as the results for US firms do not generalize to most other countries.

We show that vertical diversification hurts valuation in Korea, Malaysia, and Indonesia. In contrast, excess values increase with vertical relatedness in Japan, Hong Kong, and the United States. We do not observe any systematic relation between complementary diversification and excess value in the univariate comparative statistics. The regression analysis reveals, however, that complementary diversification is generally not detrimental to corporate value. In fact, it increases value in the United States, Japan, Korea, and Singapore. The paper proceeds as follows. Section 2 documents the data sources. In Section 3, we construct our relatedness measures and document patterns of diversification. We examine the relationships between diversification and valuation in Section 4. Section 5 concludes.

2. The data

2.1 Data sources

Our primary data source for East Asian corporate information is the Worldscope database, which contains financial and segment information on publicly traded companies from 51 countries.[4] We selected all companies from the nine countries covered by the September 1991-8 CD-rom version of annual Worldscope database. The 1991-8 Worldscope database covers firms from 1990 to 1997, and we select firms with fiscal year ending from January 1990 to December 1996. We do not use sample firms whose fiscal year ends outside this range. In each CD-rom, Worldscope provides current and historical financial data and current segment data. Since we frequently encounter missing segment information, we collect additional segment data from the autumn edition of the 1994-8 *Asian Company Handbook* and *Japan Company Handbook*. All financial data were converted to US dollars using fiscal year end foreign exchange rate.[5]

The disclosure requirements for segment information in East Asia differ significantly across countries (Table A1). The accounting standards regulatory bodies in Hong Kong, Japan, Malaysia, and Singapore all have guidelines that require compliance with the International Accounting Standard (IAS) No. 14, except on the disclosure of segment assets. Publicly-traded companies report sales, net income, and operating expenses for each segment that accounts for more than 10 percent of total sales. Some industries are, however, exempted from reporting. For example, banking and shipping companies listed

[4] The database has been used in La Porta et al. (1997), Fauver, Houston, and Naranjo (1999), and Lins and Servaes (1999a, 1999b).

[5] Worldscope, the *Asian Company Handbook* and the *Japan Company Handbook* provide information on whether all subsidiaries are consolidated, whether consolidation covers only the most significant subsidiaries, or whether the report is on a cost basis (unconsolidated). If a company changes its consolidation practice, this change is also recorded in the data. Since non-consolidated companies are a relatively small fraction of all firms (23% on average) and to increase sample size, we include all firms in the sample.

on the Hong Kong Stock Exchange do not report segment information. Corporations (listed as well as unlisted) in Korea are required to report segment information on sales revenues and operating expenditures, while corporations in Taiwan are required to report sales revenues and net income by segment. Listed companies in Indonesia and Thailand are required to report sales revenues and net income. Finally, Philippine companies report only sales revenues by segment. Since sales revenues are the only variable consistently reported in the ten sample countries, we use it to weigh the relative importance of each segment.

For US firms, we use the Compustat financial data. Segment data are obtained from the Compustat Industry Segment (CIS) database.[6] From the CIS database, we select all companies in the United States from 1990 to 1996. We exclude firms with missing segment Standard Industry Classification (SIC) codes and sales, and firms primarily in the finance sector (SIC 6000-6999). In addition to segment financial data, Compustat assigns a four-digit SIC code for each segment according to the segment's business description. Since we only have two digit information for most East Asian firms, we define segments at the two digit SIC code level. Accordingly, we aggregate segment sales to the two digit SIC level. This procedure involves two steps. In the first step, we assign two digit SIC codes reported by Worldscope to appropriate segments. As Worldscope reports SIC codes and segment data separately, we do a manual matching. For some companies, the number of reported SIC codes is not the same as the number of reported segments. If a segment cannot be associated with a single code, we determine the segment's code according to its business description. If a segment is associated with multiple codes, it is broken down equally so that each segment is associated with one SIC code.

We classify firms as single segment if at least 90 percent of their total sales are derived from one two digit SIC segment. Since we require that each segment have sales volume, the consolidation of accounting data does not affect our segment-level analysis. Following on Fauver et al. (1999) and Lins and Servaes (1999a) we classify firms as multisegment if they operate in more than one two digit SIC code industries and none of their two digit SIC code segments accounts for more than 90 percent of total firm sales. We then define the primary segment of a multisegment firm as the largest segment by sales. The remaining segments are defined as secondary segments. In a small number of cases the two largest segments have identical sales. We select the segment with the lower two digit SIC code as the primary segment. We exclude multisegment firms from the sample when they do not report segment sales and we also exclude firms whose primary business segment is financial services (SIC 6000-6999). This is because segmental financial figures are not comparable to those of non-financial firms. We keep firms that have secondary financial segments in the sample since the problem of incomparability is less severe for these firms. More importantly, finance segments can be vertically or complementarily related with the primary segments, and we need to capture this relatedness. To increase sample size, we do not enforce a minimum size threshold for firms to be included in the sample.

2.2 Summary statistics

Table 1 reports summary statistics for multi- and single segment firms between 1990 and 1996 for the ten countries, sorted by per capita GNP. For the ten countries combined, there

[6] Beginning in the fiscal year ending December 15, 1977, FASB No. 14 requires that multi-industry firms must disclose industry segment information on sales, assets, operating profits, depreciation, and capital expenditures if the segment comprises more than 10 percent of consolidated sales, assets, or profits.

are 16,522 (31 percent) multisegment firm-years and 36,460 (69 percent) single segment firm-years in our sample. US firms drive this pattern, however, as East Asian and Japanese firms diversify more than US firms. If we exclude US firms, then the ratio becomes 8,697 (65 percent) multisegment firm-year observations and 4,729 (35 percent) single segment observations. Among the Asian countries, Japanese firms comprise the majority of the sample—76 percent of multisegment firms and 68 percent of single segment firms. Looking at patterns for each East Asian country separately, Singapore and Malaysia rank high in the percentage of multisegment firms (72 and 70 percent, respectively), while Thailand and the Philippines have the lowest percentage (26 and 33 percent, respectively). The US is ranked as the lowest in the percentage of multisegment firms (20 percent).[7]

The average size of multisegment firms including the US (excluding the US) is US$2,822 (US$ 2,331) million in total assets and US$827 (US$1,773) million in total assets for single segment firms. For the nine East Asian countries, the average assets of multisegment firms are mostly larger than those of single segment firms, with the exception of Korea and Singapore. Of the multisegment firms, Japanese firms have the largest average assets (US$2,796 million), followed by Korean and Hong Kong firms. Of the single segment firms, Korean firms have the largest average assets (US$2,338 million), followed by Japanese and Hong Kong firms. If we include US multisegment firms, then they have the largest asset (US$3,365 million), but US single segment firms are ranked sixth. This evidence is consistent with the general perception that diversified US firms are large, while US single segment firms are on average smaller than their foreign peers. In these comparisons, we do not observe a clear pattern of different degrees of diversification across countries at different levels of development, even though the sample spans countries with 1997 per capita GNP varying from Japan (US$37,850) to Indonesia (US$1,110).[8]

3. Construction of the relatedness variables

So far, our analysis does not control for the type of diversification. In particular, firms can diversify into related and unrelated activities and related activities can be vertical or complementary. In this section, we follow the methodology of Fan and Lang (2001) who provide us with detailed information of the construction of vertical and complementary measures in both industry and firms levels.

3.1 Relatedness variables at the industry level

Following the approach of Lemelin (1982), we construct inter-industry relatedness coefficients, using the 1992 *Use Table* of *Benchmark Input-Output Accounts for US Economy*.[9] The *Use Table* is a matrix containing the value of commodity flows between

[7] Since we do not enforce a size threshold for US firms, the 20 percent share of multi-segment firms is likely understated.

[8] This contrasts with the internal markets hypothesis, as advanced by Williamson (1985) and followed by Gertner, Scharfstein and Stein (1994), Stein (1997), and Fauver, Houston and Naranjo (1999) among others, which would suggest that firms in less-developed countries diversify more to reap the benefits of internal markets.

[9] We only have the US Input and Output table and use it as a proxy for the East Asian countries. The benefit of using individual country tables is not obvious for two reasons. First, it is generally difficult to compare input-output data across economies. Viet (1994) reviews methods used in input-output table compilation in

each pair of roughly 500 private sector intermediate input-output industries; it reports for each pair of industries i and j, the dollar value of i's output required to produce industry j's total output, denoted as a_{ij}.[10] The *Bureau of Economic Analysis* updates the *Use Table* every five years. In this paper, we use the 1992 *Use Table* to construct relatedness variables.

Vertical relatedness

A vertical relatedness coefficient measures the opportunity for an industry to integrate forward and/or backward into another industry. We provide an example to illustrate how the vertical relatedness coefficients are constructed. We take the plastics and the bags (non-textile) industry in the United States as an example. In 1992, the total plastics output was \$31,502 million. The total output of bags was worth \$8,389 million. The bags industry consumed \$1,259 million worth of plastics (a_{ij}), whereas the plastics industry employed \$10 million worth of bags (a_{ji}) as an input. On a per-dollar basis, the bag industry consumed \$0.15 (= 1,259/8,389) worth of plastics for each dollar of bags produced (v_{ij}), whereas the plastics industry consumed \$0.0003 (=10/31,502) worth of bags for each dollar of plastics produced (v_{ji}). The vertical relatedness between the two industries is 0.0751 ($V_{ij}=1/2(v_{ij}+v_{ji})$), the average input transfer between the two industries on a per dollar basis. V_{ij} can be intuitively interpreted as a proxy of the opportunity of vertical integration between industry i and j.

Complementarity

A complementarity coefficient measures the opportunity for two industries to complement each other in procurement and marketing. To construct complementarity coefficients, we need to measure how related industries' i and j share output and input. We compute for each industry the percentage of its output supplied to each intermediate industry k, denoted as b_{ik} from the *Use Table*. For each pair of industries i and j, we compute the simple correlation coefficient between b_{ik} and b_{jk} across all k except for i and j. A large correlation coefficient in the percentage output flows suggests a significant overlap in the markets to which industries i and j sell their products. For each pair of industries i and j, we also compute a simple correlation coefficient across industry input structures (all k except for i and j) between the input requirement coefficients v_{ki} and v_{kj} of the two industries. A large correlation coefficient between the two suggests a significant overlap in inputs required by industries i and j.

We define the complementarity coefficient as the average of the two correlation coefficients, i.e., $C_{ij} = ½[corr(b_{ik},b_{jk}) + corr(v_{ki},v_{kj})]$. C_{ij} serves as a proxy for the degree

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over fifty countries in the 1970s and 1980s. He identifies numerous factors that make country tables incompatible. The incompatibility arises from different statistical units and/or industry classification systems employed, different treatment of secondary products, private final consumption, government expenditures, imports and exports, and so on. Second, the quality of input-output data prepared by less developed countries is often suspicious (Bulmer-Thomas, 1982). The most serious problem is the availability of appropriate data. Applying the US input-output data to the Asian economies assumes that the input-output relations of industries are similar between the US and the Asian economies. Although naïve, the assumption is not overly strong. In an early study, Simpson and Tsukui (1965) compare the 1947 US input-output table with the 1955 Japan input-output table. They demonstrate that, although the economic systems of Japan and the United States are very dissimilar, they contain almost identical industry patterns.

[10] See Lawson (1997) for details.

of complementarity between industry i and j. We use the plastics and the paperboard containers industry in the United States as an illustration. The correlation of output flows between the two industries is 0.2940 (corr(b_{ik},b_{jk})), whereas their correlation of input flows is 0.0384 (corr(v_{ki},v_{kj})). The complementarity coefficient between the two industries is calculated as the average of the input and output flow correlations, 0.16 (=0.294+0.0384)/2).

3.2. Relatedness variables at the firm level

In the previous section we construct relatedness coefficients at the industry level. To construct firm level measures, we impute intersegment relatedness from the industry level relatedness coefficients since the intersegment transfer data of firms are not available. The segment classifications for US, Japanese, and East Asian firms are given by the SIC code. The industry relatedness measures are constructed from the *Use* Table, where each industry is classified by an IO (input-output) code. Before linking to segment data, the relatedness coefficients are calculated at the 2-digit SIC level, i.e., we compute mean relatedness coefficients for all pairs of IO industries classified into a pair of 2-digit SIC codes. The conversion between IO and SIC codes is based on the conversion table provided by the Bureau of Economic Analysis (see Lawson, 1997). The two firm level relatedness variables (firm level V and C are without subscripts, industry-wide V and C have subscript ij) are defined as follows:

$$V=\Sigma_j (w_j*V_{ij}), \text{ and}$$

$$C=\Sigma_j (w_j*C_{ij}),$$

where w_j is the sales weight equal to the ratio of the jth secondary segment sales to the total sales of all secondary segments of the firm; V_{ij} and C_{ij} are the vertical relatedness and complementarity coefficients associated with the pair of IO industries to which the primary i and the jth secondary segment belong. The relatedness coefficients are each weighted by w_j and summed across all j to obtain the firm level relatedness variables, V and C.[11] As a robustness check, we also calculate the weight w_j as the ratio of the jth secondary segment sales to the total sales, i.e., of all secondary segments plus sales of the main segment, thus taking the size of the main segment into consideration. Similar results are obtained using this new measure (not reported).

3.3. Summary statistics

We use summary statistics on the number of segments, degree of vertical relatedness, complementarity in each country to analyze cross-country differences in diversification patterns. In Table 2, we report mean, median, standard error, minimum and maximum of number of segments (Panel A), vertical relatedness (Panel B) and complementarity

[11] The V and C measures are incremental (or marginal) to the main segments. We are able to identify two 4-digit SIC codes for individual segments for US firms, hence we can construct V and C for the main segments if we naively assumed that each 4-digit SIC code takes up half of sales in the main segment. Combining incremental V and C with those of the main segments, we could proxy for the average V and C for US firms. However, we do not have the same information for East Asian firms as we only observe one 2-digit SIC code per individual segment.

(Panel C) among multisegment firms in the ten countries sorted by their 1997 per capita GNP. Panel A reports that Malaysia has the highest average number of segments, followed by Singapore and Hong Kong. The United States has the lowest average number of segments, followed by Thailand and Korea. Panel B reports that Thailand has the highest average degree of vertical relatedness, followed by Singapore, Hong Kong and Indonesia. The US is ranked as second from the bottom after Taiwan in average degree of vertical relatedness. Panel C reports that Indonesia has the highest average complementarity, followed by Singapore, Hong Kong and Thailand. Malaysia has the lowest average complementarity, followed by Korea, the United States, and the Philippines. Consistent with Table 1, the evidence in Table 2 suggests that, among multisegment firms, US firms on average diversify less than firms in East Asia and Japan. They also have lower intersegment vertical relatedness and complementarity.

Table 3 reports the number and percentage of multisegment firms by their number of segments (Panel A), vertical relatedness (Panel B) and complementarity (Panel C). Panel A documents that 62 percent of US firms have two segments, while the highest percentage of firms with two segments among East Asian countries is 54 percent for Thailand. Panel B documents that 77 percent of US firms have a vertical relatedness measure less than 0.005, less than the percentage of firms in Taiwan (87 percent) and about equal to that in the other East Asian countries, except for Singapore, Hong Kong, Malaysia and Thailand. These later four countries have a more disperse distribution. For example, 50 percent of Thai firms and 44 percent of Hong Kong firms have a vertical relatedness measures greater than 0.005. Panel C documents that 80 percent of US firms have a complementarity measure less than 0.2, similar to firms in Taiwan, Korea, and the Philippines (81, 83, and 83 percent respectively). Other countries have a more disperse distribution. For example, between 53 and 62 percent of Hong Kong, Indonesian, Singaporean and Thai firms have a complementarity measure less than 0.2. This evidence suggests that, as compared with East Asian and Japanese firms, the predominant pattern for US firms is to diversify into one or two segments which are relatively unrelated to their main business segment, either vertically or through complementarity.

Table 4 reports time series (1990 to 1996) on number of segments, vertical relatedness and complementarity. The sample used to count the number of segments include single- and multisegment firms, while we only include multisegment firms to compute vertical relatedness and complementarity measures. Since for most East Asian countries, with the exception of Japan, we have a small sample size prior to 1993, we combine these eight countries. Consistent with Lang and Stulz (1994) and Comment and Jarrell (1995), Panel A of Table 4 shows that the number of segments decreases over time for US firms, and that decrease is statistically significant at the 1 percent level. Interestingly, the number of segments increases in Japan during 1990-6, with this trend being less pronounced during the latter part of the period (1993-6). The number of segments does not change significantly for other East Asian companies, but there is an upward trend starting in 1993. It should be noted, however, that the number of observations is limited in the earlier period, i.e., the overall trend for East Asian countries should be treated with caution.

Table 4 also reports time series for the vertical relatedness measure. Panel A indicates that the mean vertical relatedness increased between 1990 and 1996 for Japanese firms, but not for firms in the United States and the other East Asian countries. The median measures reported in Panel B do not show any statistically significant trend. Table 4 lastly reports time series on the degree of complementarity. Complementarity increases over the 1990-6

period for US firms, and over the 1993-6 period for Japanese and other East Asian firms. The overall results suggest a more focused corporate strategy for US firms, with smaller number of business segments, and a relatively greater degree of complementarity. For Japanese firms, we observe a higher degree of vertical diversification throughout the period, and also an increase in complementary diversification in 1993-6. For the other eight East Asian countries, we observe a mild trend towards complementary diversification in 1993-6.

The comparison of US and East Asian firms suggests several stylized facts. *First*, US firms diversify into one or two segments which are relatively unrelated to their main business segment, either vertically or complementarily. This trend is not observed for East Asian or Japanese corporations. We do not have any a priori reason as to why we observe this divergence of diversification patterns. *Second*, the number of segments of US firms is less than that of East Asian firms. However, as reported in Lang and Stulz (1994) and Comment and Jarrell (1995), the average number of segments for US firms in 1970s and 1980s was around 2.0 to 2.5, which is similar to that of East Asian countries in 1990s. While a direct comparison with our findings is inappropriate as we define segments at the 2-digit SIC level, it does suggest a 10- to 20-year time lag for East Asian firms in terms of diversification trends. *Third*, Table 4 shows a decrease in the number of segments in the US accompanied with more complementary diversification. In contrast, Japanese firms increased their diversification levels, expanding into both vertically related and complementary businesses. Companies in East Asia also expand into more lines of businesses during 1993-6, and this expansion leads to a mild increase in complementary diversification.

4. Diversification and valuation

4.1 Valuation measurement

We use the Berger and Ofek (1995) measure for corporate value. We define it as the natural logarithm of the ratio of the firm's actual market value to its imputed value. We use the market value of common equity plus the book value of debt at the end of 1996 as the measure of actual market value. The imputed value is computed following the industry-matching scheme. We first compute the median market-valuation-to-sales ratio—market capitalization divided by firm sales—for each industry in each country using only single segment firms. We then multiply the level of sales in each segment of a firm by its corresponding industry median market-to-sales ratio. The imputed value of the firm is obtained by summing the multiples across all segments. We construct the excess value by comparing the valuation of a specific firm with the median of the industry where this firm belongs. In doing so, we remove the industry effect.

We restrict the number of single segment firms to at least three when computing the median market-to-sales ratio of an industry. When an industry has fewer than three single segment firms, even defined broadly as Campbell (1996), we use the median of all firms in the country. This procedure avoids the loss of observations. However, the industry matching procedure could introduce bias in the excess value measure. The bias is inversely related to the availability of single segment firms. For most firms in our sample, we are

able to find matching single segment firms at the broad industry group level. We therefore do not expect such bias to be significant.[12]

4.2 Univariate results

Table 5 reports the mean and median excess value, sorted by number of segments for individual countries ranked by their respective per capita GNP in 1997. Consistent with Lang and Stulz (1994), we document for US firms that excess value, both mean and median, decreases with the number of segments. We do not observe, however, a similar monotonically decreasing trend for the other nine countries. However, comparing two segment firms with single segment firms, we do observe a mean (median) valuation decline for six (seven) of the nine East Asian countries. To conduct a non-parametric test, we count the number of positive mean excess values for multisegment firms for each country. We do not find any positive mean excess value in the US, but 36 percent of the mean excess values are positive in East Asia. In terms of median excess values, none are positive for the US, but 44 percent of median excess values are positive in the East Asian countries. Thus, while the evidence that diversification is associated with lower valuation for US firm is strong, we find similar evidence for East Asian firms comparing single- with two segment firms. The results are mixed for multisegment firms in East Asia, however.

Table 6 reports the mean and median excess value sorted by vertical relatedness for individual countries. We document a substantial variation in excess value among countries. In particular, we document striking evidence that seven countries (Japan, Singapore, the US, Korea, Malaysia, Thailand and Indonesia) experienced lower excess value for firms with more vertically diversified segments. The mean (median) excess value for these seven countries for the highest degree of vertical integration varies from –17.86 (-19.11) percent to -56.69 (-129.09) percent. Moreover, all six countries except for Korea have low excess value for the second largest vertical degree of integration, with mean (median) excess values between -12.55 (-12.89) percent to -68.15 (-75.50) percent. We do not find lower mean excess values for lower degrees of vertical diversification (except for our vertical relatedness measure between 0.005 and 0.01 in the Philippines). This evidence supports the notion that excessive vertical diversification hurts performance in most countries. Table 7 reports the mean and median excess value sorted by the degree of complementarity for individual countries, again ranked by their respective per capita GNP. We find some variation in excess value relative to the degree of complementarity among individual countries. In particular, increasing complementarity is associated with higher value in several countries, but this association is not monotonic.

To identify systematic patterns across East Asian countries relative to the US, we classify East Asian countries into a lower-middle income group, including Indonesia, the Philippines and Thailand, a higher-middle income countries including Korea and Malaysia, and a high income group including Japan, Singapore, Hong Kong and Taiwan.[13] We do not have low-income group for East Asian countries. This income grouping has been used in La Porta et al. (1997) and Fauver et al. (1999).

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[12] We require that each segment have segment sales information, hence the practice of consolidation of accounting information will not affect the computation of our performance measure.

[13] We follow the standard World Bank classification of income level. This creates some borderline cases. For example, Taiwan is in the high income group but its per capita income is only US$13,198 which is a little higher than Korea in the higher middle income group, whose per capita income is US$10,550.

Table 8, Panel A reports the mean and median excess values sorted by number of segments, vertical relatedness and complementarity for each income group including the US, a high income group without the US, a higher-middle income group and a lower-middle income group. In Panel A, we observe a monotonically decreasing mean and median excess value for US firms as the number of segments increases. We also find that for the lower-middle income groups mean (median) excess value turns negative for three- and more-segment (four and five segment) firms. For the higher-middle income group, we observe positive mean and median excess values for firms with three and four segments, suggesting that diversification does not lead to lower valuation for these firms. We find higher mean negative excess values for firms with two, three and four segments in the high income group, with the mean excess value for firms with five or more segments similar to single segment firms. The evidence that diversification does not necessarily hurt valuation for East Asian firms is consistent with findings for US firms in 1960s and 1970s; Hubbard and Palia (1999), for example, document diversification premia for US firms in 1960s and 1970s, while Servaes (1996) finds discounts in the 1960s and premia in the 1970s. This evidence suggests a similarity of the effect of diversification on valuation of East Asian firms with US firms but with a 10 to 20 year time lag. It complements our prior findings on the pattern of diversification in East Asia.

Panel B reports the mean and median excess values by the degree of vertical relatedness and income groups. Consistent with the evidence reported in Table 6, we document a sizable negative excess value for more vertically related diversification for the higher-middle and lower-middle income groups, with the mean (median) excess values for degree of vertical relatedness between 0.02 and 0.03 negative 52 (73) percent and 48 (40) percent respectively. Moreover, the mean (median) excess values for higher-middle income and lower-middle income groups are a negative 29 (24) percent and 18 (43) percent for degrees of vertical relatedness more than 0.03. In contrast, we find negative mean and median excess values between 12 to 20 percent for degrees of vertical relatedness above 0.02 for US firms. For the high-income group without the US, we find less evidence of higher negative excess value for higher degrees of vertical relatedness. In contrast, excess value increases at lower levels of vertical relatedness for the US and high-income countries. Panel C reports the mean and median excess value by degree of complementarity for each income groups. We fail to observe any significant pattern in mean or median excess values for any income group.

A natural question can be raised as to why corporations diversify, if this diversification hurts performance. It casts doubt on the rationality of corporate business strategy. One sensible answer could be that US firms have shed their unprofitable *unrelated* segments over time as part of a more focused corporate strategy. This action concurrently increases the relative degree of complementary integration of the remaining business.

4.3 Regression results

Valuation Effects of Diversification

We first examine whether there are diversification discounts across the ten countries. Country by country, we regress the natural logarithm of the excess value (EXV) on diversification level, controlling for firm size (Log(ASSETS)), measured as the natural

logarithm of firm assets in constant US dollar.[14] All of the regressions also control for fixed-year effects. Table 9 reports the OLS regression results of the following regression:

$$EXV = a + b_1*SEGN + b_2*Log(ASSETS) + (Fixed\text{-}year\ effects) + u$$

In Panel A, the diversification level of a firm is captured by a dummy variable. It equals one if the firm has multiple segments, zero otherwise. In Panel B, the diversification level is alternatively measured as the firm's number of segments.

From Panel A, we find statistically significant diversification discounts, as indicated by the negative estimated coefficients of the diversification dummy variable, for firms from Japan (-4 percent), US (-16 percent), Taiwan (-14 percent), and Indonesia (-15 percent). On the other hand, we are able to identify diversification premia for firms in Hong Kong and the Philippines though those are not significant. When the diversification level is measured by the segment number, the results hold for all countries except for Japan and Singapore (Panel B). In the Japan regression, the coefficient of the segment number is negative but insignificant. In the Singapore regression, the coefficient of the segment number is significantly negative. The overall results suggest that diversification diminishes firm value in Indonesia, Japan, Singapore, Taiwan, and the United States. In contrast, firm value is insensitive to diversification level for firms in the other countries. Note that the t-statistics for diversification level of all East Asian countries is drastically lower than that of the US. Our results are broadly consistent with the findings in previous studies, e.g., Fauver et al. (1999) and Lins and Servaes (1999b) who find smaller diversification discounts in the poorer countries.

The valuation effects of relatedness

We next examine the effects of relatedness on firm value. We perform the following OLS regressions for each of the ten countries:

$$EXV = a + b_1*V + b_2*C + b_3*SEGN + b_4*Log(ASSETS) + (fixed\text{-}year\ effects) + u$$

where EXV is the excess value, V is the vertical relatedness measure, and C is the complementarity measure. The explanatory variables also include the number of firm segments (SEGN) and the natural logarithm of firm assets in thousands of US dollar (Log(ASSETS)) to control for segment and size effects. Lastly, we include year dummy variables to control for any fixed effects that may exist, while not reported. Since we include vertical relatedness and complementarity in our regression, we only include multisegment firms in the regression. The regression is performed on the pooled sample of firms on a country-by-country basis.

Table 10 presents the regression results for the US and the nine Asian countries. The estimated coefficients of vertical relatedness are negative in five country regressions: Singapore, Korea, Malaysia, Thailand and Indonesia. Three of them (Korea, Malaysia, and

[14] To be consistent with prior studies including Berger and Ofek (1995) and Fauver et al. (1999), we also control for operating income and capital expenditure for all regressions in Table 9 and Table 10. It is always an open question whether to include operating income in regressions since the diversification may affect value through operating income. However if we include operating income, results remain the same. If we include capital expenditure, we lose about 40 percent of the firms in East Asia. Since the consequence of reducing the sample is serious, we drop it from the regressions.

Indonesia) are statistically significant. For two other East Asian countries (the Philippines and Taiwan), the coefficients of vertical relatedness are positive but insignificant. Japan and Hong Kong are the only East Asian countries where excess values increase with vertical relatedness and the estimated coefficients of vertical relatedness are significant at the 5 percent level. The regression results for East Asian firms are consistent with the univariate results reported earlier. In particular, we observe a large decline in value as the degree of vertical relatedness increases for firms the same five East Asian countries. The positive coefficient for Hong Kong is consistent with that in Table 6 where we observe an increasing value for a higher degree of vertical relatedness. We also observe a significant positive coefficient for Japanese firms in Table 10. The regression results for US firms differ from the univariate statistics where values are lowest for US firms with either the highest or lowest degree of vertical relatedness. The positive coefficient on V results from variation in the lower ranges of vertical relatedness. There appears to be a nonlinear relation between excess value and V for firms in the United States.

The statistics in Table 7 did not reveal any systematic relation between complementarity and excess value. The regression analysis identifies some significant patterns. Overall, complementary diversification is not detrimental to value. The estimated coefficients of complementarity for East Asian firms are significantly positive for Japan, Singapore and Korea at the five-percent level, weakly negative (at the 10 percent level) for Malaysia and Thailand, and insignificant for other East Asian countries. The estimated coefficient of complementarity for US firms is positive and statistically significant at the one-percent level. These results are interesting in several aspects. First, we do not observe as significant negative impact on value for complementary diversification as we do for vertical related diversification. Second, both vertical relatedness and complementarity appear to be associated with higher value increases for more developed countries as we observe positive significant coefficients for Japan, Singapore, the US and Korea. Third, while we observed a concave relationship in Table 7 between complementarity and value for US firms, the regression coefficient is positive and significant.

We next examine the effects of multiple segments on excess value. The regression coefficients are significantly negative for Singapore, the US, Hong Kong, and Malaysia. The coefficients are insignificant for Taiwan, Korea, Thailand, the Philippines, and Indonesia. Lastly, the coefficient for Japan is significantly positive. Given that a firm has multiple segments, the number of segments have different impacts on valuation among countries. These results are different from those in Table 9 where single- and multisegment firms are both included in the analysis. The differences are mainly due to single segment firms. When compared with single segment firms, multiple segment firms tend to have poorer performance, as suggested by the results in Table 9. Comparing between one and two segment firms, two segment firms in six (seven) out of the nine East Asian countries have lower mean (median) excess value. But among the multisegment firms, the relation between excess value and segment number diverges across countries. From Table 5 we also see that, in the multisegment firm sample, the relation between value and segment number are often nonlinear, suggesting that one should be cautious in interpreting the coefficients on the segment number in Table 10.

The overall results show that vertical integration weakens firm value for most developing economies in East Asia, complementary diversification increases firm value in most East Asian countries, and diversification in terms of the number of segments lowers firm values in several East Asian countries. The negative effect of vertical relatedness in East Asia may

be the result of earlier government attempts to induce rapid industrialization. This hypothesis is consistent with the findings in Rodrik (1997).

We find evidence that complementary diversification improves valuation for Japan, Singapore, and Korea. This evidence is consistent with Penrose (1959) and Teece (1980, 1982) who argue that complementary diversification allows firms to realize benefits associated with the utilization of non-contractible resources through the joint procurement of human or physical inputs or the sharing of marketing and distribution activities. Our evidence is also consistent with the view in Scharfstein and Stein (1997), Shin and Stulz (1998), and Rajan, Servaes and Zingales (1999) who argue that it is the heterogeneity in investment opportunities across diversified firms' segments which induces capital misallocation and diversification discounts. As higher complementarity implies lower heterogeneity in procurement and marketing, one would expect relatively higher valuation for complementary diversification. The positive valuation effects of vertical and complementary diversification in the United States are driven by downsizing, i.e., divestitures of unrelated assets. This finding is consistent with Schlingemann, Stulz, and Walkling (1999) who discover similar divestiture patterns in a sample of US companies.

5. Conclusions

Our evidence suggests eight stylized facts about the diversification patterns and valuation effects of diversification in the ten sample countries. First, US firms diversify less than firms in Japan and the eight East Asian countries. The intersegment relatedness of US firms is weaker, however. Second, we document a trend of reduced diversification in the United States, but not in the other nine countries. Third, vertical relatedness increased over time for Japanese firms, but did not change for firms in the US or East Asia. Fourth, complementary diversification increased over time in all sample countries. Fifth, the increase in relatedness for US firms is due to the divestiture of unrelated assets. In contrast, the increase in relatedness for firms in Japan and East Asia is due to expansion into related businesses. Sixth, and consistent with prior studies, diversification diminishes corporate value in the US, but not so for most other sample countries. Seventh, vertical diversification enhances value in the more developed countries, but diminishes value in the poorer countries or the countries with less developed financial systems. Finally, complementary relatedness generally does not have an effect on value, and even enhances corporate value in several sample countries.

There are several conjectures that warrant further research. *First*, it is not clear whether the differences in diversification patterns between East Asian firms and US firms represent a 'normal' 10 to 20 year time lag of East Asian firms in both diversification patterns and effect on value. *Second*, we argue that corporations in the United States have adopted focused strategy to get rid of non-profitable unrelated segments. This action in turn increases the vertical or complementary integration and also allows us to observe a simultaneous performance decline. *Third*, the reasons behind the relationship for US firms between vertical relatedness, complementarity, on the one hand, and firm value, on the other hand, opens some further research areas.

Table 1
Summary statistics of multi and single segments firms in the US and East Asia

Country	Per capita GNP in 1997 ($US)	Multisegment firms: Number of firm-years	Multisegment firms: Fraction of total firms	Multisegment firms: Average assets (Millions of US$)	Single segment firms: Number of firm-years	Single segment firms: Fraction of total firms	Single segment firms: (Average assets Millions of US$)
Japan	37850	6599	0.67	2796	3219	0.33	2248
Singapore	32940	358	0.72	518	140	0.28	723
USA	28740	7825	0.20	3365	31731	0.80	686
Hong Kong	25280	473	0.66	1110	243	0.34	889
Taiwan	13198	125	0.47	802	140	0.53	739
Korea (South)	10550	319	0.64	1590	177	0.36	2338
Malaysia	4682	535	0.70	607	229	0.30	542
Thailand	2800	133	0.26	574	373	0.74	302
Philippines	1220	38	0.33	486	78	0.67	341
Indonesia	1110	117	0.47	670	130	0.53	364
All countries (excl. USA)		8697	0.65	2331	4729	0.35	1773
All countries		16522	0.31	2822	36460	0.69	827

Source and Note: The sample spans the period of 1990-6. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Company segments are defined at the two digit SIC code level. Firms are classified as single segment if at least 90 percent of their total sales are derived from one two digit SIC code segment. The remaining firms are classified as multisegment firms.

Table 2
Summary statistics of multisegment firms' segment number, vertical relatedness, and complementarity

	Per capita GNP	Number	Mean	Median	Std. Error	Minimum	Maximum
Panel A: number of segments							
Japan	37850	6599	3.2250	3.0000	1.0860	2.0000	8.0000
Singapore	32940	358	3.7541	4.0000	1.2816	2.0000	7.0000
USA	28740	7825	2.5389	2.0000	0.8244	2.0000	8.0000
Hong Kong	25280	473	3.7399	4.0000	1.3220	2.0000	9.0000
Taiwan	13198	125	2.8880	3.0000	0.9522	2.0000	7.0000
Korea (South)	10550	319	2.7429	3.0000	0.8027	2.0000	6.0000
Malaysia	4682	535	4.0168	4.0000	1.6471	2.0000	10.0000
Thailand	2800	133	2.7218	2.0000	0.9797	2.0000	6.0000
Philippines	1220	38	3.3947	3.0000	1.4433	2.0000	7.0000
Indonesia	1110	117	3.1965	3.0000	1.3341	2.0000	9.0000
All countries		16522	2.9362	3.0000	1.0913	2.0000	10.0000
Panel B: vertical relatedness							
Japan	37850	5750	0.0052	0.0021	0.0077	0.0000	0.0366
Singapore	32940	345	0.0077	0.0039	0.0093	0.0000	0.0366
USA	28740	7442	0.0043	0.0016	0.0070	0.0000	0.0363
Hong Kong	25280	450	0.0077	0.0037	0.0091	0.0000	0.0366
Taiwan	13198	69	0.0026	0.0015	0.0046	0.0000	0.0359
Korea (South)	10550	160	0.0048	0.0020	0.0080	0.0000	0.0366
Malaysia	4682	497	0.0057	0.0022	0.0077	0.0000	0.0359
Thailand	2800	109	0.0094	0.0051	0.0106	0.0000	0.0359
Philippines	1220	35	0.0047	0.0026	0.0078	0.0001	0.0359
Indonesia	1110	106	0.0076	0.0036	0.0095	0.0000	0.0359
All countries		14963	0.0049	0.0019	0.0075	0.0000	0.0366
Panel C: complementarity							
Japan	37850	5750	0.2053	0.1526	0.1867	0.0088	1.0000
Singapore	32940	345	0.2336	0.1750	0.1709	0.0412	1.0000
USA	28740	7442	0.1501	0.1217	0.1035	0.0111	0.6833
Hong Kong	25280	450	0.2311	0.1866	0.1894	0.0179	1.0000
Taiwan	13198	69	0.1828	0.1335	0.2174	0.0158	1.0000
Korea (South)	10550	160	0.1490	0.1305	0.1334	0.0056	1.0000

table continues…

Malaysia	4682	497	0.1468	0.1023	0.1395	0.0116	1.0000
Thailand	2800	109	0.2140	0.1781	0.1593	0.0378	0.6833
Philippines	1220	35	0.1505	0.0919	0.1394	0.0379	0.6221
Indonesia	1110	106	0.2539	0.1215	0.2639	0.0087	1.0000
All countries		14963	0.1769	0.1338	0.1522	0.0568	1.0000

Source and Note: The sample includes multisegment firms and spans the period of 1990-6. Company segments are defined at the two digit SIC code level. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Vertical relatedness and complementarity are defined in the text. They are constructed from the segment data and the commodity-flow data in the *Use Table* of the 1992 *Benchmark Input-Output Accounts for US Economy*.

Table 3
Distribution of multisegment firms by segment number, vertical relatedness, and complementarity

	Japan	Singapore	USA	Hong Kong	Taiwan	S. Korea	Malaysia	Thailand	Philippines	Indonesia	All countries
Panel A: Segment number											
Number of firms											
SEG=2	1883	73	4855	87	50	142	122	72	12	42	7338
SEG=3	2422	79	2024	139	49	128	101	38	12	38	5030
SEG=4	1504	111	745	123	19	39	112	14	8	21	2696
SEG>=5	790	95	201	124	7	10	200	9	6	16	1458
Percentage											
SEG=2	0.29	0.20	0.62	0.18	0.40	0.45	0.23	0.54	0.32	0.36	0.44
SEG=3	0.37	0.22	0.26	0.29	0.39	0.40	0.19	0.29	0.32	0.32	0.30
SEG=4	0.23	0.31	0.10	0.26	0.15	0.12	0.21	0.11	0.21	0.18	0.16
SEG>=5	0.12	0.27	0.03	0.26	0.06	0.03	0.37	0.07	0.16	0.14	0.09
Panel B: Vertical relatedness											
Number of firms											
V<0.005	4218	207	5695	254	60	122	339	54	26	67	11042
0.005<=V<0.01	669	48	954	77	7	16	68	21	7	15	1882
0.01<=V<0.02	375	54	377	64	1	11	45	16	0	10	953
0.02<=V<0.03	323	14	220	31	0	3	36	6	0	0	651
0.03<=V	165	22	196	24	1	8	9	12	2	0	445
Percentage											
V<0.005	0.73	0.60	0.77	0.56	0.87	0.76	0.68	0.50	0.74	0.73	0.74
0.005<=V<0.01	0.12	0.14	0.13	0.17	0.10	0.10	0.14	0.19	0.20	0.16	0.13
0.01<=V<0.02	0.07	0.16	0.05	0.14	0.01	0.07	0.09	0.15	0.00	0.11	0.06
0.02<=V<0.03	0.06	0.04	0.03	0.07	0.00	0.02	0.07	0.06	0.00	0.00	0.04
0.03<=V	0.03	0.06	0.03	0.05	0.01	0.05	0.02	0.11	0.06	0.00	0.03

table continues…

Panel C: Complementarity

Number of firms											
C<0.1	1411	83	2421	113	30	56	245	27	19	36	4441
0.1<=C<0.2	2472	101	3502	131	26	76	144	39	10	30	6531
0.2<=C<0.3	941	63	886	100	4	18	48	19	3	11	2093
0.3<=C<0.4	417	42	438	51	1	7	38	8	1	4	1007
0.4<=C	509	56	195	55	8	3	22	16	2	25	891
Percentage											
C<0.1	0.25	0.24	0.33	0.25	0.43	0.35	0.49	0.25	0.54	0.34	0.30
0.1<=C<0.2	0.43	0.29	0.47	0.29	0.38	0.48	0.29	0.36	0.29	0.28	0.44
0.2<=C<0.3	0.16	0.18	0.12	0.22	0.06	0.11	0.10	0.17	0.09	0.10	0.14
0.3<=C<0.4	0.07	0.12	0.06	0.11	0.01	0.04	0.08	0.07	0.03	0.04	0.07
0.4<=C	0.09	0.16	0.03	0.12	0.12	0.02	0.04	0.15	0.06	0.24	0.06

Source and Note: The sample includes multisegment firms and spans the period of 1990-6. Company segments are defined at the two digit SIC code level. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Vertical relatedness and complementarity are defined in the text. They are constructed from the segment data and the commodity-flow data in the *Use Table* of the *1992 Benchmark Input-Output Accounts for US Economy*.

Table 4
Patterns of the mean and median segment number, vertical relatedness, and complementarity

Period	USA			Japan			Other East Asian economies		
	SEG	V	C	SEG	V	C	SEG	V	C
Panel A: Mean									
1990	1.36	0.0042	0.1471	2.33	0.0041	0.2224	3.06	0.0049	0.1722
1991	1.34	0.0042	0.1475	2.44	0.0045	0.2035	3.30	0.0062	0.2182
1992	1.33	0.0043	0.1450	2.51	0.0052	0.2091	2.69	0.0066	0.2195
1993	1.31	0.0045	0.1520	2.49	0.0051	0.1992	2.30	0.0069	0.1658
1994	1.29	0.0043	0.1492	2.46	0.0053	0.2020	2.29	0.0064	0.2034
1995	1.27	0.0043	0.1554	2.49	0.0052	0.2026	2.45	0.0067	0.1965
1996	1.26	0.0046	0.1567	2.56	0.0055	0.2134	2.50	0.0071	0.1978
Change 1990-6	-0.10***	0.0004	0.0096**	0.23**	0.0014*	-0.0090	-0.56	0.0022	0.0256
Change 1993-6	-0.05***	0.0001	0.0047	0.06	0.0004	0.0142*	0.20**	0.0002	0.032**
Panel B: Median									
1990	1	0.0016	0.1207	2	0.0019	0.1464	3	0.0026	0.1239
1991	1	0.0015	0.1190	2	0.0020	0.1561	3	0.0037	0.1370
1992	1	0.0015	0.1206	2	0.0020	0.1561	2	0.0035	0.1561
1993	1	0.0016	0.1233	2	0.0020	0.1504	2	0.0033	0.1306
1994	1	0.0016	0.1217	2	0.0020	0.1503	2	0.0030	0.1561
1995	1	0.0016	0.1233	2	0.0021	0.1504	2	0.0031	0.1416
1996	1	0.0016	0.1241	2	0.0021	0.1560	2	0.0031	0.1385

table continues…

Change 1990-6	0***	0.0000	0.0034	0.00	0.0002	0.0096	-1*	0.0005	0.0146
Change 1993-6	0***	0.0000	0.0008	0.00	0.0001	0.0056	0*	-0.0002	0.0079
Panel C: Number of firms									
1990	4866	1085	1085	135	82	82	31	19	19
1991	5031	1067	1067	886	558	558	94	63	63
1992	5223	1060	1060	1098	702	702	210	125	125
1993	5648	1075	1075	1693	963	963	423	168	168
1994	6179	1101	1101	1913	1099	1099	710	307	307
1995	6659	1106	1106	2005	1154	1154	1050	517	517
1996	5950	939	939	2008	1192	1192	1090	572	572

Source and Note: Company segments (SEG) are defined at the two digit SIC code level. Vertical relatedness (V) and complementarity (C) are defined in the text. The sample includes single- and multisegment firms from the US, Japan, and eight East Asian economies including Hong Kong, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand. The sample used to calculate the statistics of V and C includes only multisegment firms, while we use combine single and multisegment firms to compute number of segments. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). V and C are constructed from the segment data and the commodity flow data in the *Use Table* of the *1992 Benchmark Input-Output Accounts for US Economy*. Asterisks denote levels of significance: *** 1%; ** 5%; and * 10%.

Table 5
Mean and median excess value by segment number and country

Country	SEG=1	SEG=2	SEG=3	SEG=4	SEG>=5
Panel A: Mean					
Japan	-0.0023	-0.0340	-0.0607	-0.0434	0.0257
Singapore	-0.0198	-0.0593	0.0409	-0.0959	-0.2280
USA	-0.0462	-0.1469	-0.2468	-0.2589	-0.3254
Hong Kong	-0.0698	0.1270	-0.0008	-0.0009	-0.0252
Taiwan	0.0180	-0.1112	0.0674	-0.3060	-0.0983
Korea (South)	-0.0155	-0.1469	-0.0171	0.0517	-0.4570
Malaysia	-0.0030	-0.0640	0.1713	0.0615	-0.1370
Thailand	0.0338	0.0019	0.0669	0.0637	-0.2121
Philippines	0.0110	0.4245	-0.0245	-0.0662	0.3810
Indonesia	0.0622	0.0670	-0.1141	-0.1012	-0.0805
Panel B: Median					
Japan	0.0020	-0.0608	-0.0661	-0.0429	0.0315
Singapore	-0.0010	-0.0998	-0.0090	-0.0801	-0.2810
USA	-0.0562	-0.1634	-0.2637	-0.2718	-0.3302
Hong Kong	-0.0035	0.1722	-0.0100	0.0227	0.0025
Taiwan	-0.0010	-0.0151	-0.0532	-0.3215	-0.1053
Korea (South)	-0.0010	-0.1803	0.0113	0.0487	-0.5834
Malaysia	-0.0010	-0.0460	0.1595	0.0305	-0.1887
Thailand	0.0000	-0.0855	0.1161	0.1422	-0.3012
Philippines	0.0000	0.3754	0.0816	0.0987	0.4134
Indonesia	0.0059	0.0397	-0.1663	-0.2046	0.1613

Source and Note: Excess value is the natural logarithm of the actual capital divided by imputed capital as defined in the text. The sample includes single- and multisegment firms and spans the period of 1990-96. Company segments are defined at the two digit SIC code level. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999).

Table 6
Mean and median excess value by vertical relatedness and country

Country	V<0.005	0.005<=V<0.01	0.01<=V<0.02	0.02<=V<0.03	V>=0.03
Panel A: Mean					
Japan	-0.0664	0.0098	-0.0014	0.0945	-0.0742
Singapore	-0.0961	-0.1833	0.0191	-0.4409	-0.2176
USA	-0.2163	-0.1559	-0.0283	-0.1255	-0.1786
Hong Kong	0.0032	-0.0244	0.0450	0.0642	0.2349
Taiwan	-0.1172	0.1232	-0.3960	0.0000	0.0000
Korea (South)	-0.0946	-0.0236	-0.0969	0.2761	-0.3644
Malaysia	0.0113	0.0410	0.0544	-0.5436	-0.2097
Thailand	0.0936	0.1019	0.0867	-0.2062	-0.2579
Philippines	0.2709	-0.7330	0.0000	0.0000	0.7890
Indonesia	-0.0634	0.2637	0.1102	-0.6815	-0.5669
Panel B: Median					
Japan	-0.0758	-0.0100	0.0392	0.0563	-0.0181
Singapore	-0.0812	-0.2891	-0.0493	-0.5259	-0.2843
USA	-0.2473	-0.1769	0.0179	-0.1289	-0.1978
Hong Kong	0.0492	-0.0192	0.0667	0.1275	0.2254
Taiwan	-0.1053	0.2199	-0.3960	0.0000	0.0000
Korea (South)	-0.1244	0.0137	-0.0758	0.2761	-0.2836
Malaysia	-0.0010	0.1070	0.0940	-0.7550	-0.1911
Thailand	0.1002	0.1955	-0.1205	-0.3210	-0.4354
Philippines	0.2525	-0.7812	0.0000	0.0000	0.7890
Indonesia	-0.0932	0.0732	0.0361	-0.6350	-1.2909

Source and Note: Excess value is the natural logarithm of the actual capital divided by imputed capital as defined in the text. The sample includes multisegment firms and spans the period of 1990-6. Company segments are defined at the two digit SIC code level. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Vertical relatedness is defined in the text. They are constructed from the segment data and the commodity-flow data in the *Use Table* of the *1992 Benchmark Input-Output Accounts for US Economy.*

Table 7
Mean and median excess value by complementarity and country

Country	C<0.1	0.1<=C<0.2	0.2<=C<0.3	0.3<=C<0.4	C>=0.4
Panel A: Mean					
Japan	-0.0565	-0.0801	-0.0031	0.0034	-0.0030
Singapore	-0.1459	-0.1779	-0.1026	-0.2187	0.1379
USA	-0.2763	-0.1865	-0.0674	-0.1057	-0.1921
Hong Kong	-0.0960	0.1096	0.0609	-0.1208	0.1132
Taiwan	-0.0041	-0.1569	-0.1807	-0.3960	-0.0951
Korea (South)	-0.2019	-0.0663	-0.1052	0.3479	0.0000
Malaysia	0.0689	-0.1624	-0.1725	0.0701	0.0044
Thailand	-0.0967	0.0667	0.1876	-0.0030	0.0350
Philippines	-0.1073	0.3884	0.3256	0.2327	0.0000
Indonesia	-0.0485	-0.1814	0.0703	0.5862	-0.1705
Panel B: Median					
Japan	-0.0565	-0.0801	-0.0314	0.0034	-0.0030
Singapore	-0.1020	-0.1131	-0.1767	-0.3368	0.1305
USA	-0.3326	-0.1925	-0.0414	-0.1298	-0.1831
Hong Kong	-0.0725	0.1488	0.1466	-0.2288	0.1693
Taiwan	-0.0090	-0.0470	-0.1053	-0.3960	-0.3215
Korea (South)	-0.2810	0.0202	-0.0910	0.4213	0.0000
Malaysia	0.0648	-0.1899	-0.2757	0.2421	0.0601
Thailand	0.0449	0.2135	0.1873	0.2768	-0.2771
Philippines	-0.0307	0.2461	0.3987	0.2327	0.0000
Indonesia	0.0373	-0.3601	0.1517	0.8582	-0.2081

Source and Note: Excess value is the natural logarithm of the actual capital divided by imputed capital as defined in the text. The sample includes multisegment firms and spans the period of 1990-6. Company segments are defined at the two digit SIC code level. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Complementarity is defined in the text. They are constructed from the segment data and the commodity-flow data in the *Use Table* of the *1992 Benchmark Input-Output Accounts for US Economy*

Table 8
Mean and median excess value by relatedness and income group

	USA	High income	Higher-middle income	Lower-middle income
Panel A: Segment number				
Mean				
SEG=1	-0.0462	-0.0060	-0.0051	0.0369
SEG=2	-0.1469	-0.0308	-0.1086	0.0575
SEG=3	-0.2468	-0.0553	0.0652	-0.0237
SEG=4	-0.2589	-0.0463	0.0590	-0.0430
SEG>=5	-0.3254	-0.0038	-0.1523	-0.0115
Median				
SEG=1	-0.0562	0.0000	-0.0010	0.0010
SEG=2	-0.1634	-0.0576	-0.1238	0.0227
SEG=3	-0.2637	-0.0597	0.0430	0.0382
SEG=4	-0.2718	-0.0455	0.0324	-0.0855
SEG>=5	-0.3302	0.0015	-0.1996	-0.0882
Panel B: Vertical relatedness				
Mean				
V<0.005	-0.2163	-0.0648	-0.0151	0.0478
0.005<=V<0.01	-0.1559	-0.0033	0.0274	0.0274
0.01<=V<0.02	-0.0283	0.0059	0.0277	0.0972
0.02<=V<0.03	-0.1255	0.0745	-0.5195	-0.4778
0.03<=V	-0.1786	-0.0555	-0.2871	-0.1801
Median				
V<0.005	-0.2473	-0.0725	-0.0502	0.0861
0.005<=V<0.01	-0.1769	-0.0171	0.0505	0.0732
0.01<=V<0.02	0.0179	0.0305	-0.0080	-0.0488
0.02<=V<0.03	-0.1289	0.0497	-0.7331	-0.3997
0.03<=V	-0.1978	-0.0325	-0.2374	-0.4261
Panel C: Complementarity				
Mean				
C<0.1	-0.2763	-0.0811	0.0206	-0.0267
0.1<=C<0.2	-0.1865	-0.0710	-0.1299	0.0718
0.2<=C<0.3	-0.0674	0.0015	-0.1565	0.0583

table continues…

0.3<=C<0.4	-0.1057	-0.0156	0.1242	0.2752
0.4<=C	-0.1921	0.0639	0.0044	-0.2254
Median				
C<0.1	-0.3326	-0.0576	0.0188	0.0373
0.1<=C<0.2	-0.1925	-0.0768	-0.1301	0.1239
0.2<=C<0.3	-0.0414	-0.0314	-0.2600	0.2088
0.3<=C<0.4	-0.1298	-0.0450	0.3121	0.3207
0.4<=C	-0.1831	0.0227	0.0601	-0.2620

Source and Note: Excess value is the natural logarithm of the actual capital divided by imputed capital as defined in the text. The sample includes multisegment firms and spans the period of 1990-6. The income grouping of the Asian economies is according to the World Bank definition. The high-income group includes Hong Kong, Japan, Singapore, and Taiwan. The higher-middle income group includes South Korea and Malaysia. The lower-middle income group includes Indonesia, the Philippines, and Thailand. The primary data source of the East Asian firms is Worldscope, amended by Asian/Japan Company Handbook. The data source of the US firms is COMPUSTAT. The sample excludes firms whose segment data are missing and firms primarily in the finance industry (SIC 6000-6999). Vertical relatedness and complementarity are defined in the text. They are constructed from the segment data and the commodity-flow data in the *Use Table* of the *1992 Benchmark Input-Output Accounts for US Economy.*

Table 9
OLS regressions of excess value on diversification levels

	Japan	Singapore	USA	Hong Kong	Taiwan	Korea	Malaysia	Thailand	Philippines	Indonesia
Panel A										
Intercept	-0.2066***	0.1878	-0.1715***	-0.8748***	0.8626**	0.0959	0.4677**	-0.9347***	-0.3426	-2.2647***
	(-3.05)	(0.68)	(-8.06)	(-2.99)	(2.24)	(0.38)	(2.02)	(-3.57)	(-0.65)	(-5.36)
Diversification dummy	-0.0401***	-0.0826	-0.1624***	0.076	-0.1353**	-0.0687	-0.0051	-0.0605	0.1169	-0.1492*
	(-3.61)	(-1.34)	(-17.86)	(1.39)	(-2.30)	(-1.39)	(-0.09)	(-0.95)	(0.92)	(-1.65)
Log(ASSETS)	0.0175***	-0.0158	0.0128***	0.0624***	-0.0656**	-0.0004	-0.04**	0.0812***	0.0316	0.1882***
	(4.82)	(-0.72)	(7.50)	(3.30)	(-2.25)	(-0.21)	(-2.41)	(3.74)	(0.73)	(5.51)
Adjusted R2	0.0038	0.0013	0.0101	0.0163	0.0263	0.0088	0.0004	0.0288	-0.0198	0.1183
Observations	9458	442	32197	615	244	443	681	435	96	208
Panel B										
Intercept	-0.2154***	0.1215	-0.0989***	-0.8675***	0.8255**	0.0928	0.4112*	-0.9151***	-0.3670	-2.1894***
	(-3.18)	(0.44)	(-4.63)	(-2.96)	(2.14)	(0.36)	(1.74)	(-3.52)	(-0.69)	(-5.14)
Number of segment(s)	-0.0059	-0.0408**	-0.0961***	-0.0007	-0.0533**	-0.0108	-0.0162	-0.0369	0.0251	-0.0613*
	(-1.56)	(-2.40)	(-19.09)	(-0.46)	(-2.05)	(-0.47)	(-1.19)	(-1.15)	(0.59)	(-1.73)
Log(ASSETS)	0.0172***	-0.0055	0.0144***	0.0666***	-0.0597**	-0.0051	-0.0314	0.0828***	0.0332	0.1863***
	(4.73)	(-0.24)	(8.37)	(3.43)	(-2.02)	(-0.27)	(-1.59)	(3.97)	(0.75)	(5.47)
Adjusted R2	0.0027	0.0103	0.0114	0.0135	0.0219	0.0049	0.0024	0.0297	-0.0254	0.1194
Observations	9458	442	32197	615	244	443	681	435	96	208

Source and Note: This table reports the OLS regressions of excess value on diversification levels. The sample includes single- and multisegment firms from ten economies as indicated in the table. The dependent variable, EXV, is the excess value defined as the natural logarithm of the ratio of a firm's actual value to its imputed value. In Panel A, diversification level is defined as a dummy variable equal to one if a firm has more than one segment, and otherwise zero. In Panel B, diversification level is defined as the number of the firm's segment(s). All regressions control for fixed-year effects (not reported) and firm size (Log(ASSETS)), defined as the natural logarithm of firm assets in thousands of US dollar. T-statistics are in parentheses. The asterisks denote levels of significance: ***: 1%; ** 5%; and * 10%.

Table 10
OLS regressions of excess value on vertical relatedness, complementarity, and number of segments

	Japan	Singapore	USA	Hong Kong	Taiwan	Korea	Malaysia	Thailand	Philippines	Indonesia
Intercept	-0.4573***	0.2913	-0.2321***	-1.0642***	1.1398	0.5187	0.5074	-0.0285	-2.4328*	-2.1025***
	(-5.14)	(0.88)	(-4.91)	(-2.66)	(1.03)	(0.95)	(1.61)	(-0.04)	(-1.73)	(-2.88)
Vertical relatedness	3.7337***	-5.0542	3.4719***	7.883**	20.1386	-12.4565**	-17.008***	-10.6810	9.5291	-13.1357*
(V)	(3.91)	(-1.38)	(3.38)	(2.09)	(0.57)	(-2.13)	(-3.93)	(-1.52)	(0.61)	(-1.63)
Complementarity	0.0973**	0.4075**	0.3212***	0.0324	-0.3756	2.0787***	-0.3724*	-0.7763*	1.998	0.0373
(C)	(2.49)	(2.16)	(4.45)	(0.18)	(-1.03)	(3.49)	(-1.68)	(-1.79)	(1.28)	(0.14)
Number of segments	0.0147**	-0.0526*	-0.0683***	-0.0764***	-0.0299	-0.0685	-0.0549**	0.0009	-0.0374	0.0076
(SEGN)	(2.29)	(-1.89)	(-7.56)	(-2.79)	(-0.35)	(-1.11)	(-2.43)	(0.01)	(-0.41)	(0.11)
Log(ASSETS)	0.0205***	-0.0199	0.0151***	0.1057***	-0.0913	-0.0431	-0.0179	0.0247	0.1902*	0.167***
	(4.37)	(-0.70)	(4.81)	(3.92)	(-1.07)	(-1.18)	(-0.65)	(0.44)	(1.72)	(3.12)
Adjusted R2	0.0099	0.0419	0.015	0.0468	-0.0511	0.0633	0.048	0.0058	0.0127	0.0981
Observations	5546	310	6728	395	57	134	444	92	28	91

Source and Note: This table reports the OLS regression results of the following regression model: $EXV = a + b_1*V + b_2*C + b_3*SEGN + b_4*Log(ASSETS) + (Fixed\text{-}year\ effects) + u$. The sample includes multisegment firms from the ten economies as indicated in the table. The dependent variable, EXV, is the excess value defined as the natural logarithm of the ratio of a firm's actual value to its imputed value. Among the independent variables, V is the vertical relatedness measure, C is the complementarity measure, SEGN is the number of segments, and Log(ASSETS) is the natural logarithm of firm assets in thousands of US dollar. The vertical relatedness and complementarity variables are constructed from the commodity flows data in the *Use Table of the 1992 Benchmark US Input-Output Accounts*. The details of the variable definition are described in the text. T-statistics are in parentheses. The asterisks denote levels of significance: ***: 1%; ** 5%; and * 10%.

Table A1
Reporting Requirements on Segment Data

Country	Mandatory Reported Segment Data	Source of Information
Japan	Sales Revenue, Net Income, Operating Expenditures	Business Accounting Deliberation Council, 1995, Implementation Guide for Certified Public Accountants, Tokyo, Japan, can be viewed at http://www.jipca.or.jp/n_eng/index.html
Singapore	Sales Revenue, Net Income, Operating Expenditures, Total Assets, Fixed Assets	Ng, Eng Juan, 1994, Statements of Accounting Standard (Singapore), Longman Singapore Publishers; can also be viewed at http://www.accountants.org.sg
USA	Sales Revenue, Net Income, Total Assets	International Accounting Standards Committee, International Accounting Standard 14 (Revised), can be viewed at http://www.iasc.org.uk/frame/cen2_114.htm
Hong Kong	Sales Revenue, Net Income, Operating Expenditures	Hong Kong Society of Accountants, Accounting Guideline 2.206, 'Reporting Financial Information by Segment', can be viewed at http://www.hksa.org.hk/hksa/profpron
Taiwan	Sales Revenue, Net Income	T.N. Soong and Co., 1992, The Accounting Profession in Taiwan, Republic of China, American Institute for Certified Public Accountants, New York.
Korea (South)	Sales Revenue, Operating Expenditures	Korea Accounting Standards Board, 1998, Accounting in Korea, can be viewed at http://msm.byu.edu/c&i/cim/account/Korea.htm#segment
Malaysia	Sales Revenue, Net Income, Operating Expenditures	Malaysian Accounting Standards Board, 1997, Financial Reporting Act, can be viewed at http://www.jaring.my/grapr/html/masb.html
Thailand	Sales Revenue, Net Income	Institute of Certified Accountants and Auditors of Thailand, 1996, Accounting Principles, can be viewed at http://www.icaat.or.th/menueng.html
Philippines	Sales Revenue	Accounting Standards Council of the Philippine Institute of Certified Public Accountants, 1997, Compliance with Philippine GAAP, Manila.
Indonesia	Sales Revenue, Net Income	Komite Standar Akuntaksi Keuangan, 1996, Statement of Financial Accounting Standards, can be viewed at http://www.akutan-iai.or.id/standar/sak/sak.htm

Source: authors' compilation.

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