

THE WEALTH EFFECT OF INCREASE IN RESEARCH & DEVELOPMENT EXPENDITURE ANNOUNCEMENTS OF COMPANIES LISTED ON THE KUALA LUMPUR STOCK EXCHANGE

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INTRODUCTION

In today's competitive economic environment, the long-term survival of firms depends on their ability to create a competitive advantage through the development of new products, improvement of existing products and/or new methods of production. This is pertinent to firms in high-technology industries where the rate of technological obsolescence is high relative to other industries. The creation and sustenance of competitive advantage requires firms to invest heavily (sometimes with the use of public funds through governments) in research and development activities (R & D). The economic rationale for such investment is to increase factor productivity and quality, therefore increase living standards and confer general benefits on society. On the macro level, there is evidence which suggest (OECD, 1997) that the invention and initial exploitation of new products and processes is of less value compared to the rapid and widespread diffusion of such technology to sustain a steady economic growth. Firms in the R&D intensive sectors (such as computer equipment, aerospace and pharmaceuticals) usually pursue technological development through purchasing R&D intensive capital equipment rather than directly financing research in the laboratories. A good example is Japan which for the past few decades increased its technological sophistication through greater use of high-tech equipment rather than heavy direct spending on R&D.

In the developed economies where R&D expenditure is an essential component of most firms' strategic planning, there is evidence that the stock market reacts positively to R&D expenditure increase announcements (Hirschey 1982, Woolridge and Snow 1990, Chan, Martin and Kessinger 1990) and this reaction is more pronounced on firms in the high-tech sectors (Daukas and Switzer 1992). The consensus in the literature is that firms which pursue R&D programs and create technological innovations, increase their competitive advantage in the markets, which translates into expected positive market reaction to announcements of an increase in R&D expenditures. The increase in the R&D expenditures of one firm in a particular industry may signal an intra-industry information transfer

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regarding the announcing firm's ability to be the first to innovate and hence reap the benefits of a first-mover. The competitive structure of the industry might be changed to its advantage.

In a fairly efficient share market this translates into negative abnormal returns on share of rival firms which now are competitively disadvantaged, unless they quickly counter the entry and mobility barriers through new innovations. This is the "first-to innovate hypothesis".

It could also be that the announcement of an increase in R&D expenditure by a firm in an industry results in either no loss or positive wealth effects for rival firms due to the expected spillovers of the expected benefits from the R&D expenditure. Even if the rival firms pursue a new R&D program based on the free knowledge available, their commitment could be smaller compared to the innovator's investment, thus justifying the either zero or positive wealth effect. This is the "spill-over" hypothesis.

It is also likely that the abnormal returns observed on the rival firms' shares is the net effect of both hypotheses. A negative return to rival firms signals that the "first-to-innovate" effect dominates the "spill-over" effect, and a positive abnormal return to rival firms signals that the "spill-over" effect dominates the "first-to-innovate" effect. The disclosure of R&D expenditure is not a mandatory requirement but a voluntary effort by the management to disclose private information to reduce informational asymmetry and uncertainty for investors. It is possible that the disclosure is intentional as the announcement is expected to generate positive abnormal returns to the announcing firm and negative abnormal returns to the rival firms.

In Malaysia, the government encourages R&D activities through its tax exemption incentive program. For this purpose, companies which pursue R&D activities are defined as: the contract R&D company, that is a company which provides R&D services in Malaysia to companies other than its related companies; the R&D company, which provides R&D services in Malaysia to its related companies and/or to other companies; and the in-house research or companies which carry out in-house R&D activities for the purpose of its own business. This study samples the third category of companies which are listed on the Main Board of the Kuala Lumpur Stock Exchange and which have their own in-house R&D department.

The objective of this study is to analyse the wealth effect of announcement of increase in R&D

expenditure by companies listed on the Kuala Lumpur Stock Exchange. Specifically, the abnormal returns behaviour of the announcing and rival companies around the announcement of increase in R&D expenditure will be analysed. A positive and significant abnormal return for company making the announcement will be in support of the "first-to-innovate" hypothesis. Positive or zero abnormal returns for the rival companies would be in support of the "spill-over" hypothesis. Negative abnormal returns for the rival companies would support the notion that the effect of "first-to-innovate" hypothesis dominate the effect of "spill-over" hypothesis, and the voluntary disclosure by the management is a strategic decision. Second, the test of these hypotheses are also conducted on a sample of companies in the high-tech and low-tech sectors to ascertain whether those in the former category experience more pronounced effects than those in the low-tech sector.

DATA AND METHODOLOGY

After screening for confusing announcements and availability of complete data necessary to compute abnormal returns and cross-sectional analysis, a sample of 60 announcement plans to increase R&D expenditure made between 1987 to 1997 by 60 listed companies on the KLSE were sampled. The sample was identified by screening through the company files, newspaper reports and company reports. It was assumed that investors expect no change in the R&D expenditure from the previous year. Therefore an increase in R&D expenditure is construed as unexpected news for the market. Sixty rival companies were selected based on the criteria of similar industry and size to the announcing companies. The classification of the sampled companies into high and low tech sector was based on their main business activity as reported in the KLSE Annual Companies Handbook. For example, companies involved in producing high tech products and capital intensive are classified as high tech firms. To date there are no set standards for such classification of companies in Malaysia and therefore the classification was based on the nature of business activity and the degree of capital intensity. After identifying the announcing companies, the rival companies were selected based on the matching technique using the criteria of similar industry as based on KLSE's classification, size as measured in terms of sales turnover and level of sophistication of technology based on the nature of business activity and capital intensity.

The event-study methodology is used to analyse the wealth-effect of announcements of plans to increase R&D expenditure on the share price of the announcing and rival companies.

1 The study uses the rule of thumb observations only, as those companies involved in pharmaceuticals tend to be classified as high-tech compared to those manufacturing, say, cotton buds. The distinction is purely arbitrary.

After identification of announcement dates, the daily share prices of the sampled companies and the daily Composite Index values were compiled from day -60 to day +60. The abnormal returns are estimated by the difference between the observed and expected returns in the analysis period of 20 days surrounding the announcement. The observed returns in the analysis period are estimated as follows:

$$R_t = (P_{t+1} - P_t) / P_t$$

Where R_t = return on day t

P_{t+1} = price on day $t+1$

P_t = price on day t

The expected returns are estimated using the market model:

$$E(R_j) = \alpha_j + \beta_j E(R_m)$$

Where $E(R_j)$ = expected returns on stock j

$E(R_m)$ = returns on market index

α_j = intercept term

β_j = beta of stock j

The parameters (α_j, β_j) for estimating the expected returns using the market model were estimated using 60 days returns before the day-21 and beyond day +21.

The abnormal returns are estimated as follows:

$$AR_{jt} = R_{jt} - E(R_j)$$

The statistical significance of the abnormal returns are ascertained using t-statistics based on the procedure described by Zantout and Tsetsekos (1994). The t - statistic for the AR_{jt} is equal to the ratio of AR and the Standard Error of AR (SE).

$$t = (AR) / SE$$

For the cross sectional analysis, the cumulative average abnormal returns of rival companies (CAR_{ri}) is regressed on the cumulative average abnormal returns of announcing companies (CAR_{aj}) and a dummy variable D . The dummy variable will assume the value of zero to represent low-tech companies and value of one to represent high-tech companies. The regression is run on various window intervals and the model is expressed as follows:

$$E(CAR_{ri}) = a + b E(CAR_{aj}) + cD_j$$

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Where $j = 1, \dots, N$ a = the intercept term b = the slope D_j = the dummy variable (0,1)

The F-test and t-test are used to determine the significance of the results and the fit of the model.

FINDINGS

(i) Wealth Effect of Announcements

(a) Total Sample

Table 1
Abnormal Returns Surrounding the Announcement
of R&D Expenditure for the Full Sample

Day	Abnormal Returns of All Companies							
	R&D Companies				Rival Companies			
	Average	Std Dev	Std Err	t-stat	Average	Std Dev	Std Err	t-stat
-10	-0.0069	0.0547	0.0112	-0.6156	-0.0035	0.0351	0.0072	-0.4883
-9	0	0.0465	0.0095	0.0025	-0.0026	0.0178	0.0036	-0.7077
-8	0.0012	0.328	0.0067	0.175	0.0041	0.0259	0.0053	0.7796
-8	0.0021	0.0222	0.0045	0.4723	-0.0015	0.0243	0.005	-0.2973
-6	-0.0017	0.0217	0.0044	-0.3875	0.0046	0.0279	0.0057	0.8076
-5	0.0031	0.0198	0.004	0.7788	0.0027	0.0189	0.0039	0.7017
-4	-0.0015	0.0302	0.0062	-0.2442	0.0023	0.0325	0.0066	0.3411
-3	0.0052	0.0206	0.0042	1.2413	0.0032	0.0336	0.0069	0.4706
-2	-0.0139	0.029	0.0059	-2.3577**	0.0032	0.0316	0.0065	2.0401*
-1	0.0068	0.0308	0.0063	1.0758	0.0142	0.0315	0.0054	0.6501
0	0.0044	0.0253	0.0052	0.8549	0.0039	0.0221	0.0045	0.8621
1	-0.0002	0.02	0.0041	-0.0505	-0.0037	0.0335	0.0068	-0.5343
2	0.0042	0.0152	0.0031	1.3404	0.0155	0.005	0.005	1.3791
3	-0.006	0.024	0.0049	-1.2199	-0.0081	0.0337	0.0069	-1.1729
4	0.0054	0.0297	0.0061	0.8977	0.0013	0.0213	0.0043	0.3077
5	-0.0024	0.0194	0.004	-0.5965	0.0027	0.0414	0.0084	0.3168
6	-0.0048	0.0167	0.0034	-1.4208	-0.0061	0.0176	0.0036	-1.7076
7	0.0006	0.018	0.0037	0.1533	-0.0061	0.0162	0.0033	-1.8384*
8	0.0017	0.0287	0.0059	0.2925	0.0009	0.0143	0.0029	0.3226
9	-0.0006	0.0275	0.0056	-0.1154	0.0024	0.0206	0.0042	0.5677
10	0.0043	0.0216	0.0044	0.987	-0.0056	0.0319	0.0065	-0.8574

* significant at $\alpha = 0.10$ $t > 1.714$ or < -1.714 ** significant at $\alpha = 0.05$ $t > 2.069$ or < -2.069 *** significant at $\alpha = 0.01$ $t > 2.807$ or < -2.807

The findings in Table 1 summarise the abnormal returns surrounding the announcement of increase in R&D expenditure for the total sample. The announcing companies had negative and significant abnormal returns (-1.4%, $t=-2.357$) 2 days before announcement while the rest of the drifts are not significantly different from zero. The rival companies had positive and significant abnormal returns on day -2 and negative and significant abnormal returns on day +7. The results seem to be consistent with the "spillover" hypothesis and inconsistent with the "first-to-innovate" hypothesis.

(b) Companies in the high-tech group

The total sample was classified into companies that are in the high-tech industry and low-tech industry. The literature suggests that companies in the former category experience more pro-

Table 2
Abnormal Returns of High Technological Group

Day	Abnormal Returns of High Technological Companies							
	R&D Companies				Rival Companies			
	Average	Std Dev	Std Err	t-stat	Average	Std Dev	Std Err	t-stat
-10	0.0027	0.0101	0.0031	0.8714	-0.0011	0.0201	0.0061	-0.1759
-9	-0.0135	0.0331	0.01	-1.3551	-0.0047	0.0172	0.0052	-0.9043
-8	0.0056	0.0364	0.011	0.5221	-0.0067	0.0298	0.009	-0.7494
-7	-0.0116	0.0203	0.0061	-1.8988**	-0.0066	0.0285	0.0086	-0.7731
-6	-0.0011	0.0221	0.0067	-0.1631	0.0188	0.0258	0.0078	2.4195**
-5	-0.0062	0.0181	0.0054	-1.1418	0.0098	0.0198	0.006	1.6416
-4	0.0036	0.0087	0.0026	1.3886	0.0065	0.0216	0.0065	1
-3	0.0051	0.0084	0.0025	2.0268*	0.0034	0.0322	0.0097	-0.3506
-2	-0.0079	0.0328	0.0099	-0.7998	0.0053	0.0352	0.0106	0.5005
-1	0.0012	0.0187	0.0056	0.2047	0.0105	0.0236	0.0071	1.4775
0	0.0142	0.0326	0.0098	1.4482	0.0047	0.012	0.0036	1.288
1	0.0017	0.0119	0.0036	0.4673	-0.0072	0.0317	0.0096	-0.7477
2	0.0041	0.0178	0.0054	0.7618	0.034	0.0739	0.0223	1.5257
3	-0.0095	0.0329	0.0099	-0.9555	-0.015	0.0447	0.0135	-1.1137
4	0.0015	0.0345	0.0104	0.1444	0.0032	0.0258	0.0078	0.4112
5	-0.0053	0.0095	0.0029	-1.8540*	0.0165	0.0548	0.0165	0.9972
6	0.0001	0.0153	0.0046	0.0324	-0.0018	0.0202	0.0061	-0.2938
7	0.0049	0.0183	0.0055	0.8868	-0.0104	0.0124	0.0037	-2.7822**
8	-0.0113	0.0163	0.0049	-2.2973**	0.0024	0.0189	0.0057	0.4134
9	0.0089	0.0217	0.0066	1.3655	0.077	0.0223	0.0067	1.1468
10	0.0075	0.0223	0.0067	1.1079	-0.0125	0.0218	0.0066	-1.9043*

* significant at $\alpha = 0.10$

** significant at $\alpha = 0.05$

*** significant at $\alpha = 0.01$

$t > 1.782$ or < -1.782

$t > 2.179$ or < -2.179

$t > 3.055$ or < -3.055

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nounced wealth effects than the latter. Findings in Table 2 show that announcing companies in the high-tech category experience positive and significant abnormal returns (0.5%, $t=2.03$) on day -3, whereas the rival companies earn normal returns during the same period. Though the findings are weak, nevertheless they seem to be in support of the "first-to-innovate" and "spillover" hypotheses.

(c) Companies in the low-tech group

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Findings in Table 3 suggest that low-tech announcing companies experience significant negative returns (-1.9%, $t=-2.69$) on day -2 and the rival companies earn significant positive returns (1.98%, $t=2.56$) during the same period, consistent with the evidence that low-tech companies experience low or negative returns on announcements of increase in R&D expenditure compared to companies

Table 3
Abnormal Returns of Low Technological Group

t-stat	Abnormal Returns of Low Technological Companies								
	Day	R&D Companies				Rival Companies			
		Average	Std Dev	Std Err	t-stat	Average	Std Dev	Std Err	t-stat
-0.1759	-10	-0.015	0.0742	0.0206	-0.727	-0.0056	0.0449	0.0125	-0.4464
-0.9043	-9	0.0115	0.054	0.015	0.7665	-0.0008	0.0188	0.0052	-0.15
-0.7494	-8	-0.0027	0.0304	0.0084	-0.3192	0.0133	0.0187	0.0052	2.5721**
-0.7731	-7	0.0138	0.0168	0.0047	2.9509**	0.0029	0.0203	0.0056	0.5143
2.4195**	-6	-0.0022	0.0222	0.0062	-0.3646	-0.0074	0.0243	0.0068	-1.0993
1.6416	-5	0.0111	0.0181	0.005	2.2041**	-0.0033	0.0165	0.0046	-0.7205
1	-4	-0.0059	0.0405	0.0112	-0.5216	-0.0013	0.0401	0.0111	-0.1197
-0.3506	-3	0.0053	0.0274	0.0076	0.6961	0.0088	0.0351	0.0097	0.9081
0.5005	-2	-0.019	0.0255	0.0071	-2.6954**	0.0198	0.0279	0.0077	2.5602**
1.4775	-1	0.0115	0.0384	0.0106	1.0813	-0.0012	0.037	0.0102	-0.1167
1.288	0	-0.0039	0.0133	0.0037	-1.0518	0.0032	0.0285	0.0079	0.4071
-0.7477	1	-0.0018	0.0253	0.007	-0.2567	-0.0007	0.0359	0.0099	-0.0687
1.5257	2	0.0042	0.0133	0.0037	1.1398	-0.0001	0.0261	0.0072	-0.0207
-1.1137	3	0.003	0.0133	0.0037	-0.8105	-0.0022	0.0208	0.0058	-0.3819
0.4112	4	0.0088	0.0259	0.0072	1.22	-0.0002	0.0175	0.0049	-0.0496
0.9972	5	0.0001	0.0251	0.007	0.017	-0.009	0.0215	0.006	-1.5061
-0.2938	6	-0.009	0.0171	0.0048	-1.9022*	0.0098	0.0148	0.0041	-2.3815**
-2.7822**	7	-0.0031	0.0177	0.0049	-0.6334	-0.0024	0.0184	0.0051	-0.4672
0.4134	8	0.0127	0.0327	0.0091	1.4053	-0.0003	0.0096	0.0027	-0.0957
1.1468	9	-0.0088	0.03	0.0083	-1.055	-0.0021	0.0187	0.0052	-0.4086
-1.9043*	10	0.0017	0.0214	0.0059	0.2881	-0.0003	0.0383	0.0106	0.0294

* significant at $\alpha = 0.10$ $t > 1.782$ or < -1.782

** significant at $\alpha = 0.05$ $t > 2.179$ or < -2.179

*** significant at $\alpha = 0.01$ $t > 3.055$ or < -3.055

in the high-tech group. The findings are also consistent with the "spillover" hypothesis.

(d) Cross-sectional Analysis

Findings in Table 4 show the cross-sectional analysis of the announcing companies' abnormal returns to the abnormal returns of rival companies. The abnormal returns of the rival companies are regressed against the abnormal returns of the announcing companies plus an additional variable (tech) to control for the effect of high or low-tech industry. The model is a good fit with statistically significant F statistic. The significant and positive coefficient for the announcing companies' abnormal returns implies that the benefit from intra-industry technology spillovers dominate the "first-to-innovate" benefits of the announcing companies. This is consistent with the notion that in a developing economy like Malaysia, the general level of technological competence among its companies is relatively low, though some sectors might be more advanced than others, therefore the wealth effect of R&D benefits are expected to be more pronounced. The intercept is negative but not statistically significant, a negative intercept implies that the announcing companies are moving ahead of their rivals in innovation.

Table 4
Cross-sectional Regression of Rival Company's Abnormal Returns
to R&D Announcing Company's Abnormal Returns

Windows	Variables	Coefficients	Standard Error	t-start	P-value	Adjusted R2	F
(-10,+10)	Intercept	-0.001	0.0214	-0.0463	0.9635	0.2735	5.3292
	R&D	0.4736	0.1638	2.8908	0.0087		
	Tech	0.0534	0.0317	1.685	0.1068		

*	significant at $\alpha = 0.10$	$t > 1.721$ or < -1.721	$F > 3.47$
**	significant at $\alpha = 0.05$	$t > 2.080$ or < -2.080	$F > 5.78$
***	significant at $\alpha = 0.01$	$t > 2.831$ or < -2.831	

CONCLUSION

The focus of this research was to ascertain the presence of "first-to-innovate" and "spillover" hypotheses on the share prices of companies announcing an increase in their R&D expenditure and on the share prices of their rivals. The first to innovate companies are expected to benefit from first-mover advantages, which is unfavourable news for shareholders of rival companies, whereas the spillover refers to the benefits to the rival companies through the intra-industry technology spillovers, which benefits the rival company shareholders.

The findings of this preliminary study are weak both on the abnormal and cumulative abnormal returns analysis but in support of the presence of both hypotheses, with more pronounced results for companies in the high-tech sector. The cross-sectional analysis substantiates the findings of the abnormal return analysis. The shareholders of announcing companies in the high tech sector seem to benefit from the announcements as the market believes that such companies need a consistent on-going R&D program to remain competitive and viable in the long run. Furthermore, companies in this high tech sector are expected to successfully implement any new or substantiation of current R&D program as it is vital for their survival. The reverse is true for companies in the low tech sector.

The rival companies seem to enjoy some free-ride benefits, especially in the high tech sector. This could be due to their ability to quickly imitate or even improve on what has been announced. As for the rival companies in the low tech sector, the market perceives them to be not able to quickly exploit the opportunity available to them and therefore does not respond positively to the announcements.

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