Available online at www.sciencedirect.com
SCIENCE DIRECT®

Pacific-Basin Finance Journal 11 (2003) 365–392

PACIFIC-BASIN FINANCE JOURNAL

www.elsevier.com/locate/econbase

When does corporate diversification matter to productivity and performance? Evidence from East Asia

Stijn Claessens[a], Simeon Djankov[b], Joseph P.H. Fan[c,*], Larry H.P. Lang[d]

[a] *University of Amsterdam, Amsterdam, The Netherlands*
[b] *World Bank, Washington, DC, USA*
[c] *Department of Finance, Hong Kong University of Science and Technology, Clearwater Bay, Kowloon, Hong Kong, China*
[d] *Chinese University of Hong Kong, Hong Kong, China*

Abstract

Employing a sample of over 10,000 firm-years in nine East Asian economies during 1991 through 1996, this study examines the patterns of vertical relatedness and complementarity of diversified firms' business segments. It tests the learning-by-doing and the misallocation-of-capital effects pertaining to the productivity consequences of the different types of business combination. Evidence indicates that the two effects vary systematically with the types of business combination and the levels of economic development.

JEL classification: G31; G34; L22
Keywords: Corporate diversification; Vertical integration; Learning-by-doing; Asia

1. Introduction

The East Asian financial crisis has in part been attributed to the excessive diversification of corporations. While a plethora of anecdotal evidence and some systematic research[1] to support this argument has surfaced in the aftermath of the crisis, there was

* Corresponding author. Tel.: +852-2358-8016; fax: +852-2358-1749.
E-mail address: pjfan@ust.hk (J.P.H. Fan).

[1] Mitton (2002), Claessens et al. (in press), and Lemmon and Lins (in press) report that the performance of diversified firms is worsen relative to single-segment firms during the Asian Financial Crisis.

0927-538X/03/$ - see front matter
doi:10.1016/S0927-538X(03)00029-5

little discussion preceding the crisis. Quite the opposite, the rapid expansion of East Asian corporations through entry into new business segments was seen as an important contributing factor to the East Asian Miracle (World Bank, 1994). In this article, we examine the performance of diversified corporations in nine East Asian economies, using a panel data of more than 10,000 firm-years over the 1991–1996 pre-crisis period. We offer three contributions to the literature. First, we document the degree of diversification in the corporate sector in Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand, economies which have achieved enviable rates of economic growth over the last three decades. Second, we distinguish between vertical relatedness and complementarity of diversified firms' businesses and study the differences across the nine economies. Finally, we investigate whether and how diversification in East Asia has hurt or improved economic efficiency.

To accomplish the first two objectives, we employ the inter-industry commodity flow data in the input–output table as a common benchmark to construct vertical relatedness and complementarity indices between the primary and the secondary businesses of the sample firms. Developed by Fan and Lang (2000), these indices allow us to quantify the possibility of vertical integration and complementarity in procurement or sales between any pairs of businesses within a firm.

In answering the third question, we examine two hypotheses pertaining to the productivity consequences of the different types of business combination. A misallocation-of-capital hypothesis states that diversified firms are prone to misallocate capital to unproductive segments. The more diverse and complex the investment opportunity available, the more pronounced this misallocation is.[2] Such misallocation of capital should be associated with a reduction of both short- and long-term productivity and hence a share value discount. On the other hand, a learning-by-doing hypothesis argues that when firms diversify into new lines of business, there is an initial period during which employees are learning to use new technologies and/or coordinate with the new business; therefore, a reduction in short-term productivity should be observed.[3] This learning-by-doing should not be associated, however, with low long-term productivity or a share value discount since the forward-looking capital market fairly assesses the increase in productivity over time as the learning-by-doing pays off.

We test these hypotheses by distinguishing between vertical integration and business combination that provides complementarity. Vertical integration involves merging a potential supplier and a customer into common ownership, thus bypassing market transactions. An important source of gain from vertical integration is the savings of market transaction costs.[4] Complementary diversification involves merging businesses with overlapping input or output markets. A main source of gain from complementary diversification is the economy of scale and scope of procuring input factors from similar suppliers or providing services to similar customers. On the cost side, compared with

[2] See Scharfstein (1998), Shin and Stulz (1998), and Rajan et al. (2000). Note that misallocation of capital can also arise from agency problem (Jensen, 1986, 1989). In this paper, we focus on misallocation caused by managerial inability to deal with complexity.

[3] See Stockey (1991) and Young (1993).

[4] See Coase (1937), Williamson (1971) and Klein et al. (1978) for the transaction cost theory of vertical integration. See also Perry (1989) for a survey of the economic literature on vertical integration.

complementary diversification, vertical integration requires more complex coordination in technology, management, production, and capital investment among vertically linked but dissimilar segments. The higher coordination uncertainty in vertical integration thus requires more learning-by-doing and involves higher possibilities for capital misallocation. The impact of learning-by-doing and/or capital misallocation on productivity should be reflected in the performance difference between vertical integration and complementary diversification.

We also examine whether the productivity effects of the two types of business combination are sensitive to the degree of economic development. Economic development may influence diversification performance, for it has implications on both the cost of using the internal organization and the cost of using external market in allocating resources. We will more fully discuss this point in the next section.

Our data display different degrees of vertical relatedness and complementarity of multi-segment firms across the nine economies. Thai firms have the highest degree of vertical relatedness, followed by Indonesia, Singapore, Hong Kong, Malaysia, the Philippines, Japan, Korea, and Taiwan. Ranked by the average degree of complementarity of the diversified firms' segments, the nine economies in descending order are Singapore, Hong Kong, Thailand, Japan, Korea, Indonesia, Taiwan, and the Philippines.

We report that vertical relatedness and complementarity both have positive effects on short- and long-term performance of multi-segment firms, with the short- and long-term effects more pronounced for complementarity than for vertical relatedness. The positive effect of vertical relatedness, however, is attributable to Japanese firms. By contrast, firms in all of the remaining eight economies experience negative effects of vertical relatedness on short-term performance, significantly so for firms of Indonesia, South Korea, Taiwan and Thailand. The long-term performance effects of vertical relatedness are significantly negative in South Korea and Malaysia, while insignificant in the remaining six economies. On the other hand, the positive effects of complementarity on short- and long-term performance exist in several economies rather than concentrating in one or two economies. The different short- and long-term effects between vertical relatedness and complementarity suggest that, with the exception of Japanese firms, it has been more difficult for East Asian firms to enhance their productivity by integrating vertically than by exploring complementarity. The evidence is consistent with the view that vertical integration involves more complex coordination problems than complementary diversification does, and hence requires a more costly learning process in the short-term and a higher possibility of capital misallocation that negatively affects long-term productivity.

We find that firms in more developed economies, such as Japan, are more successful in vertical integration, in terms of both higher short-term profitability and higher long-term market valuation. The evidence is consistent with the view that the costs of learning and the probabilities of capital misallocation are smaller in more developed economies as their markets are more efficient in facilitating learning and capital allocation than those in less developed economies. On the other hand, we find that firms in less developed economies are more likely to benefit from complementary diversification in the short run, but firms in more developed economies are more likely to ultimately benefit from such diversification. The evidence suggests that firms in the less developed economies have more opportunities for short-term profits by exploring complementarity, potentially due to low degrees of learning required by this type of business combination. However, the long-run result suggests that firms in more developed economies are subject to smaller capital misallocation problem when they pursue complementary diversification, possibly because markets in these economies are more effective in monitoring resource allocation.

The paper is organized as follows. Section 2 provides a brief literature review. Section 3 describes the data and methodology. Section 4 reports empirical results. Section 5 concludes.

2. Hypothesis development

In this section, we discuss effects of learning-by-doing and capital misallocation on diversified firms' short- and long-term performance. We further discuss how the performance effects vary with types of diversification (vertical integration or complementary diversification) and level of economic development. These predicted performance effects are summarized in Table 1.

2.1. Learning-by-doing and capital misallocation

Stockey (1991) and Young (1993) argue that when firms enter new businesses, the entry is associated with a temporarily lower level of profitability as the firms and their labors are learning about and coordinating with the new businesses. If the capital is used for advantageous economic activity, however, profitability should recover over time. Young (1992, 1995) has applied the learning-by-doing hypothesis in the context of East Asia, examining the patterns of corporate growth in Hong Kong and Singapore. He finds that as firms diversify into less related businesses, they require more time to adapt to the new technology (see also Kim and Lau, 1994; Krugman, 1994).

Table 1
Predicted effects of learning-by-doing and capital misallocation on diversification performance

	Learning-by-doing	Capital misallocation
Panel A: Performance of diversification strategy		
Short-term performance	Negative	Negative
Long-term performance	Nil	Negative
Panel B: Performance of vertical integration relative to that of complementary diversification		
Short-term performance	More negative	More negative
Long-term performance	Nil	More negative
Panel C: Effect of economic development on the performance of vertical integration relative to that of complementary diversification		
Short-term performance	More positive	Unclear, depending on the capital allocation efficiency of the market relative to that of internal organization
Long-term performance	Nil	Unclear, depending on the capital allocation efficiency of the market relative to that of internal organization

On the efficiency of capital allocation within diversified firms, several authors argue that diversified firms are prone to misallocate their capital to unprofitable segments.[5] The more diverse investment opportunities available, the more pronounced the misallocation. Shin and Stulz (1998) report that non-core segments of diversified firms invest more than specialized firms in the same industry when other segments do well and invest less when they do poorly. Their evidence is consistent with the view that the investment policy within diversified firms differs from that of specialized firms. Scharfstein (1998) examines investment patterns across segments in diversified firms and concludes that diversified firms appear to practice some form of suboptimal "socialist" reallocation of resources across divisions, moving funds from profitable firms in high growth industries to support investment in lower growth sectors. Rajan et al. (2000) model that diversified firms are associated with coordination and competition among their divisions for resources. The complexity in resources and growth opportunities among the divisions induces capital misallocation. They report evidence that diversified firms misallocate investment funds; the extent of misallocation is positively related to the diversity of investment opportunities across divisions.

Another potential reason for capital misallocation is agency problem. Denis et al. (1997) argue that value-reducing investment strategies are sustained over time because they benefit management. The takeover market can act as a disciplining tool, albeit not sufficient in eliminating the capital misallocation problem (Jensen, 1986, 1989). However, the agency theory does not offer explanations on why organizations with different degrees of complexity or different types of diversification could be subject to different degrees of capital misallocation problem.

According to the learning-by-doing hypothesis, diversification strategy can be associated with a low short-term performance; however, it should not be associated with a long-term value discount since the forward-looking capital market fairly assesses the increase in productivity over time as the learning-by-doing pays off. On the other hand, under the misallocation of capital hypothesis, diversification strategy should be associated with low short-term productivity and a pronounced long-term value discount. These predicted performance effects of diversification strategy are summarized in Panel A of Table 1.

2.2. *Effects of relatedness*

We now distinguish between vertical integration and business combination that provides complementarity. Compared with complementary diversification, vertical inte-

[5] A body of empirical studies investigates the impact of diversification on the market valuation of firms. Lang and Stulz (1994), Berger and Ofek (1995), Comment and Jarrell (1995), and Servaes (1996), among others, document that diversified firms in the United States trade at discounts relative to single-segment firms. That literature however does not provide conclusive answer to the issue. More recent research questions the existence and the magnitude of the diversification discount by showing that such discount can be partially attributable to measurement errors and self-selection, i.e., firms in poorly performing industries are more likely to diversify into new industries. That literature however does not provide conclusive answer to the question. More recent research question the existence and the magnitude of the diversification discount by showing that such discount can be partially attributable to measurement errors and self-selection, i.e., firms in poorly performing industries are more likely to diversify into new industries.

gration requires more complex coordination in technology, management, production, and capital investment among vertically linked but dissimilar segments. The higher coordination uncertainty in vertical integration thus requires more learning-by-doing and involves higher possibilities for capital misallocation.

The impact of learning-by-doing and/or capital misallocation on productivity should be reflected in the performance difference between vertical integration and complementary diversification. Because vertical integration is associated with higher learning costs, all else equal, the short-term performance of vertical integration is likely inferior to that of complementary diversification. As employees move up the learning curve in the long run, learning costs become insignificant, and therefore no difference in long-term performance is expected between the two types of business combination. Although capital misallocation destroys value in both types of business combination, it is more likely occurs in vertical integration than in complementary diversification. Therefore, the expected short- and long-term performance of vertical integration should be both worse than that of complementary diversification. In comparison, while the learning hypothesis predicts no long-term performance difference between vertical integration and complementary diversification, the capital misallocation hypothesis predicts that the former strategy is associated with worse long-term performance than the latter. We summarize these predicted effects in Panel B of Table 1.

2.3. Roles of economic development

Economic development may affect diversification performance through its impact on learning and capital misallocation costs. Markets in more developed economies are likely to have accumulated more knowledge in place and have more peer firms to learn from each other than markets in less developed economies have. Diversification strategy is therefore associated with lower learning costs in the more advanced economies.

On the roles of economic development in capital allocation efficiency of the firm versus the market, there exist two alternative views. The first view emphasizes that markets in more advanced economies are more efficient than those in less developed economies in monitoring resource allocation decisions of firms and their managers, and hence mitigate the likelihood of capital misallocation caused by management or agency problems. According to this view, diversification strategy is expected to be associated with lower capital misallocation costs in more advanced economies. Consistent with this argument, Lins and Servaes (2002) find a diversification discount for Asian firms that are part of a business group. By contrast, the second view emphasizes that diversification strategy allows firms to bypass distorted external markets for financial capital, raw materials, labor, or products (Williamson, 1985; Gertner et al., 1994; Lamont, 1997; Stein, 1997; Scharfstein and Stein, 2000; Scharfstein, 1998). Such beneficial effects are larger in less developed economies as their markets are subject to heavier distortions. Consistent with this argument, Fauver et al. (in press) find significant diversification discount in developed economies, but not in lower-income countries. Whether the first or the second view better describes the role of economic development depends on how the costs of using the market and the costs of internal organization change with economic development. Increasing level of economic development benefits diversification strategy, if internal organizational costs are reduced more than market transaction costs are. Conversely, increasing level of economic development produces unfavorable effects on diversification strategy, if market transaction costs are lowered more than internal organizational costs are.

Economic development can also be associated with uneven productivity effects between vertical integration and complementary diversification strategies. Compared with complementary diversification, vertical integration is more subject to learning and capital misallocation problems that are both affected by economic development as we have discussed. Therefore, the performance of vertical integration is more sensitive to the level of economic development of a country than the performance of complementary diversification is. Accordingly, the learning-by-doing hypothesis predicts a positive effect of economic development on the short-term performance of vertical integration relative to complementary diversification, but no such difference in long-term performance. On the other hand, the prediction based on the misallocation of capital hypothesis is ambiguous. If the first view (that the market is more effective than the firm in monitoring resource allocation) better describes the state of nature, higher level of economic development should bring more positive short- and long-term productivity effects to vertical integration than to complementary diversification. By contrast, if the second view (that the internal organization is more effective in allocating resources) better describes the world, higher economic development should bring more detrimental productivity effects to vertical integration than to complementary diversification. These predictions regarding the roles of economic development in the performance of the different types of diversification strategy are summarized in Panel C of Table 1.

3. Data and methodology

3.1. The data

We study corporate diversification in nine economies: Hong Kong, Indonesia, South Korea, Japan, Malaysia, Philippines, Singapore, Taiwan and Thailand. Our primary data source is the Worldscope database. Worldscope contains financial and segment information on companies from around 50 economies. We initially selected all companies from the nine economies covered by the June 1991–1998 CD-Rom version of annual Worldscope database. In each of the annual database, Worldscope provides historical financial data with a lag of 1 to 2 years. We are able to assemble several years of financial data between 1991 and 1996 for most of the companies. Historical segment data for many of the companies are missing, however, since Worldscope reports only the latest available segment data. To increase sample size, we collected additional segment data for Worldscope companies from the autumn edition of the *1994–1998 Asian Company Handbook* and *Japan Company Handbook*. All financial data were converted to US dollars using fiscal year end foreign exchange rate for each firm.

In order to determine the types of the companies' businesses, we group the companies' segments according to the two-digit Standard Industry Classification (SIC) system. This procedure involves two steps. In the first step, we assign the four-digit SIC codes reported by Worldscope to appropriate segments. In many cases, we are able to obtain one-to-one matches between SIC codes and segments. 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 reported SIC code, we determine the segment's SIC code according to its business description. If a segment is associated with multiple SIC codes, it is broken down equally so that each segment is associated with one SIC code. In the second step, we redefine segments at the two-digit SIC level and aggregate segment sales to that level.

We classify firms as single-segment if at least 90% of their total sales are derived from one two-digit SIC segment. Firms are classified as multi-segment 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% of total firm sales. This classification scheme is the same as in the works of Lins and Servaes (1999, 2002). We further define the primary segment of a multi-segment firm as the largest segment by sales. The remaining segment(s) is defined as secondary segments. In a small number of cases, two largest segments have identical sales. In such cases, we select the segment with the lower two-digit SIC code as the primary segment. Note that our empirical results generally hold if the alternative is chosen as the primary segment.

As the cited studies, we exclude multi-segment firms from the sample when they do not report segment sales. We also exclude firms whose primary business segment is financial services (SIC 6000-6999). This selection results in a sample described in Table 2.

There are 8450 (65%) multi-segment firms and 4625 (35%) single-segment firms in the sample. Japanese firms comprise the majority of the sample, as they account for 75% of the multi-segment firms and 68% of the single-segment firms. Across the nine economies, Singapore and Malaysia rank high in the percentage of multi-segment firms (72% and 70%, respectively), while Thailand and the Philippines have the lowest percentage (27% and 33%, respectively).

Table 2
Summary statistics of multi- and single-segmented firms

	Multi-segment firms			Single-segment firms		
	Number	Percentage of total firms	Average assets (Millions of US$)	Number	Percentage of total firms	Average assets (Millions of US$)
Hong Kong	488	65	1199	256	34	974
Indonesia	117	47	670	133	53	391
Japan	6407	67	2850	3153	33	2250
Korea (South)	270	64	1556	152	36	2502
Malaysia	531	70	612	230	30	499
Philippines	38	33	489	76	67	455
Singapore	357	72	526	137	28	721
Taiwan	111	46	768	128	54	766
Thailand	131	27	578	360	73	261
All economies	8450	65	2371	4625	35	1776

The primary data source is Worldscope, amended by Asian/Japan Handbook. The sample spans the period of 1991 – 1996. Firms with missing segment sales data are excluded. Firms with their primary businesses in financial services (SIC 6000-6999) are also excluded. Company segments are defined at the two-digit SIC code level. Firms are classified as single-segment if at least 90% of their total sales are derived from one two-digit SIC code segment. The remaining firms are classified as multi-segment firms.

The average size of multi-segment firms is US$2371 million in total assets and US$1776 million in total assets for single-segment firms. Across the nine economies, the average assets of multi-segment firms are mostly larger than those of single-segment firms, with the exception of South Korea and Singapore. Of the multi-segment firms, Japanese firms have the largest average assets (US$2850 million), followed by Korean and Hong Kong firms. Of the single-segment firms, Korean firms have the largest average assets (US$2250 million), followed by Japanese and Hong Kong firms.

3.2. Construction of the main variables

In this sub-section, we describe the measurement of vertical relatedness and complementarity of diversified firms' segments. We also discuss the measurement of short- and long-term performance.

3.2.1. Relatedness

Fan and Lang (2000) develop two variables to capture the degree of relatedness (vertical and complementary) between the primary and secondary segments of a firm. The vertical relatedness variable measures the degree to which a firm integrates forward and/or backward into its secondary segment(s), given its primary segment. The complementarity variable measures the degree to which the primary and the secondary segments complement each other (forward) in marketing and distribution and/or (backward) in procurement. We adopt these relatedness measures in this study. To ensure consistency across economies and to provide a common benchmark, we construct the two variables from information in U.S. input–output tables.[6] The procedure of constructing these variables is described in Appendix A.[7]

3.2.2. Short-term performance

We employ the procedure of Lang and Stulz (1994) to construct our short-term performance measures. In addition to adjust for sectoral differences in performance, the measures can be interpreted as the performance of a multi-segment firm relative to single-segment firms in its industries. These measures allow us to compare the performance

[6] We only have the U.S. input and output table and use it as a proxy for the East Asian economies. 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 over 50 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 U.S. 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 U.S. 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.

[7] See also Fan and Goyal (2002) for the application of the methodology to measuring vertical relations in mergers.

differences between multi-segment (diversified) and single-segment (focused) firms and associate the performance differences with their different investment strategies.

We measure a firm's short-term performance by its profit margin, calculated as one minus the costs of goods sold over sales. We first use the sub-sample of single-segment firms in each economy to compute the median profit margin for each two-digit SIC code industry. We then multiply the sales share in each segment of a firm by the corresponding industry median profit margin. We sum the sales-weighted profit margin across segments to obtain the imputed profit margin of the firm. Lastly, we subtract the imputed profit margin from the actual profit margin to obtain the industry-adjusted excess profit margin (EPM). This excess profit margin measure is more appropriate than other accounting income variables for the purposes of this study, since it is perfectly correlated with average variable cost (defined as 1-profit margin) which is widely used by micro-economists to proxy factor productivity changes (see, for example, Young, 1992; Clerides et al., 1998).

In the computation of industry median profit margin, we restrict the number of single-segment firms to be at least three. In some cases, we do not have sufficient number of firms to compute the median profit margin. In these cases, we use the median profit margin of broader industry groups as defined by Campbell (1996). This procedure avoids the loss of observations.

3.2.3. Long-term performance

In calculating the long-term performance measure, we adopt the approach of Berger and Ofek (1995). This approach defines the excess value (EXV) as the ratio of the firm's actual value to its imputed value. Market capitalization is used as the measure of actual firm value. It is the market value of common equity plus the book value of debt. The imputed value is computed following the industry-matching scheme described in Section 3.1. We first compute median market-to-sales ratio for each industry in each economy using only single-segment firms. The market-to-sales ratio is the market capitalization divided by firm sales. 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 can be obtained by summing the multiples across all segments. We also 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 economy.

4. Empirical results

4.1. The patterns of relatedness

In Table 3, we rank multi-segment firms by their relatedness levels, group the firms into 10 percentiles, and compute mean relatedness measures for each of the 10 percentiles. We focus on the 50th (median) percentile. The mean vertical relatedness is 0.0049 (Table 3, Panel A). This implies that for every dollar worth of production by the firm, only 0.49 cent is potentially transacted in-house between the primary and secondary segments. The maximum in-house transaction is 10 cent per dollar worth of output, while the minimum is

Table 3
Summary statistics of vertical relatedness and complementarity of multi-segment firms

Percentile	Hong Kong	Indo-nesia	Japan	Korea (South)	Malaysia	Philip-pines	Singa-pore	Taiwan	Thai-land	All economies
Panel A: Vertical relatedness										
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0010	0.0004	0.0007	0.0006	0.0010	0.0006	0.0013	0.0003	0.0010	0.0007
20	0.0019	0.0021	0.0014	0.0013	0.0016	0.0019	0.0024	0.0007	0.0023	0.0014
30	0.0034	0.0046	0.0020	0.0018	0.0024	0.0024	0.0033	0.0013	0.0062	0.0022
40	0.0055	0.0052	0.0030	0.0023	0.0035	0.0037	0.0061	0.0020	0.0079	0.0033
50	0.0078	0.0082	0.0044	0.0037	0.0052	0.0046	0.0079	0.0031	0.0096	0.0049
60	0.0117	0.0097	0.0065	0.0051	0.0076	0.0088	0.0102	0.0053	0.0131	0.0071
70	0.0175	0.0151	0.0090	0.0069	0.0111	0.0106	0.0172	0.0076	0.0276	0.0099
80	0.0302	0.0350	0.0148	0.0137	0.0168	0.0144	0.0301	0.0090	0.0357	0.0163
90	0.0486	0.0529	0.0326	0.0301	0.0400	0.0170	0.0493	0.0125	0.0697	0.0377
100	0.0824	0.0825	0.0977	0.0879	0.0851	0.0825	0.0925	0.0746	0.0811	0.0977
Panel B: Complementarity										
0	0.0117	0.0129	0.0148	0.0248	− 0.0005	0.0017	0.0637	0.0393	0.0716	− 0.0005
10	0.1175	0.0865	0.1482	0.0922	0.0760	0.1057	0.1298	0.0950	0.0997	0.1306
20	0.1860	0.1565	0.1947	0.1489	0.1031	0.1151	0.2099	0.1294	0.1706	0.1851
30	0.2570	0.2205	0.2584	0.1868	0.1264	0.1522	0.2720	0.1516	0.2533	0.2416
40	0.3299	0.2355	0.3103	0.2429	0.1523	0.1776	0.3302	0.2057	0.3275	0.2946
50	0.3915	0.2722	0.3485	0.3009	0.2091	0.2121	0.3991	0.2649	0.3560	0.3413
60	0.4357	0.4145	0.3919	0.3341	0.2616	0.2551	0.5119	0.3546	0.3988	0.3919
70	0.5751	0.6420	0.4271	0.3825	0.3276	0.2994	0.6318	0.3904	0.4520	0.4283
80	0.6457	0.9489	0.5311	0.4095	0.4254	0.5626	0.7391	0.4276	0.6420	0.5375
90	0.9720	1.3655	0.7539	0.4330	0.6287	0.8951	1.0070	1.2886	0.9082	0.7908
100	2.0000	2.0000	2.0000	2.0000	2.0000	1.2744	2.0000	2.0000	1.4190	2.0000

We rank multi-segment firms by their relatedness levels, group the firms into 10 percentiles, and compute mean relatedness measures for each of the 10 percentiles. The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 Benchmark U.S. Input–Output Accounts. The details of the variable definitions are described in the text.

zero. Across the nine economies, the mean vertical relatedness of the 50 percentile is highest for Thailand (0.0096), followed by Indonesia, Singapore, Hong Kong, Malaysia, the Philippines, Japan, Korea, and Taiwan (0.0031). This order does not correlate with the degree of economic development.

Panel B of Table 3 reports mean complementarity measures by percentile. The mean complementarity of the 50th percentile is 0.3413. The maximum is 2 while the minimum is close to 0. Comparing the levels of the two relatedness measures, these numbers suggest that the across-industry diversification by the Asian companies generate more opportunities of sharing procurement and/or sales activities relative to the opportunity of transacting input internally through vertical integration. Across the nine economies, the mean complementarity of the 50th percentile is the highest for Singapore (0.3991), followed by Hong Kong, Thailand, Japan, South Korea, Indonesia, Taiwan, the Philippines, and Malaysia (0.2091). This order does not appear to correlate with the across-economy order of the vertical relatedness measure or the degree of economic development.

To further examine the patterns of diversification by the firms, we report in Panels A and B of Table 4 the distribution of firms by number and by cumulative percentage across 10 different levels of the vertical relatedness measure *V*. As in Panels A and B, the majority of the multi-segment firms falls into the category of $V < 0.01$. For the sample as a whole, 5298 (70%) of firms have their vertical relatedness measure below that level. The number of firms decreases as *V* increases. The pattern suggests that, for most of the firms, there exist a small amount of transactions (less than 1 cent per dollar of output) between the firms' primary and secondary segments.

Across the nine economies, Thailand has the lowest percentage (50%) of firms falling into the first category where $V < 0.01$, followed in ascending order by Hong Kong, Singapore, Indonesia, Philippines, Malaysia, Japan, South Korea, and Taiwan (86%). The order is almost identical to the results presented in Table 3. The order suggests that Thai-firms have more vertically related segments than firms in the eight other economies. On the other hand, Taiwanese multi-segment firms are the least vertically related.

Panels C and D of Table 4 present the distribution of firms across 10 levels of the complementarity measure *C* which indicates the possibility of sharing procurement or sales activities. In the sample as a whole, the majority (62%) of the multi-segment firms falls into the first four categories where $C < 0.4$. Using 0.4 as the cutoff level, the economies in ascending order of the cumulative percentage are Singapore (50%), Hong Kong (52%), Indonesia (59%), Thailand (60%), Japan (61%), Taiwan (73%), Philippines (75%), Korea (76%), and Malaysia (77%). The order is comparable to the results in Table 3, with Singaporean firms having the highest segmental complementarity, and Malaysian firms having the least segmental complementarity.

4.2. Relatedness and short-term performance

We perform a regression analysis on the roles of relatedness in short-term productivity. The regression model is as follows:

$$\mathrm{EPM} = a + b_1 * V + b_2 * C + b_3 * \mathrm{SEGN} + b_4 * \mathrm{Log(ASSETS)} + (\text{Fixed effects}) + u \quad (1)$$

where EPM is the industry-adjusted excess profit margin, *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 dollars (Log(ASSETS)) to control for segment and size effects. Lastly, we include economy and year dummy variables to control for any fixed effects that may exist. The regression is performed on the pooled sample of multi-segment firms as well as on economy-by-economy samples.

Note to Table 4:
The table reports for each economy the distribution of firms in number and in cumulative percentage across 10 relatedness levels. Panels A and B report numbers and cumulative percentages by vertical relatedness (*V*). Panels C and D report numbers and cumulative percentages by complementarity (*C*). The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 Benchmark U.S. Input–Output Accounts. The details of the variable definition are described in the text.

Table 4
Distribution of multi-segment firms by relatedness and complementarity

	All economies	Hong Kong	Indonesia	Korea (South)	Japan	Malaysia	Philippines	Singapore	Taiwan	Thailand
Panel A: Number of firms by vertical relatedness										
$V<0.01$	5298	260	65	122	4170	336	23	208	58	56
$0.01 \le V<0.02$	1068	87	14	14	789	78	11	51	8	16
$0.02 \le V<0.03$	271	32	4	8	175	22	0	21	0	9
$0.03 \le V<0.04$	226	27	5	5	136	20	0	19	0	14
$0.04 \le V<0.05$	174	24	5	0	110	16	0	17	0	2
$0.05 \le V<0.06$	229	16	6	3	173	24	0	7	0	0
$0.06 \le V<0.07$	110	9	1	2	85	1	0	9	0	3
$0.07 \le V<0.08$	154	20	5	5	94	7	0	13	1	9
$0.08 \le V<0.09$	32	1	1	1	19	3	2	4	0	1
$0.09 \le V$	5	0	0	0	4	0	0	1	0	0
Panel B: Cumulative percentage of firms by vertical relatedness										
$V<0.01$	0.70	0.54	0.61	0.76	0.72	0.66	0.63	0.59	0.86	0.50
$0.01 \le V<0.02$	0.84	0.72	0.74	0.85	0.86	0.81	0.94	0.74	0.98	0.65
$0.02 \le V<0.03$	0.87	0.79	0.78	0.90	0.89	0.85	0.94	0.80	0.98	0.73
$0.03 \le V<0.04$	0.90	0.85	0.83	0.93	0.91	0.89	0.94	0.85	0.98	0.86
$0.04 \le V<0.05$	0.92	0.90	0.87	0.93	0.93	0.93	0.94	0.90	0.98	0.88
$0.05 \le V<0.06$	0.96	0.93	0.93	0.95	0.96	0.97	0.94	0.92	0.98	0.88
$0.06 \le V<0.07$	0.97	0.95	0.94	0.96	0.97	0.98	0.94	0.94	0.98	0.90
$0.07 \le V<0.08$	0.99	0.99	0.99	0.99	0.99	0.99	0.94	0.98	1.00	0.99
$0.08 \le V<0.09$	0.99	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
$0.09 \le V$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Panel C: Number of firms by complementarity										
$C<0.1$	404	28	13	17	217	93	2	15	8	11
$0.1 \le C<0.2$	1356	75	11	37	982	152	16	52	18	13
$0.2 \le C<0.3$	1312	73	34	24	1013	80	8	54	10	16
$0.3 \le C<0.4$	1624	73	5	45	1338	67	1	55	13	27
$0.4 \le C<0.5$	1150	64	5	26	970	37	1	26	8	13
$0.5 \le C<0.6$	412	36	2	1	312	22	2	32	1	4
$0.6 \le C<0.7$	384	50	7	3	257	20	1	37	1	8
$0.7 \le C<0.8$	184	10	3	1	137	10	0	19	0	4
$0.8 \le C<0.9$	99	11	3	3	63	7	2	7	1	2
$0.9 \le C$	642	56	23	3	466	19	3	53	7	12
Panel D: Cumulative percentage of firms by complementarity										
$C<0.1$	0.05	0.05	0.12	0.10	0.03	0.18	0.05	0.04	0.11	0.10
$0.1 \le C<0.2$	0.23	0.21	0.22	0.33	0.20	0.48	0.50	0.19	0.38	0.21
$0.2 \le C<0.3$	0.40	0.36	0.54	0.48	0.38	0.64	0.72	0.34	0.53	0.36
$0.3 \le C<0.4$	0.62	0.52	0.59	0.76	0.61	0.77	0.75	0.50	0.73	0.60
$0.4 \le C<0.5$	0.77	0.65	0.64	0.93	0.78	0.84	0.77	0.57	0.85	0.72
$0.5 \le C<0.6$	0.82	0.73	0.66	0.93	0.83	0.88	0.83	0.66	0.86	0.76
$0.6 \le C<0.7$	0.87	0.83	0.72	0.95	0.88	0.92	0.86	0.77	0.88	0.83
$0.7 \le C<0.8$	0.90	0.85	0.75	0.96	0.90	0.94	0.86	0.82	0.88	0.87
$0.8 \le C<0.9$	0.91	0.88	0.78	0.98	0.91	0.96	0.91	0.84	0.89	0.89
$0.9 \le C$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 5 presents the regression results. We first examine the effects of multiple segments on EPM. The coefficient of SEGN in the pooled regression is negative and significant, suggesting that more segments are associated with lower firm profitability. Across the nine economies, six economies exhibit negative segment effects and five of the coefficient estimates are statistically significant. The Philippines is the only economy exhibiting significantly positive segment effect. This result may be driven by the small sample size (35 firms). The overall negative relation between segments and short-term performance suggests that the internal organizational costs, including learning-by-doing and capital misallocation costs, outweigh any benefits of diversification in the short-term.

In the pooled regression, the estimated coefficients of the two relatedness variables V and C are both positive but only the latter is statistically significant. The result is largely driven by Japanese firms, which account for more than two third of the sample. In the economy-by-economy regressions, the estimated coefficient of V is negative in all economies but Japan. The negative coefficients are significant for Indonesia (significant at the 10% level), Korea (1%), Taiwan (5%), and Thailand (5%). Vertical relatedness seems to hurt performance in these economies. Japan is the only economy whose profitability has benefited from vertical relatedness, as the estimated coefficient of V is positive and significant at the 1% level. By contrast, the estimated coefficient of C is positive in all but two economies, Hong Kong and Japan. The positive coefficients are significant for Indonesia (5%), Korea (1%), Taiwan (1%), and Thailand (1%). Firm profitability in these economies has thus benefited from complementary diversification. Although the coefficients of C in the cases of Hong Kong and Japan are negative, they are not statistically significant.

Lastly, there exist significant positive size effects on profitability except for Taiwan. Large firms are on average more profitable than small firms, as indicated by the positive and highly significant coefficient of Log(ASSETS) in the pooled regression. The economy-by-economy evidence is consistent with the pooled result.

To provide the statistical significance of the difference of impact between vertical relatedness and complementarity on profit margin, we test whether the estimated coefficients of V and C from the regressions are equal. As reported in Table 5, the F-value is not significant for the pooled sample. Across the nine economies, we find that the F-value is significant in five economies: Indonesia, Japan, Korea, Taiwan, and Thailand. The evidence for these four economies except for Japan is consistent with the view that vertical integration entails higher learning costs than complementary diversification. Note that Japan is the only economy whose profitability has benefited from vertical relatedness and the estimated coefficient of V is significantly higher than that of C. This evidence indicates that Japan as the most developed economy in East Asia may already utilize sophisticated technologies and may also have peer firms to learn from. Hence, they have benefited from vertical integration more than from complementary diversification whose degree of required learning is lower. We will examine this proposition more generally in Section 4.4.

4.3. Relatedness and long-term performance

The results in Section 4.2 show that short-term performance is significantly positive when firms diversify into complementary businesses but significantly negative when firms

Table 5
OLS regressions of excess profitability on relatedness and complementarity

	Dependent variable: EPM									
	All economies	Hong Kong	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand
Intercept	– 0.5135	– 0.3751***	– 0.1398	– 0.0599***	0.0187	– 0.2657***	0.2119	– 0.3323***	0.6943***	– 0.2661
	(– 0.830)	(– 5.375)	(– 0.695)	(– 3.979)	(0.165)	(– 3.642)	(0.577)	(– 3.554)	(2.675)	(– 1.332)
Vertical relatedness (*V*)	0.1154	– 0.2470	– 1.8746*	0.4788***	– 1.4989***	– 0.4626	– 1.7029	– 0.2253	– 4.8110**	– 2.0914**
	(1.228)	(– 0.644)	(– 1.974)	(4.739)	(– 2.820)	(– 0.958)	(– 0.903)	(– 0.489)	– 2.362)	(– 2.369)
Complementarity (*C*)	0.0087*	– 0.0177	0.0789**	– 0.0066	0.1291***	0.0432	0.1349	0.0302	0.1947***	0.1791***
	(1.949)	(– 0.886)	(1.984)	(– 1.447)	(2.901)	(1.604)	(1.272)	(1.080)	(4.242)	(2.754)
Number of segments	– 0.0176***	– 0.0374***	0.0190	– 0.0173***	– 0.0120	– 0.0289***	0.0530**	– 0.0250***	– 0.0384*	0.0321
(SEGN)	(– 12.900)	(– 6.057)	(1.025)	(– 11.864)	(– 0.968)	(– 5.388)	(2.177)	(– 3.096)	(– 1.708)	(1.564)
Log(ASSETS)	0.0103***	0.0395***	0.0092	0.0075***	– 0.0041	0.0293***	– 0.0260	0.0285***	– 0.0494**	0.0102
	(9.554)	(6.914)	(0.619)	(7.131)	(– 0.565)	(4.567)	(– 0.885)	(3.606)	(– 2.437)	(0.619)
Adjusted R-square	0.0471	0.1177	0.0432	0.0311	0.0583	0.0657	0.1295	0.0398	0.3366	0.1365
Observations	7489	466	106	5726	147	492	35	342	67	108
F-value for $V=C$	1.2497	0.3478	4.1741	22.3926	8.8410	1.0599	0.9314	0.2975	5.9752	6.4084
Probability>F	0.2637	0.5556	0.0437	0.0001	0.0035	0.3037	0.3422	0.5858	0.0174	0.0129

This table reports the OLS regression results of the following regression model: $EPM = a + b_1*V + b_2*C + b_3*SEGN + b_4*Log(ASSETS)+(Fixed\ effects) + u$, where EPM is the excess profitability measure, 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 polled regression controls for fixed effects by including economy and year dummy variables (not reported). EPM = PM – IPM, where PM = 1 – (Costs of goods sold)/Sales. IPM is the imputed profitability measure. Using only single-segment firms, we compute the median profitability measure in each two-digit SIC code industry. The median profitability measure of each segment of a diversified firm is multiplied by the sales weight of the segment. The imputed profitability measure is the sum of the sales-weighted medians across all segments. The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 U.S. Input–Output Accounts. T-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

engage in vertical integration. This evidence is consistent with the view that vertical integration involves higher learning costs. However, the learning effects should not impair long-term performance for either vertical integration or complementary diversification. By contrast, finding negative long-term performance effects would be consistent with capital misallocation. We perform the following estimation:

$$\mathrm{EXV} = a + b_1 * V + b_2 * C + b_3 * \mathrm{SEGN} + b_4 * \mathrm{Log(ASSETS)} + (\text{Fixed effects}) + u \tag{2}$$

where EXV is the excess value of diversification discount, 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 economy and year dummy variables to control for any fixed effects that may exist. The regression is performed on the pooled sample of multi-segment firms as well as on economy-by-economy samples.

Table 6 presents the regression results. The estimated coefficients of SEGN have mixed signs. The effect of segments is positive in Japan, negative in Malaysia, and insignificant in the remaining economies. This evidence, with the exception of Malaysia, does not suggest that diversification strategy is associated with serious capital misallocation. Combining with the generally negative short-term results in Table 5, the overall evidence on segments is consistent with the learning-by-doing effect.

In the pooled regression, the estimated coefficients of the two relatedness variables V and C are both positive and statistically significant. In the economy-by-economy regressions, the estimated coefficient of V is negative for five economies. The negative coefficients are significant for Korea (5%) and Malaysia (5%). Japan is the only economy whose EXV benefits from vertical relatedness, as the estimated coefficient of V is positive and significant at the 1% level. In contrast, the estimated coefficient of C is positive for four economies, and significant for Japan (1%), South Korea (5%) and Singapore (5%).

We study separately the significance levels of V on EXV for Indonesia, Korea, Taiwan and Thailand since the earlier results for EPM for these four economies are consistent with both hypotheses. To be consistent with the learning hypothesis, the significant differential effect between V and C should reduce or disappear in the long run. As documented in Table 6, the statistical significance of the difference of impact between vertical integration and complementary diversification on EXV is insignificant for three economies, Indonesia, Taiwan and Thailand. In contrast, to be consistent with the misallocation-of-capital hypothesis, the significant differential effect between V and C should remain, as is the case for South Korea. As documented in Table 6, the statistical significance of the difference of impact between vertical integration and complementary diversification on EXV is significant at the 5% level for South Korea. The results for Malaysia are interesting. In the EPM regression, the effect of vertical relatedness on EPM is negative but insignificant, while this variable becomes significantly negative and significantly different from the effect of complementary diversification in the EXV regression. The results indicate that the costs of capital misallocation do not show up immediately but rather in the long run.

Table 6
OLS regressions of excess value on relatedness

Dependent variable: EXV	All economies	Hong Kong	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand
Intercept	1.1088***	– 0.2893	– 1.0173	0.7555***	1.5531**	1.5347***	– 1.4029	1.1905***	3.1165***	1.9956**
	(3.311)	(– 0.796)	(– 1.101)	(9.582)		(3.749)	(– 1.106)	(3.538)	(2.773)	(2.341)
Vertical relatedness (*V*)	1.2863***	2.0361	– 3.0572	2.1913***	– 7.2571**	– 6.8400***	7.9937	– 0.3712	1.3894	– 4.9497
	(2.685)	(1.033)	(– 0.594)	(4.108)	(– 2.356)	(– 2.615)	(1.307)	(– 0.217)	(0.074)	(– 1.188)
Complementarity (*C*)	0.0715***	– 0.0559	– 0.1563	0.0896***	0.7830**	– 0.1372	0.7112	0.2217**	– 0.0221	– 0.3463
	(3.182)	(– 0.573)	(– 0.866)	(3.749)	(2.332)	(– 0.944)	(1.563)	(2.227)	(– 0.109)	(– 1.198)
Number of segments	0.0174**	– 0.0445	– 0.0354	0.0357***	0.0014	– 0.0652**	0.0533	– 0.0262	– 0.0388	– 0.0364
(SEGN)	(2.548)	(– 1.419)	(– 0.401)	(4.682)	(0.020)	(– 2.238)	(0.647)	(– 0.895)	(– 0.445)	(– 0.345)
Log(ASSETS)	0.0135**	0.1340***	0.2028***	0.0118**	– 0.0486	0.0097	0.1689	– 0.0158	– 0.1488*	– 0.0318
	(2.501)	(4.471)	(2.929)	(2.139)	(– 1.150)	(0.273)	(1.634)	(– 0.550)	(– 1.697)	(– 0.450)
Adjusted *R*-square	0.0136	0.0397	0.0788	0.0128	0.0434	0.0182	0.1187	0.0092	– 0.0026	– 0.0011
Observations	7127	402	93	5550	133	455	30	315	57	92
F-value for $V = C$	6.2388	1.0958	0.3127	15.0572	6.3856	6.3498	1.3705	0.1170	0.0057	1.1915
Probability>*F*	0.0125	0.2958	0.5775	0.0001	0.0127	0.0121	0.2528	0.7325	0.9403	0.2781

This table reports the OLS regression results of the following regression model: $EXV = a + b_1 * V + b_2 * C + b_3 * SEGN + b_4 * Log(ASSETS) + (Fixed\ effects) + u$. The dependent variable, EXV, is the excess value defined as the ratio of a firm's actual value to its imputed value. Details of the variable construction can be found in the text and also in the works of Berger and Ofek (1995) and Lins and Servaes (1999, 2002). 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 polled regression controls for fixed effects by including economy and year dummy variables (not reported). The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 Benchmark U.S. Input–Output Accounts. The details of the variable definition are described in the text. *T*-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

There exist significant positive size effects on EXV except for Taiwan. Large firms are on average valued higher than are small firms.

A potential source of gain by merging complementary businesses is the economy of scale and scope achieved through joint procurement from similar suppliers or providing services to similar customers. Our evidence show that short- and long-term performances of diversified firms in several Asian economies are both increasing with the degree of complementarity, suggesting that the more complementary are the diversified firms' businesses, the more likely that the gain outweighs the costs of the diversification, including the short-term learning and the long-term capital misallocation costs. On the other hand, an important source of the gain from vertical integration is the saving of market transaction costs. Our evidence shows that short-term and long-term performances of firms in a few economies decrease with the extent of vertical relatedness, suggesting that vertical integration encounters substantial organizational costs, including the learning and capital misallocation costs, that cannot be fully compensated by the benefits derived from internalizing transactions.

4.4. Roles of economic development

We now investigate whether the learning and capital misallocation problems are sensitive to the degree of development of the economy to which a firm belongs.

In the previous section, using Japan as an example, we argued that learning-by-doing is less costly and capital misallocation is less severe for firms in more developed economies. Since vertical integration is more complex than complementary diversification, we should observe that firms in more developed economies benefit more from vertical integration. On the other hand, we should observe less significant differences in performance for complementary diversification across different degrees of economic development.

We regress EPM and EXV on diversification variables as well as variables proxying for the level of economic development of each of the nine economies. In the first model specification, we use the average per-capita GNP[8] during 1991–1996 (World Bank, 1996) as the proxy for economic development. In an alternative specification, we proxy the level of economic development by using the World Bank classification of economies by income level groups, as in La Porta et al. (1997). As reported by the World Bank, the lower-middle income dummy equals one if the firm is from Indonesia, the Philippines, or Thailand. The high-income dummy equals one if the firm is from Hong Kong, Japan, Singapore or Taiwan. The numeraire is higher-middle income economies (Korea and Malaysia). The results are reported in Table 7.

Initially focus on the interactive effects of vertical relatedness and economic development. From columns (1) to (4) of Table 7, the estimated coefficients of V are negative and mostly significant. From columns (2) and (4), the interaction term between per-capita GNP and vertical relatedness is positive and significant for both EPM and EXV. From columns (1) and (3), EPM and EXV are positively related to vertical relatedness in high-income economies while negatively (or insignificantly in the case of EXV) related to it in lower-

[8] We divide the per-capita GNP by 1,000,000 in the regressions.

Table 7
Diversification effects and economic development

Dependent variable	EPM		EXV	
	(1)	(2)	(3)	(4)
Intercept	− 0.0518	− 0.0544	1.5214***	1.4959***
	(− 0.840)	(− 0.883)	(4.545)	(4.485)
Per-capita GNP		− 0.1560		− 9.7390***
		(− 0.683)		(− 7.826)
Lower-middle income dummy	0.0269*		0.1119	
	(1.681)		(1.356)	
High-income dummy	− 0.0024		− 0.2612***	
	(− 0.289)		(− 5.898)	
Vertical relatedness (*V*)	− 0.4035	− 1.4980***	− 4.3809***	− 3.4311***
	(− 1.251)	(− 5.964)	(− 2.692)	(− 2.583)
Complementarity (*C*)	0.0536***	0.0976***	− 0.0870	− 0.1220*
	(2.660)	(7.245)	(− 0.835)	(− 1.756)
Number of firm segments (SEGN)	− 0.0176***	− 0.0184***	0.0180***	0.0152**
	(− 13.001)	(− 13.632)	(2.665)	(2.249)
Log(ASSETS)	0.0106***	0.0109***	0.0124**	0.0149***
	(10.122)	(10.216)	(2.345)	(2.778)
Per-capita GNP × *V*	n.a.	59.9630***	n.a.	17.6224***
		(6.828)		(3.827)
Per-capita GNP × *C*	n.a.	− 3.2240***	n.a.	6.6650***
		(− 7.088)		(2.858)
Lower-middle income dummy × *V*	− 1.9974***	n.a.	1.9199	n.a.
	(− 3.940)		(0.705)	
High-income dummy × *V*	0.7115**	n.a.	6.5049***	n.a.
	(2.105)		(3.813)	
Lower-middle income dummy × *C*	0.0778***	n.a.	− 0.1240	n.a.
	(2.706)		(− 0.832)	
High-income dummy × *C*	− 0.0555***	n.a.	0.1755*	n.a.
	(− 2.681)		(1.643)	
Adjusted *R*-square	0.0448	0.0428	0.0132	0.0136
Observations	7489	7489	7127	7127

Excess profit margin (EPM) and excess value (EXV) are employed as the dependent variable in Eqs. (1)–(4), respectively. GNP is the annual per-capita GNP in US dollars divided by 1,000,000. The Lower-middle income dummy equals one if the firm is from Indonesia, Philippines, or Thailand. The High-income dummy equals one if the firm is from Hong Kong, Singapore, Taiwan, or Japan. The numeraire is Higher-middle income economies (Korea and Malaysia). The income groups are assigned according to World Bank. *V* and *C* are the vertical relatedness and the complementarity measures, respectively. SEGN is the number of firm segments. Log(ASSETS) is the natural logarithm of firm assets in thousands of US dollars. The sample includes multi-segment firms in the nine Asian economies. In Eqs. (3) and (4), firms with excess values greater than four or less than one-fourth are deleted. *T*-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

middle income economies. These results suggest that firms in more developed economies are more successful in vertically integrating in terms of both higher short-term profitability and higher market valuation, while this is not the case for firms in less-developed economies.

From Table 7, we observe that the coefficients of C are positive and significant in three of the four regressions, consistent with the previous results. There exist differential short- and long-term interactive effects of complementary diversification and economic development. From column (2) and (4), the coefficient of (Per-capita GNP) $\times C$ is significantly negative for the EPM regression but significantly positive for the EXV regression. Using the alternative specification, the coefficients of (Lower-income dummy) $\times C$ and (High-income dummy) $\times C$ in the EPM regression are significantly positive and negative, respectively (column (1)). However, the reverse is true in the EXV regression (column (4)). From these results, it appears that in the short-run firms in less developed economies benefit more from complementary diversification relative to those from more developed economies. It is consistent with the view that, relative to firms in more developed economies, firms in the less developed economies have more opportunities for short-term profits by exploring complementarity, potentially due to low degrees of learning required by this type of business combination. However, the firms in more developed economies are more likely to ultimately benefit from such diversification. This long-run result is consistent with the view that firms in more developed economies are subject to smaller capital misallocation problem when they pursue complementary diversification, possibly because the markets in these economies have higher degrees of efficiency in resource allocation.

Note that in the developing economies, firms benefit from complementary diversification in the short-term but not in the long-term. It is not clear what drives this result. Possible reasons include that competition eventually arrives and/or the costs of capital misallocation do not show up immediately but rather in the long run. In either or both of the conditions, complementary diversification can experience short-term gain, even though the long-run results are mediocre. Note also that it is not evident why the developed economies (mainly Japan) can gain substantially from vertical integration while not generate value from less complicated complementary diversification. Again, one such missing condition is competition. Competitors may catch up faster and drive out profits earlier in the case of complementary diversification than that of vertical integration, for it is easier to imitate the former strategy. Although not clear how they can be tested, these conjectures await to be addressed in future research.

We now examine whether our evidence on the roles of economic development is consistent with the learning-by-doing or the misallocation-of-capital hypothesis. As discussed in Section 2.3, the learning-by-doing hypothesis predicts that economic development has a more positive short-term effect on the performance of vertical integration than that of complementary diversification, but no such differential effects on long-term performance. On the other hand, the misallocation-of-capital hypothesis predicts that any beneficial (or detrimental) effect of economic development is larger for vertical integration than for complementary diversification. Our evidence shows that when the level of economic development is high, short-term performance react positively to vertical integration but negatively to complementary diversification. However, the reverse is true when the level of economic development is lower. In terms of long-term performance, economic development has positive effects on both vertical integration and complementary diversification, and more so for vertical integration. These short-term and long-term results collectively lend support for both of the hypotheses.

Table 8
The OLS regressions of excess profitability on change in relatedness

	All countries	Hong Kong	Indonesia	Japan	Korea (south)	Malaysia	Philippines	Singapore	Taiwan	Thailand
Intercept	− 0.3124***	− 0.2880***	− 0.0962	− 0.0715***	0.1954	− 0.2940***	0.4572	− 0.5425***	1.1166*	− 0.1735
	(− 3.43)	(− 3.70)	(− 0.27)	(− 4.27)	(1.04)	(− 3.04)	(0.86)	(− 3.56)	(2.08)	(− 0.72)
Change in vertical relatedness (CV)	0.2776**	− 0.0358	− 0.6880	0.6026***	− 1.2629	− 0.1977	1.5141	− 0.2810	0.3638	0.0978
	(2.02)	(− 0.08)	(− 0.54)	(3.87)	(− 1.34)	(− 0.36)	(0.72)	(− 0.28)	(0.19)	(0.07)
Change in complementarity (CC)	− 0.0033	0.0108	− 0.0246	− 0.0101	− 0.0064	0.0040	− 0.0140	− 0.0193	0.0925	0.1285
	(− 0.52)	(0.41)	(− 0.37)	(− 1.45)	(− 0.15)	(0.14)	(− 0.15)	(− 0.47)	(0.81)	(1.74)
Number of segments (SEGN)	− 0.0190***	− 0.0378***	0.0379	− 0.0188***	− 0.0085	− 0.0310***	0.0684**	− 0.0295**	− 0.0619	0.0395
	(− 11.93)	(− 5.75)	(1.31)	(− 11.25)	(− 0.40)	(− 5.02)	(2.10)	(− 2.34)	(− 1.02)	(1.31)
Log(ASSETS)	0.0113***	0.0325***	0.0018	0.0092***	− 0.0169	0.0330***	− 0.0481	0.0471***	− 0.0717	0.0036
	(9.19)	(5.25)	(0.07)	(7.68)	(− 1.35)	(4.03)	(− 1.06)	(3.76)	(− 1.48)	(0.17)
Adjusted *R*-square	0.06	0.1432	− 0.0338	0.0423	0.0042	0.0913	0.0425	0.0611	0.1268	0.0476
Observations	4910	255	54	3992	66	257	19	189	26	52
F-value for $V=C$	4.06	0.01	0.27	15.00	1.73	0.13	0.52	0.07	0.02	0.00
Probability>*F*	0.0440	0.9169	0.6064	0.0001	0.1935	0.7150	0.4823	0.7926	0.8868	0.9820

This table reports the OLS regression results of the following regression model: $EPM = a + b_1*CV + b_2*CC + b_3*SEGN + b_4*Log(ASSETS)$+(Fixed effects)$+u$, where EPM is the excess profitability measure, CV is the change in the vertical relatedness measure, CC is the change in 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 polled regression controls for fixed effects by including economy and year dummy variables (not reported). EPM = PM − IPM, where PM = 1 − (Costs of goods sold)/Sales. IPM is the imputed profitability measure. Using only single-segment firms, we compute the median profitability measure in each two-digit SIC code industry. The median profitability measure of each segment of a diversified firm is multiplied by the sales weight of the segment. The imputed profitability measure is the sum of the sales-weighted medians across all segments. The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 U.S. Input–Output Accounts. *T*-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

Table 9
OLS regressions of excess value on change in relatedness

	All countries	Hong Kong	Indonesia	Japan	Korea (South)	Malaysia	Philippines	Singapore	Taiwan	Thailand
Intercept	1.3782**	– 0.8214*	– 2.7376*	0.8444***	1.0080	1.6387**	– 1.0372	1.0055**	2.9152	1.8371*
	(2.11)	(– 1.69)	(– 1.85)	(9.32)	(0.96)	(2.47)	(– 0.49)	(2.29)	(1.38)	(1.73)
Change in vertical	0.9392	3.0252	1.8137	0.7233	– 3.7017	– 3.2628	– 1.0040	0.2432	6.5954	7.1927
relatedness (CV)	(1.29)	(1.15)	(0.34)	(0.86)	(– 0.75)	(– 0.88)	(– 0.14)	(0.08)	(1.19)	(0.97)
Change in	0.0560	– 0.0626	– 0.1187	0.0907**	0.1302	0.1880	0.2518	– 0.1042	– 0.0368	– 0.1655
complementarity (CC)	(1.64)	(– 0.38)	(– 0.44)	(2.38)	(0.52)	(0.95)	(0.72)	(– 0.87)	(– 0.11)	(– 0.45)
Number of segments	0.0338***	– 0.0408	– 0.0620	0.0436***	– 0.0684	0.0362	0.1267	– 0.0186	– 0.0128	– 0.2018
(SEGN)	(4.07)	(– 1.01)	(– 0.49)	(4.85)	(– 0.60)	(0.88)	(1.07)	(– 0.50)	(– 0.07)	(– 1.26)
Log(ASSETS)	0.0131**	0.1705***	0.3306***	0.0082	0.0190	– 0.0364	0.1396	0.0020	– 0.1382	– 0.0001
	(2.04)	(4.36)	(3.03)	(1.27)	(0.27)	(– 0.65)	(0.77)	(0.06)	(– 0.77)	(– 0.00)
Adjusted *R*-square	0.01	0.07	0.13	0.01	– 0.05	– 0.01	– 0.05	– 0.02	– 0.11	– 0.038
Observations	4731	230	47	3896	60	238	16	176	21	47
F-value for $V = C$	1.44	1.31	0.13	0.54	0.59	0.84	0.03	0.01	1.44	0.97
Probability>*F*	0.2308	0.2543	0.7238	0.4608	0.4457	0.3594	0.8637	0.9125	0.2478	0.3294

This table reports the OLS regression results of the following regression model: $\text{EXV} = a + b_1 {*} \text{CV} + b_2 {*} \text{CC} + b_3 {*} \text{SEGN} + b_4 {*} \text{Log(ASSETS)} + (\text{Fixed effects}) + u$. The dependent variable, EXV, is the excess value defined as the ratio of a firm's actual value to its imputed value. Details of the variable construction can be found in the text and also in the works of Berger and Ofek (1995) and Lins and Servaes (1999, 2002). Among the independent variables, CV is the change in the vertical relatedness measure, CC is the change in 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 polled regression controls for fixed effects by including economy and year dummy variables (not reported). The vertical relatedness and complementarity variables are constructed from the commodity flows data in the Use Table of the 1992 Benchmark U.S. Input–Output Accounts. The details of the variable definition are described in the text. *T*-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

It is also interesting to report the direct effects of the degree of economic development on the performance of the multi-segment firms. For both measures (EPM and EXV), the coefficient estimate on Per-capita GNP is negative (columns (2) and (4)). The dummy

Table 10
OLS regressions of excess profit margin and excess market value on economic development and change in relatedness

Dependent variable	EPM		EXV	
	(1)	(2)	(3)	(4)
Intercept	− 0.3122***	− 0.3054***	1.3790**	1.3197**
	(− 3.41)	(− 3.34)		(2.02)
Per-capita GNP	n.a.	− 0.8254***	n.a.	− 5.00***
		(− 3.93)		(− 4.44)
Lower-middle income dummy	− 0.0162**	n.a.	− 0.1568***	n.a.
	(− 2.14)		(− 3.93)	
High-income dummy	0.0321**	n.a.	0.0046	n.a.
	(2.35)		(0.06)	
Change in vertical relatedness (CV)	− 0.4667	− 0.5820*	− 3.3811	0.3876
	(− 1.07)	(− 1.77)	(− 1.46)	(0.22)
Change in complementarity (CC)	0.0187	0.0214	0.1776	− 0.0455
	(0.86)	(1.27)	(1.49)	(− 0.50)
Number of segments (SEGN)	− 0.0181***	− 0.0188***	0.0348***	0.0328***
	(− 11.51)	(− 11.93)	(4.26)	(4.00)
Log(ASSETS)	0.0112***	0.0114***	0.0131**	0.0145**
	(9.20)	(9.27)	(2.06)	(2.27)
Per-capita GNP × CV	n.a.	30.00***	n.a.	20.00
		(2.80)		(0.32)
Per-capita GNP × CC	n.a.	− 0.9502	n.a.	4.00
		(− 1.62)		(1.21)
Lower-middle income dummy × CV	0.1118	n.a.	6.3211*	n.a.
	(0.17)		(1.75)	
High-income dummy × CV	0.8522*	n.a.	4.6135*	n.a.
	(1.84)		(1.89)	
Lower-middle income dummy × CC	− 0.0035	n.a.	− 0.3218*	n.a.
	(− 0.11)		(− 1.78)	
High-income dummy × CC	− 0.0253	n.a.	− 0.1141	n.a.
	(− 1.10)		(− 0.91)	
Adjusted R-square	0.04	0.04	0.01	0.01
Observations	4910	4910	4731	4731

Excess profit margin (EPM) and excess value (EXV) are employed as the dependent variable in Eqs. (1)–(4), respectively. GNP is the annual per-capita GNP in US dollars divided by 1,000,000. The Lower-middle income dummy equals one if the firm is from Indonesia, Philippines, or Thailand. The High-income dummy equals one if the firm is from Hong Kong, Singapore, Taiwan, or Japan. The numeraire is Higher-middle income economies (Korea and Malaysia). The income groups are assigned according to World Bank. CV and CC are the change in the vertical relatedness and the change in the complementarity measures, respectively. SEGN is the number of firm segments. Log(ASSETS) is the natural logarithm of firm assets in thousands of US dollars. The sample includes multi-segment firms in the nine Asian economies. In Eqs. (3) and (4), firms with excess values greater than four or less than one-fourth are deleted. *T*-statistics in parentheses; asterisks denote the level of significance.

* 10%.

** 5%.

*** 1%.

variables for income (columns (1) and (3)) tell a similar story: the lower-middle income group dummy has a positive (and significant in column (1)) coefficient, while the high-income group dummy is negative in both specifications, and significant in explaining EXV. These results show that, compared with single-segment firms, diversified (multi-segment) firms in less developed economies perform better relative to those in more developed economies.

4.5. Effects of change in relatedness

Our statistical analysis has related performance with level of relatedness. This level analysis does not directly address how changes in relatedness over time affect firm productivity and performance. We attempt to examine this issue by regressing the performance measures on contemporaneous annual change in both vertical relatedness and complementarity, and the other control variables. Unfortunately, the time-series coverage of our data is poor, in particular outside Japan. Additional data loss occurs when a firm reduces its business scope to just one industry segment, because the relatedness of single-segment firms is generally undefined. As a result of taking annual changes in the relatedness variables, we lose almost 30% of the observations for Japan. The loss of observations outside Japan is more severe: about half of the observations were lost.

Tables 8 and 9 report the short-term and long-term performance results, respectively. As expected, the serious data loss substantially weakens the power of the tests. Except for Japan, the estimated coefficients of change in vertical relatedness and complementarity are insignificantly different from zero. In Japan, short-term performance is positively related to change in vertical relatedness but insignificantly related to change in complementarity; long-term performance is positively related to change in complementarity but insignificantly related to change in vertical relatedness. Although based on a much smaller sample, the results of Japan suggest that related diversification creates more value than unrelated diversification.

We also analyze the roles of economic development on the performance effects of change in relatedness. We replicate the regressions in Table 7, using change in vertical relatedness and complementarity as independent variables. As reported in Table 10, the overall results do not provide conclusive evidence for the hypothesized effects of economic development. There is some evidence that short-term performance is positively related to change in vertical relatedness in more developed economies measured by either the GNP level or the High-income classification by World Bank.

5. Conclusions

This study examines the patterns of vertical relatedness and complementarity for a large sample of diversified firms in East Asia. It investigates the short- and long-term productivity effects associated with the different types of business combination. It finds that, except for Japanese firms, vertically integrated firms experience poor performance both in the short- and the long-term. By contrast, firms exploring complementary diversification are generally associated with positive short- and long-term performance. These results suggest that, relative to complementary diversification, vertical integration is more complex and involves higher short-term learning costs and higher probabilities of capital misallocation.

We further examine the role of economic development in the productivity consequences of corporate diversification. We document that firms in more developed economies are more successful in vertically integrating, in terms of both short-term profitability and market valuation. On the other hand, firms in less developed economies experience higher short-term profitability in complementary diversification. However, firms in more developed economies are more likely to ultimately benefit from such diversification in the long run. These evidence collectively support the learning-by-doing hypothesis that firms in more developed economies learn faster to improve their performance because they have more peer firms to learn from. They are also consistent with the capital misallocation hypothesis that markets in the more developed economies are more efficient in monitoring resource allocation; surviving firms in these markets thus are subject to smaller degrees of capital misallocation problem, comparing with firms in other markets that are less effective in monitoring capital allocation.

We have attempted to demonstrate that types of business combination and economic development affect the productivity of diversification strategy. One caveat of our analysis is that it relates performance with the level of relatedness. One would ideally examine how performance is affected by change in relatedness over time. We are unable to find robust results in such analysis because we are confined to a much smaller sample, which substantially reduces the power of the tests. Neither have we identified the causes of the various types of business combination. For example, why have some firms pursued vertical integration given that it has been detrimental to firm value in most East Asian economies? Further research in these directions would help us better understand these corporate strategies.

Acknowledgements

The authors acknowledge helpful comments from Aris Stouraitis, an anonymous referee, and participants of the 2002 Asia-Pacific Finance Association Annual Conference at Tokyo. Joseph Fan thanks the financial support by the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No. HKUST6108/99H) and the University of Queensland for research support during his visit when part of the paper was written. An earlier version of this article was circulated as World Bank Working Paper (No. 2033): "Diversification and Efficiency of Investment by East Asian Corporations." The opinions expressed do not necessarily reflect those of the World Bank.

Appendix A

The construction of the vertical relatedness and complementarity measures entails three steps as in the works of Fan and Lang (2000). First, we create four matrices of inter-industry relatedness coefficients. This involves computing the coefficients between each pair of over 400 industries defined in the input–output tables. We follow an approach similar to Lemelin (1982) in measuring inter-industry relatedness. The building block of this approach is the *Use Table of the 1992 Benchmark U.S. Input–Output Accounts*. The accounts reports commodity flows between pairs of over 400 non-government and non-household industries. The *Use Table* 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 V_{ij}. We divide V_{ij} by the dollar value of industry j's total output to get v_{ij}, representing the dollar value of i's output required to produce one dollar worth of industry j's output. When v_{ij} is large, it suggests a high degree of forward integration of i into j. Conversely, v_{ji} measures the dollar value of j's product required by industry i to produce one dollar worth of its output. When v_{ji} is large, it suggests an opportunity for i to backward integrate into j. We therefore define two vertical relatedness coefficients, $\mathrm{FVR}_{ij}=v_{ij}$ and $\mathrm{BVR}_{ij}=v_{ji}$, to proxy for the opportunity for industry i to forward and backward integrate into industry j, respectively.

From the *Use Table*, we compute for each industry i the percentage of its output supplied to each industry k, denoted as c_{ik}. For each pair of industries i and j, we compute the simple correlation coefficient between c_{ik} and c_{jk} across all k. A large correlation coefficient in the percentage output flows suggests a significant overlap in 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 between the input requirement coefficients v_{ik} and v_{jk} of the two industries. A large correlation coefficient suggests a significant overlap in inputs required by industries i and j. We hence define two complementarity coefficients, $\mathrm{FCOM}_{ij}=\mathrm{corr}(c_{ik}, c_{jk})$ and $\mathrm{BCOM}_{ij}=\mathrm{corr}(v_{ik}, v_{jk})$, to proxy for the degree of forward and backward complementarity between industries i and j, respectively. In step one, the subscripts for FVR, BVR, FCOM, and BCOM are small i and j which denote 400×400 industries.

In the second step, we condense the relatedness coefficient matrices to accommodate the widely used SIC codes and reduce 400 industries to a manageable number. This involves classifying the industries into 34 industry groups and computing mean relatedness coefficients by pairs of industry groups. For each pair of the 34 industry groups, we compute mean relatedness coefficients across pairs of industries that are classified into the same 34 pairs of industry groups. This results in four 34×34 matrices of mean relatedness coefficients.

In the third step, we construct the relatedness variables for each multiple-segment firm in our sample based on the mean relatedness coefficients from the condensed matrices. We define the vertical relatedness and the complementarity variables as follows:

$$V = \Sigma_k (w^k * \mathrm{FVR}^k_{IJ}) + \Sigma_k (w^k * \mathrm{BVR}^k_{IJ}) \tag{3}$$

and

$$C = \Sigma_k (w^k * \mathrm{FCOM}^k_{IJ}) + \Sigma_k (w^k * \mathrm{BCOM}^k_{IJ}) \tag{4}$$

where w^k is the asset weight equal to the ratio of the kth secondary segment assets to the total assets of all secondary segments; FVR^k_{IJ}, BVR^k_{IJ}, FCOM^k_{IJ}, and BCOM^k_{IJ} are the four mean related coefficients associated with industry groups I and J to which the primary and the secondary segments belong.

References

Berger, P.G., Ofek, E., 1995. Diversification's effect on firm value. Journal of Financial Economics 37, 39–65.

Bulmer-Thomas, V., 1982. Application of input–output analysis for less developed countries. In: Staglin, R. (Ed.), International Use of Input–Output Analysis. Vandenhoeck and Ruprecht, Göttingen, Germany, pp. 199–230.

Campbell, J., 1996. Understanding risk and return. Journal of Political Economy 104, 298–345.

Claessens, S., Djankov, S., Fan, J.P.H., Lang, L., 2003. The benefits and costs of internal markets: Evidence from Asia's financial crisis. In: Fan, J.P.H., Hanazaki, M., Teranishi, J. (Eds.), Designing Financial Systems in East Asia and Japan. Routledge. In press.

Clerides, S., Lach, S., Tybout, J., 1998. Is "Learning-by-exporting" important? Micro-dynamic evidence from Colombia, Mexico and Morocco. Quarterly Journal of Economics 113, 903–947.

Coase, R.H., 1937. The nature of the firm. Economica 4, 386–405.

Comment, R., Jarrell, G.A., 1995. Corporate focus and stock returns. Journal of Financial Economics 37, 67–87.

Denis, D.J., Denis, D.K., Sarin, A., 1997. Agency problem, equity ownership, and corporate diversification. Journal of Finance 52, 135–160.

Fan, J.P.H., Lang, L.H.P., 2000. The measurement of relatedness: An application to corporate diversification. Journal of Business 73, 629–660.

Fan, J.P.H., Goyal, V.K., 2002. On the patterns and wealth effects of vertical mergers. Working Paper, Hong Kong University of Science and Technology.

Fauver, L., Houston, J., Naranjo, A., 2003. Capital market development, integration, legal systems, and the value of corporate diversification: A cross-country analysis. Journal of Financial and Quantitative Analysis (in press).

Gertner, R., Scharfstein, D., Stein, J., 1994. Internal vs. external capital markets. Quarterly Journal of Economics 109, 1211–1230.

Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. Papers and Proceedings of the Ninety-Eighth Annual Meeting of the American Economic Association. The American Economic Review 76 (2), 323–329.

Jensen, M.C., 1989. Eclipse of the public corporation. Harvard Business Review 67, 61–74.

Kim, J., Lau, L., 1994. The Sources of economic growth of the east Asia newly industrialized countries. Journal of the Japanese and International Economies 8, 235–271.

Klein, B., Crawford, R.A., Alchian, A., 1978. Vertical integration, appropriable rents, and the competitive contracting process. Journal of Law and Economics 21, 297–326.

Krugman, P., 1994. The myth of Asia's miracle. Foreign Affairs (November–December), 62–78.

Lamont, O., 1997. Cash flows and investment: evidence from internal capital markets. Journal of Finance 52, 83–109.

Lang, L.H.P., Stulz, R.M., 1994. Tobin's q, corporate diversification, and firm performance. Journal of Political Economy 102, 1248–1280.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1997. Legal determinants of external finance. Journal of Finance 52, 1131–1150.

Lemelin, A., 1982. Relatedness in the patterns of interindustry diversification. The Review of Economics and Statistics 64, 646–657.

Lemmon, M., Lins, K., 2003. Ownership structure, corporate governance and firm value: evidence from the East Asian financial crisis. Journal of Finance (in press).

Lins, K., Servaes, H., 1999. International evidence on the value of corporate diversification. Journal of Finance 54, 2215–2239.

Lins, K., Servaes, H., 2002. Is corporate diversification beneficial in emerging markets? Financial Management (Summer), 5–31.

Mitton, T., 2002. A cross-firm analysis of the impact of corporate governance on the East Asian financial crisis. Journal of Financial Economics 64, 215–241.

Perry, M.K., 1989. Vertical integration: Determinants and effects. In: Schmalensee, R., Willig, R.D. (Eds.), Handbook of Industrial Organization, Volume I (Elsevier, Amsterdam), pp. 183–255.

Rajan, R., Servaes, H., Zingales, L., 2000. The cost of diversity: The diversification discount and inefficient investment. Journal of Finance 55, 35–80.

Scharfstein, D.S., 1998. The dark side of internal capital markets: II. Evidence from diversified conglomerates. NBER Working Paper No. 6352.

Scharfstein, D.S., Stein, J., 2000. The dark side of internal capital markets: Divisional rent-seeking and inefficient investment. Journal of Finance 55, 2537–2564.

Servaes, H., 1996. The value of diversification during the conglomerate merger wave. Journal of Finance 51, 1201–1225.

Shin, H., Stulz, R., 1998. Are internal capital markets efficient? Quarterly Journal of Economics 113, 531–552.

Simpson, D., Tsukui, J., 1965. The fundamental structure of input–output tables: An international comparison. Review of Economics and Statistics 47, 434–446.

Stein, J.C., 1997. Internal capital markets and the competition for corporate resources. Journal of Finance 52, 111–133.

Stockey, N., 1991. Human capital, product quality and growth. Quarterly Journal of Economics 106, 587–616.

Viet, V.Q., 1994. Practices in input–output table compilation. Regional Science and Urban Economics 24, 27–54.

Williamson, O.E., 1971. The vertical integration of production: Market failure consideration. American Economic Review 61, 112–123.

Williamson, O.E., 1985. The Economic Institutions of Capitalism. The Free Press, New York.

World Bank, 1994. The East Asian Miracle. Oxford University Press, New York.

World Bank, 1996. World Development Report, From Plan to Market, Washington, DC.

Young, A., 1992. In: Blanchard, O.J., Fisher, S. (Eds.), A tale of two cities: Factor accumulation and technical change in Hong Kong and Singapore, NBER Macroeconomics Annual. The MIT Press, Cambridge, MA, pp. 13–54.

Young, A., 1993. Invention and bounded learning by doing. Journal of Political Economy 101, 443–472.

Young, A., 1995. The tyranny of numbers: Confronting the statistical realities of the East Asian growth experience. Quarterly Journal of Economics 110, 641–680.