
The Intra-Industry Effect of Share Repurchase Deregulation: Evidence from Taiwan

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Share repurchases were deregulated in Taiwan in 2000. The regulatory provisions and the government's stated aim of market stabilization provide a setting in which share repurchases are exclusively motivated by undervaluation. This study investigates if deregulation of share repurchases is an effective method of market stabilization by investigating the intra-industry effects of repurchase deregulation in Taiwan. We find that repurchasing firms and their corresponding rivals both experience strong value creation upon the repurchase announcements. The evidence suggests that the intra-industry effect of share repurchases is negatively associated with rivals' firm size, and positively associated with the announcing firm's abnormal return, the size of share repurchases and the similarity of business operation between rivals and repurchasing firms. These findings hold even after taking into account other effects that could influence the valuation of the rival firms.

Keywords: Share repurchase; competitive effect; contagion effect.

1. Introduction

The Securities and Exchange Law in Taiwan strictly prohibited share repurchases before 2000, mainly to protect public investors from being exploited

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by large shareholders.¹ In fact, regulatory change was first proposed in 1996,² but a consensus on share repurchase deregulation was not reached until 2000, when Taiwan's stock market declined by more than 20% in the period from February to June. The Ministry of Finance had repeatedly and openly claimed that the legal reform of share repurchases was mainly motivated by government's intention to rescue the declining stock market (Hsu, 2000). To further promote the new policy, the Taiwanese government met with numerous large corporations to encourage the implementation of share repurchases (October 17, 2000, *Economic Daily News*). By all those measures, the Taiwanese government intended to convey signals of market undervaluation, and hoped deregulation would be able to slow or reverse the market downturn. To achieve this goal, however, deregulation of share repurchases should be able to create a positive market/industry-wide systematic impact. If a share repurchase only conveys firm-specific signals, it is then unlikely to exhibit a strong, if any, influence on market movements.

Prior literature suggests the effects of a share repurchase on firms in the same industry may depend on the contents of revealed information. For example, the contagion effect hypothesis suggests that if share repurchases signal changes of industry-wide growth prospects, other firms in the same industry are expected to exhibit similar effects as the repurchasing firms. On the other hand, the competitive effect hypothesis argues that the information contents may reflect positive changes in the competitive positions of the repurchasing firms at the expense of their competitors. In this case, repurchase announcements are expected to have negative impacts on the share prices of rival firms. Nevertheless, the revealed information might convey firm-specific information that has little influence on their competitors. Under this circumstance, share repurchases are expected to have little effect on the rival firms.

Prior evidence on the intra-industry effects of share repurchases is inconclusive. Hertzell (1991) finds that share repurchases only convey firm-specific

¹Before August, 2000, the Securities and Exchange Law in Taiwan stated that, to protect public investors from being exploited by large shareholders through insider trading, a company shall not redeem or buy back any of its own shares, nor accept any of them as security in cases where shares may be taken back by the company at the current market price to offset debts due and payable by such shareholders to the company prior to liquidation or bankruptcy.

²In 1996, a military exercise by China attempted to influence the presidential election and negatively impacted the Taiwanese stock market. The topic of share repurchases was hotly debated again during the Asian financial crises in 1997.

information with no impact on the rivals, while Erwin and Miller (1998) document a strong competitive effect. Since the intra-industry effect is highly associated with the information contents released to the market, one possible explanation for the aforementioned empirical inconsistency could be that the signals conveyed in various share repurchase announcements are fundamentally different. Prior studies found various motives for share buybacks, including equity undervaluation (Dann *et al.*, 1991; Bartov, 1991; Ofer and Thakeor, 1987; Comment and Jarrell, 1991; Stephens and Weisbach, 1998; Ikenberry, Lakonishok and Vermaelen, 2000), capital structure changes (Opler and Titman, 1996), redistribution of excess cash flow (Denis, Denis and Sarin, 1994) and takeover attempt deterrence (Bagwell, 1991; Hodrick, 1996). Dittmar (2000) provides evidence that share repurchases are motivated by different reasons across time in the US. For instance, repurchases were mostly conducted by the motivation to counter the dilution effects of stock options in the late 1980s and early 1990s when the use of management stock options increased greatly. Also, more firms repurchased stocks to fend off takeover attempts during the mid-1980s, a period having an active takeover market (Dittmar, 2000). Since different motives may result in different intra-industry effects, one possible reason for the mixed empirical evidence is that repurchase announcements examined in prior literature were distributed over a long time period that may mix various motives.

Compared to the US markets, share repurchases in Taiwan are unique in several aspects. Firstly, the regulations only authorize share buybacks for very limited purposes, which are directly or indirectly related to market undervaluation.³ On the other hand, share repurchases in the US are generally not confined to any specific purpose. Therefore, the information content of share buybacks in Taiwan is less ambiguous. Secondly, share repurchases in Taiwan operate under close monitoring by the Ministry of Finance. The implementation of a share repurchase is subject to the disclosure of detailed transaction information on a timely basis. Besides, share repurchases are required to be completed within 60 days after gaining approval; otherwise the buyback plan has to be cancelled. In contrast, share buybacks in the US are generally not subject to these regulatory obligations. Stephens and Wesback (1998) document that in three-year period following repurchasing announcements, only 57% of the US repurchasing firms bought back the number of shares targeted in the original repurchase announcements.

³Detailed information is provided in Sec. 2.

As is clear, repurchase announcements by Taiwanese firms carry a stronger commitment for actual implementation than those in the US. Finally, the transaction has to fulfill the purposes stated in the repurchase plan, or be cancelled to avoid the firm taking advantage of transient stock mispricing. In contrast, repurchasing transactions are not closely regulated in the US.

The share repurchase regulations in Taiwan reveal the government's intention to encourage share buybacks only when firms experience significant market undervaluation. Furthermore, the authorization of share buyback plans by the government may carry a convincing signal of future prospects that were not previously recognized in the share price (Akhigbe and Madura, 1999). All these factors result in a natural setting to test the intra-industry effects of share repurchases due to the exclusive reason of market mispricing. In the robustness tests, we examine other potential motives for share buybacks, and find no evidence that the sample in this study could be motivated by reasons other than market undervaluation.

Our study investigates the intra-industry effect of share repurchases in Taiwan during the period of August 2000 to October 2001. Consistent with the undervaluation hypothesis, the results show that both the repurchasing firms and their rivals experience significant undervaluation before share buyback announcements. For the repurchasing firms, we find the announcement of share repurchase, on average, is associated with positive abnormal returns. This suggests that share repurchases generally create value to Taiwanese firms. In addition, the results also indicate that the rival firms benefit from the repurchase programs, since they experience significant wealth gains upon the announcements. The findings suggest that the contagion effect of share repurchases dominates the competitive effect. Share repurchase announcements send favorable information about not only the repurchasing firms, but also the corresponding industry as a whole. Our findings are consistent with Akhigbe and Martin (2000), but they contrast with Hertzl (1991) and Erwin and Miller (1998). We attribute the difference to the unique deregulation effect and regulatory constraints on share repurchases in Taiwan, which result in a less ambiguous signal being conveyed from stock repurchase announcements.

We also find that rival firms experience a stronger contagion effect when they have more similar patterns of cash flow with the repurchasing firms. In addition, rival firms receive greater market responses when repurchase announcements are more favorably accepted by the investors. Finally, the evidence suggests that the intra-industry effect is positively correlated with

the size of share repurchase, and negatively associated with rival's firm sizes. The results, however, find no evidence that industry concentration, cash flow and leverage are important in explaining the market reactions to rivals' share prices.

This paper proceeds as follows. In Sec. 2, we discuss the literature on the intra-industry effects of share repurchases. Section 3 introduces the repurchase regulations in Taiwan. Section 4 describes samples and methodology. Section 5 presents the empirical evidence. Section 6 concludes this paper.

2. Literature Background

Studies exploring intra-industry information transfer suggest that investors use the information conveyed by one firm to make inferences about other competing firms in the same industry. Previous research has documented significant intra-industry effects for various corporate events, such as bankruptcy (Lang and Stulz, 1992), dividend change (Firth, 1996), bond-rating adjustment (Akhigbe, Madura and Whyte, 1997), voluntary corporate liquidation (Akhigbe and Madura, 1996) and going-private transaction (Slovin, Sushka and Bendeck, 1991).

Two competing hypotheses are offered in the literature of intra-industry effects. Under the contagion effect hypothesis,⁴ share repurchase announcements may send signals of future industry-wide investment opportunities that could influence the value assessment of other firms in the same industry. Since rivals compete with similar products, and rely on similar inputs, information conveyed by repurchasing firms may lead to revisions of the rivals' earnings prospects by signaling a change in industry-wide economic conditions. The contagion hypothesis thus predicts a positive correlation of announcement returns between repurchasing firms and their corresponding rivals. Akhigbe and Madura (1999) document a significant contagion effect with share repurchases in the banking industry.

On the other hand, share repurchases may convey information that reflects changes in the competitive structure within the industry. For example, the revealed information may signal the enhancement of the repurchasing firm's market power that could impose a serious threat to the competing firms. This shift in the competitive balance could then place downward pressure on rival firms' share prices. Therefore, the competitive effect hypothesis predicts a negative relationship in announcement returns

⁴This is similar to the information-signaling hypothesis in Akhigbe and Martin (2000).

between repurchasing firms and their competitors. Erwin and Miller (1998) find that open market share repurchase announcements are associated with strong competitive effects.

Finally, the information revealed may simply be firm-specific, that has little impact on other firms. For example, if a share repurchase is motivated by tax effects, or wealth transfers between stakeholders, the conveyed information is expected to have impact on investors' value assessment for the announcing firms only, no effect is expected on the rivals. Hertzfel (1991) documents a firm-specific effect for tender offer share repurchases.

In sum, prior studies on the intra-industry effects of share repurchases focused only on US firms, and the evidence is inconclusive. Little work has been done on the international evidence from other countries. Since great regulatory differences exist in share repurchases between the US and other countries, research on other countries may give further insights into the understanding of how share repurchases affect the associated industry/market.

3. Share Repurchase Regulations in Taiwan

In this section, we present the important repurchase regulations in Taiwan, and make a comparison with those in the US.

3.1. *Share repurchase purposes*

A Taiwanese public firm is allowed to conduct share repurchases for only three purposes: “for transferring shares to its employees”, “for equity conversion in coordination with the insurance of convertible securities”, and “for maintaining a company’s credit and shareholder’s equity”.⁵ While the meanings of first two purposes are precise, the last one is not as clearly defined. The idea of “maintaining a company’s credit and shareholder’s wealth” is typically applied to situations when the equity shares are experiencing significant undervaluation due to some “non-economic factors”. One good example of the “non-economic factors” referred to here occurred in 1996, when China conducted short-range missile test firings at the north and south parts of Taiwan in an attempt to influence the presidential election on the island (March 5, 1996, CNN News; December 12, 2000, *Washington Times*), the stock index lost as much as 38% in the following week. Share repurchases

⁵A company may implement share repurchases for multiple reasons. However, they should be executed in different periods.

were at that time considered an effective mechanism to stabilize the stock market.

To buy back shares for the purpose of maintaining a firm's value, firms have to present to the authority a report which justifies unreasonable underpricing taking into account the global economy, market situation, corporate business prospects and the firm's asset assessment. Furthermore, the report is to be submitted to the authority together with an assessment justifying a reasonable buyback price by an accountant or underwriter. In order to avoid large shareholders manipulating the stock price via repeatedly buying back and selling out a company's shares, the shares purchased per purpose 3 have to be cancelled. On the other hand, shares repurchased for the other two purposes shall be transferred within three years from the date of the buyback, or be deemed as not issued by the company, and an amendment registration shall be processed.

As a matter of fact, all three purposes address the issue of market undervaluation. Considering the purposes of employee stock transfer and equity conversion of convertible securities, acquiring shares from the market is not the only choice. Firms can alternatively choose to issue new shares. Myers and Majluf (1984) suggest that a firm will issue stocks only when they are overvalued. Since new share issues will be less attractive when the equity is not fairly valued in the market, the decision to conduct a share repurchase for the purposes of stock transfers and convertible securities conveys a strong signal of undervaluation to investors. Purpose 3 is directly aimed at irrational market underpricing. Therefore, these three legally allowed purposes reveal the government's intention to permit share repurchases mainly to counter undervaluation.

In a sharp contrast to Taiwan, share repurchases in the US are generally not confined to any specific purpose. Besides undervaluation, the motives can range from managerial compensation, take-over attempt deterrence, and capital structure change (Dittmar, 2000). In most cases, the purposes of share repurchases in the US are not even explicitly revealed in the announcements (Evans and Gentry, 2000; Raad and Wu, 1995). Consequently, the limited purposes of share buybacks in Taiwan could allow for less ambiguous information contents conveyed to investors.

3.2. Approval and authorization of share repurchase programs

In addition to the buyback purpose declaration, the other unique regulation of share buybacks in Taiwan *ex ante* concerns the authority/approval of

share repurchases. For firms in Taiwan that intend to repurchase their own shares, first, they have to get approval from their board of directors. Within two days of the approval, they have to report details to the regulators of the repurchasing programs. In addition to the buyback purpose, Taiwan's regulators require firms to declare information, in accordance with buyback regulations, such as repurchasing volume (not more than 10% of outstanding shares), range of repurchasing prices, and the scheduled completion date (being conducted within 60 days of gaining approval). Only in accordance with the disclosure requirements made by the regulators will firms get the authority to buy back their own stocks.

In contrast, in the US after approval from the board of directors, regulators require only notification to the stock exchange and the filling of specific forms. No additional requirements are added, i.e., firms may buy back shares directly without further authority from the regulators.

3.3. Report on the execution of share repurchases

In addition to the *ex ante* differences of share repurchase requirements mentioned above, *ex post* regulations in Taiwan are also different from those in the US. In Taiwan, repurchasing firms are required to file a formal execution report within two months following the expiration date. In this report, firms need to present detailed information on the execution progress of share repurchase programs. In cases when the share buyback deviates from the approved plan, firms are required to report the reasons to the Board. Thus, greater completion rates can be expected due to these strict monitoring mechanisms.

In contrast, share buybacks in the US are not subject to these obligations. It is commonly found among US firms that announcements of share

⁶Research on share repurchases outside the US is limited because of the relatively short history of repurchase regulations in these countries. Many countries have only allowed firms to repurchase stock in the last decade, such as Japan in 1995, Finland in 1995, Germany in 1998, and Taiwan in 2000 (Sabri, 2002). Generally, share repurchase regulations in these countries are more stringent than those in the US. For example, in Australia, firms are required to state buyback reasons in advance of the repurchase program announcement (Otchere and Ross, 2002). In Canada, repurchasing firms are required to report their trading activities on a monthly basis. In addition, they must receive approval from the exchange before initiating a repurchase program (Ikenberry *et al.*, 2000). Japanese firms are required to report the actual number and value of transactions for one year after the initial announcement (Hatakeda and Isagawa, 2001). In contrast, none of the regulations stated above are found in the US. See Kim, Schremper and Varaiya (2004) for regulations on open market share repurchases in other markets.

repurchases are merely an attempt to raise the firm's stock price at little cost (Kracher and Johnson, 1997; March 7, 1995, *Wall Street Journal*, September 4, 1995, *Fortune*). In addition, due to the US reporting convention, it is very difficult to obtain precise information on repurchase activities and completion rates (Stephens and Weisbach, 1998). Due to these regulation differences, we believe an announcement of a share repurchase by Taiwanese firms functions as a costly signal, sending a stronger commitment to the correction of stock mispricing.⁶

4. Sample and Methodology

We collect a sample of Taiwanese listed firms that announced open market share repurchases from August 2000 to October 2001. The announcements were collected from the *Share Repurchase Databases on Market Observation Post System* website⁷ compiled by the Taiwan Stock Exchange Corporation. We then review the articles in the publications that refer to those announcements. When an announcement is found in a different publication, the announcement that has the earliest date is chosen because this is the earliest date when the information of the repurchase is publicly available. Our definition of the announcement date (day 0) is the date of the publication in which the company's initial announcement appears.

To be included in the final sample, the repurchasing firms should be listed on the Taiwan Stock Exchange, and their financial data should be available from the *Taiwan Economic Journal* (TEJ) Data Bank. The rival firms are defined as firms with the same two-digit Standard Industrial Classification code as the repurchasing firms as reported in *D&B Taiwan's Leading Corporations*. We exclude industries with less than two rivals. To avoid the confounding effects of intra-industry information transfer, rival firms that announce share repurchases in the event windows are removed from the sample. Following Hertzell (1991) and Erwin and Miller (1998), financial institutions are excluded from the sample because of close regulations and strict monitoring by government in this industry.

We employ standard event-study methods to examine stock price responses to announcements of share repurchases. Event-study methodology measures the effect of unexpected events on the expected stock returns of the associated firms. This approach is based on the efficient market hypothesis (Fama, 1970) which argues that in an informationally efficient market,

⁷<http://mops.tse.com.tw/>

any new information will be incorporated into security prices. Thus, changes in the price of a security would reflect the market's unbiased estimate of the economic value associated with that event (Brown and Warner, 1985). The event-study methodology is well accepted and has been widely used in a variety of disciplines, such as finance, accounting, business strategy, marketing and organizational behavior.

To measure the abnormal stock return to announcements of share repurchases, we use the market model to obtain estimates of expected returns (Brown and Warner, 1985; Hertz, 1991; Erwin and Miller, 1998). The market model depicts the return on a security as varying with market portfolio return, which is adjusted for the security's risk factor, that is,

$$E(R_{it}|I_{t-1}, R_{mt}) = \alpha_i + \beta_i R_{mt},$$

where $E(R_{it}|I_{t-1}, R_{mt})$ is the expected return on the i th firm at time t , given the available information (I_{t-1}) and the return on the market portfolio (R_{mt}), β_i measures the risk or sensitivity of the firms' returns relative to the market portfolio, and α_i is the intercept. The abnormal return is calculated as the residual from the actual return and an expected return generated by the market model, with parameters, α_i and β_i , estimated over a period from 250 to 51 days before the initial announcements (Erwin and Miller, 1998). The value-weighted All-Share Index of Taiwan Stock Exchange is used to compute market returns. The cumulative abnormal return, CAR (a , b), is calculated as the sum of the abnormal returns over the window period between dates a and b . Data on share returns are obtained from *Taiwan Economic Journal*. To correctly measure the wealth effect, we ignore repurchase announcements that occurred in the event window $(-5, 5)$ of announcements made by rival firms. The final sample consisted of 218 announcements.

Table 1 presents the sample distribution by repurchase purposes and industry profile. As shown in panel A, most share repurchases are conducted for transferring shares to employees (125), followed by maintaining the company's credit and the shareholders' equity (92). Panel B shows that the repurchasing firms are distributed over a wide range of industries: 24 two-digit SIC codes are represented in the sample. The most commonly represented industry is "Electronic & Other Electrical Equipment & Components, Except Computer Equipment", which covers almost 18% of the total sample.

Table 2 reports the sample statistics on several explanatory variables used in this study. Data are obtained from *Share Repurchase Databases* on *Stock Observation Station* website and *Taiwan Economic Journal*. The

Herfindahl index has been widely used as a measure of industry concentration (Lang and Stulz, 1992; Firth, 1996; Erwin and Miller, 1998). We use a sale-based Herfindahl Index as a measure of industry concentration,⁸ estimated as the squared sum of the fractions of industry sales. A return correlation is to measure the similarity of business operations between the repurchasing firm and rival portfolio. The rival portfolio is an equally weighted portfolio of competing firms' shares. Following Erwin and Miller (1998), we estimate the returns correlation as the correlation coefficient between the daily stock returns of the repurchasing firm and the rival portfolio in the one year preceding the announcement. Cash flow represents the median of the industry rivals' operating cash flow to total assets in the industry portfolio. Leverage is measured by the median value of the ratio of long-term debt to total assets one year preceding the announcements in the industry portfolio.

Table 1. Sample distribution of repurchase announcements by industry and purposes.

This table summarizes the distribution, by industry and buyback purposes, of 218 open market share repurchase announcements made by 132 Taiwanese firms during August 2000 to October 2001. The announcements are collected from the Share repurchase databases on Stock Observation Station website, compiled by Taiwan Stock Exchange Corporation. Three types of buyback purposes are stated in Security and Exchange Law, Chapter II, Article-2: "In any of the following situations, a company whose stocks are listed on a stock exchange may, upon the approval of a majority of the directors present at a directors meeting attended by two-thirds or more of directors, buy back its shares from the centralized securities exchange market in accordance with Paragraph 2 of Article 43-1, without being subject to the provision of Paragraph 1 of Article 167 of the Company Law". The two-digit Standard Industrial Classification codes are from D&B Taiwan's Leading Corporation.

Purposes for Share Repurchase		Number	%
<i>Panel A: Sample distribution by three types of buyback purposes</i>			
I	For transferring shares to its employees	125	57
II	For equity conversion in coordination with the insurance of corporate bonds with subscription right, especial shares with subscription right, convertible corporate bonds, convertible special shares or stock/subscription warrants	1	0.8
III	For maintaining the company's credit and the shareholder's equity	92	43
Total		218	100

⁸The results are very similar when we use an assets-based Herfindahl index.

Table 1. (Continued)

SIC	Industry	Announcing Firms	Announcements	%
<i>Panel B: Sample distribution by industry</i>				
15	Building Construction	8	11	5.05
16	Heavy Construction Other than Building Construction Contractors	2	5	2.29
17	Construction-Special Trade Contractors	2	3	1.38
20	Food & Kindred Products	1	1	0.46
22	Textiles Mill Products	16	24	11.01
26	Paper & Allied Products	3	7	3.21
28	Chemicals & Allied Products	9	16	7.34
29	Petroleum Refining and Related Industries	1	2	0.92
32	Stone, Clay, Glass, Concrete Products	4	7	3.21
33	Primary Metal Industries	11	27	12.39
34	Fabricated Metal Products, Except Machinery & Transportation Equipment	1	2	0.92
35	Industrial & Commercial Machinery & Computer Equipment	18	27	12.39
36	Electronic & Other Electrical Equipment & Components, Except Computer Equipment	27	38	17.43
37	Transportation Equipment Measuring, Analyzing & Controlling	3	5	2.29
38	Instruments; Photographic, Metal & Optical Goods; Watches & Clocks	3	4	1.83
42	Motor Freight Transportation & Warehousing	2	3	1.38
44	Water Transportation	3	6	2.75
47	Transportation	1	1	0.46
50	Wholesaling Trade-Durable Goods	8	12	5.50
53	General Merchandise Stores	2	2	0.92
61	Nondepository Credit Institutions	1	2	0.92
70	Hotels, Rooming, Houses, Camps & Other Lodging Places	1	5	2.29
73	Business Services	1	1	0.46
87	Engineering, Accounting, Research, Management & Related Services	4	7	3.21
	Total	132	218	100

5. Empirical Results

5.1. *Wealth effect of overall sample*

To test for the intra-industry wealth effects, we compute the daily abnormal returns of each rival firm using the same methodology for repurchasing firms. We then construct an equally weighted rival portfolio for each announcement (Erwin and Miller, 1998). The results of the event study for the entire sample are reported in Table 3.

Table 2. Sample characteristics.

The sample consists of 218 open market share repurchase announcements made by 132 Taiwanese firms during August 2000 to October 2001. Data are obtained from the *Share Repurchase Databases on Stock Observation Station* website, compiled by Taiwan Stock Exchange Corporation. Herfindahl Index is estimated as the ratio of the squared sum of the fractions of industry sales. Returns correlation is the correlation coefficient between the daily stock return of repurchasing firms and the rival portfolio one year preceding the announcement. Cash flow represents the median of the industry rivals' operating cash flow to total assets one year preceding the announcement in the industry portfolio. Leverage is the median of the ratio of the book value of long-term debt to the book value of total assets one year preceding the announcement in the industry portfolio. Firm size is the median value of rival firm's market value for the year preceding the announcement in the industry portfolio.

Variables	N	Mean	Median	Max	Min	Standard Deviation
Herfindahl Index	218	0.1424	0.0880	0.70	0.03	0.1241
Returns Correlation	218	0.6356	0.6585	1	0.23	0.1281
Cash Flow	218	-1.03	-1.18	0.54	-2.06	0.47
Leverage	218	0.0586	0.0570	0.22	0	0.0370
Firm Size (NT, Million)		69783	28964	498934	10354	112980

The results in panel A indicate that repurchasing firms experience significant negative abnormal returns before the repurchase announcements. This result is consistent with the undervaluation hypothesis that firms repurchase shares when their equity values are underestimated in the markets (Vermaelen, 1981; Comment and Jarrell, 1991; Dittmar, 2000). Upon the announcement date, repurchasing firms receive strong positive mean (median) abnormal returns of 1.06% (0.86%), significant at the 1% level using two-tailed tests. The results of Wilcoxon sign rank test and the fact that around 61% of sample firms receive a positive market reaction both suggest that the conclusion is not driven by outlying observations. Furthermore, we find that the positive announcement effect of share repurchases is not limited on the announcement date. It actually continues for three days after the announcements. Panel B shows that the average (median) cumulative announcement abnormal return from day -1 to day 1 is 2.83% (2.54%), significant at the 1% level using a two-tailed test. The significant wealth increase holds throughout the event windows (+2, +5). Therefore, our findings are consistent with previous research that repurchasing firms gain significant wealth from share buyback announcements (Ofer and Thakeor, 1987; Comment and Jarrell, 1991; Stephens and Weisbach, 1998).

Table 3. Abnormal returns associated with share repurchase announcements.

The sample consists of 218 open market share repurchase announcements made by 132 Taiwanese firms during August 2000 to October 2001. Abnormal returns are estimated using the standard market model procedure with parameters estimated for the period 250 days to 51 days before the announcement. Day 0 in event time is the date of the publication in which the company's initial announcement appears. The abnormal returns of various event windows are the cumulative abnormal returns over the event window periods. The significance level of mean and median is based on t-statistic of student's t-test, and z-statistic of Wilcoxon test, respectively. “**”, “***” and “****” represents a 10%, 5% and 1% significance level, respectively, using a two-tailed test.

Day Relative to Announcement	Repurchasing Firms				Rival Firm Portfolios				
	Mean (%)	Median (%)	Proportion of Negative Abnormal Returns (%)	Mean (%)	Median (%)	Proportion of Negative Abnormal Returns (%)	Mean (%)	Median (%)	Proportion of Negative Abnormal Returns (%)
-5	-0.88***	-0.82***	62.8	-0.27***	-0.25***	56.9	-0.27***	-0.25***	56.9
-4	-0.71***	-0.67***	62.4	-0.32***	-0.28***	60.6	-0.32***	-0.28***	60.6
-3	-0.36*	-0.54***	59.2	-0.33***	-0.33***	58.7	-0.33***	-0.33***	58.7
-2	-0.34*	-0.68*	56.5	-0.17*	-0.22**	56.9	-0.17*	-0.22**	56.9
-1	0.13	-0.25	53.7	-0.06	-0.17	56.4	-0.06	-0.17	56.4
0	1.06***	0.86***	39.0	0.28***	0.13**	45.9	0.28***	0.13**	45.9
+1	1.64***	1.25***	33.9	0.40***	0.17***	44.0	0.40***	0.17***	44.0
+2	0.93***	0.36***	46.3	0.04	0.04	48.6	0.04	0.04	48.6
+3	0.74***	0.39***	43.1	-0.11	-0.18*	56.9	-0.11	-0.18*	56.9
+4	0.38**	0.02	50	-0.07	-0.03	50.9	-0.07	-0.03	50.9
+5	0.16	-0.09	51.4	-0.06	-0.02	51.1	-0.06	-0.02	51.1

Panel A: Announcement-period abnormal return for repurchasing firms and corresponding rival firm portfolios

Table 3. (Continued)

Day Relative to Announcement	Repurchasing Firms			Rival Firm Portfolios		
	Average Abnormal Return (%)	Median	Proportion of Negative Abnormal Returns (%)	Average Abnormal Return (%)	Median	Proportion of Negative Abnormal Returns (%)
(-5,-2)	-2.30***	-1.77***	63.9	-1.13***	-1.08***	66.2
(-1,0)	1.19***	0.42***	46.8	0.22	-0.06	50.9
(-1,+1)	2.83***	2.54***	31.2	0.63***	0.11*	47.7
(-1,+5)	5.11***	4.47***	32.9	0.46	-0.02	50.2
(+2,+5)	2.23***	1.42***	39.8	-0.19	-0.30	56.7

Panel B: Cumulative abnormal returns for repurchasing firms and corresponding rival firm portfolios

As for the rival portfolio, the results in Table 3 indicate that competing firms also experience significant undervaluation before the repurchase announcements. Similar to the findings documented for the repurchasing firm, significant wealth loss also exists for rival firms in the event windows $(-5, -2)$. This suggests that the industries associated with the share repurchasing firms are strongly undervalued before the repurchase announcements. The evidence of rival firms provides further support for the undervaluation hypothesis.

The results indicate that the rival portfolios experience significant positive mean abnormal returns on both the announcement day and one day after. The Wilcoxon sign-rank tests also indicate similar evidence. The mean abnormal returns on days 2 to 5 are relatively small and insignificantly different from zero at the conventional level. The results suggest that the announcement effect of share repurchases is quickly reflected on share prices on the event days (days 0 and 1) only. And there is no other systematic confounding effect in the observation windows. Panel B shows the results for various event windows and the conclusions are similar.⁹ These findings imply that the contagion effect of repurchase announcements dominates the competitive effect. Repurchase announcements reveal industry-wide favorable market information to investors such that both the repurchasing firms and their associated rivals experience positive revaluation effects.¹⁰

The results of our study are similar to Akhigbe and Madura (1999), but different from Hertzal (1991) and Erwin and Miller (1998). We argue that the dominance of the contagion effect is because share repurchases in Taiwan convey a much clearer signal of undervaluation that better convince investors. Akhigbe and Madura (1999) report similar findings for share repurchases in the banking industry.

⁹Although the *CAR* (2, 5) is negative, it is not significantly different from zero.

¹⁰Another potential explanation for the finding is that repurchases may decrease the overall supply of shares in the market place and thus push up share prices. Indeed, price pressure from a sudden decrease of supply can result in important upward movement of share prices. However, in our opinion, this effect is unlikely to cause the systematic strong reaction in the market found in this study. The reason is because the average amount of repurchase in our sample firms is only 1.2% of total shares outstanding, with the largest repurchase is 3%. With this small magnitude of repurchase from a single firm, we think the effect on the whole industry/market place cannot be large enough to cause a strong market reaction. We thank an anonymous reviewer for this potential explanation.

5.2. Cross-sectional analysis of intra-industry abnormal returns

5.2.1. Analysis of subsamples based on buyback purposes

To investigate if the intended purposes of repurchases matter, we compare the announcement effects based on repurchase purposes. Since there is only one share repurchase announcement made for the reason of equity conversion in coordination with the insurance of convertible securities, we are not able to conduct statistical analysis against other subgroups. Consequently, we only make comparison of repurchases aimed to transfer shares to employees with those for maintaining company’s credit and shareholders’ equity. The results are presented in Table 4.

The results show that share repurchases of both purposes result in significant and positive stock market reactions. The difference, however, is statistically insignificant. Hsu (2001) argues that firms have stronger incentive to buy back shares and transfer to employees when the share value is underestimated in the market. Consequently, both purposes of share repurchases may convey a similar signal of undervaluation.

5.2.2. Cross-sectional regression analysis

Although our analysis shows that share repurchases have a significant positive effect on both repurchasing and rival firms, the effect may vary across industries. That is, the contagion effect may dominate the competitive effect

Table 4. Comparison of mean and median announcement-period abnormal returns based on buyback purposes.

Three-day (-1,1) announcement period abnormal return are estimated using the standard market model procedure with parameters estimated for period 250 days to 51days before the announcement. For each cell, we report the mean abnormal return, the median abnormal return and in parentheses, the t-statistic, the p-value for the Wilcoxon Z-statistic. For the comparison of means, we report mean and median difference, the t-statistic in parentheses assuming equal variances and the p-value for the nonparametric Kruskal-Wallis statistic. The results are similar with the assumption of unequal variances. “***”, “**” and “*” represent 1%, 5% and 10% significant levels using a two-tailed test.

For Transferring Shares to Employees	For Maintaining the Company’s Credit and the Shareholder’s Equity	Difference
Mean abnormal return = 0.75%	Mean abnormal return = 0.61%	Mean = 0.14%
Median abnormal return = 0.42%	Median abnormal return = 0.22%	Median = 0.20%
(3.62***, 0.00, 127)	(2.49**, 0.01, 90)	(0.96, 0.71)

in some industries; while in other industries the competitive effect may be more important. Furthermore, on the announcement day for the rival portfolio, there is still 46% of the industry portfolios receiving negative abnormal returns. The dispersion of rival returns implies that the intra-industry effect of share repurchases is cross-sectionally heterogeneous.

To investigate the determinants of intra-industry effects of share repurchases, we use multivariate regression analysis to explore this issue. In the regression analysis, the three-day announcement period cumulative abnormal return is used as the dependent variable.

Contagion effect

If the announcement of share repurchases reveals an unexpected increase of future cash flow due to a favorable industry-wide prospect, the positive announcement effect may be contagious within the industry. The contagion effect is expected to be stronger when the rival firms exhibit a similar pattern of cash flow to that of repurchasing firms (Erwin and Miller, 1998; Akhigbe and Martin, 2000). To test the contagion effect, we measure the similarity of cash flow by calculating the correlation coefficient of the daily market returns between the repurchasing firms and the corresponding rival portfolio one year preceding the repurchase announcements (Erwin and Miller, 1998).

Competitive effect

In addition to contagion effect, share repurchase announcements may reflect unexpected information on repurchasing firms' future cash flow resulting from shifts in the competitive balance. If the released information reflects a change in the repurchasing firms' competitive position at the expense of rivals, the buyback announcements may have a negative effect on the rival firms. Moreover, the less competitive (more concentrated) the industry is, the more seriously the rival firms will be affected. Therefore, the competitive effect is expected to be stronger in industries with a lower degree of competition (Lang and Stulz, 1992; Howe and Shen, 1998; Erwin and Miller, 1998; Akigbe and Martin, 2000).

To test the competitive effect, we measure degree of competition by Herfindahl index calculated as the sum of the squared market shares of sale of the rival firms (Lang and Stulz, 1992; Erwin and Miller, 1998). Since higher values of the Herfindahl index suggest a lower degree of competition, we expect the competitive effect to be stronger in industries with higher Herfindahl index scores.

Impact of repurchase announcements

Hertzel (1991) and Erwin and Miller (1998) suggest that the impact of intra-industry effect on competing firms may depend on the magnitude of the signals revealed to investors. To control for the announcement effect, we use the announcement-period abnormal returns of repurchasing firms as the measure of the repurchase announcement impact (Akhigbe and Martin, 2000).

Leverage ratio

Lang and Stulz (1992) argue that high-levered firms are less able to exploit the change in market conditions because of the financial constraints (Bolton and Schartsein, 1990). To the extent that a share repurchase conveys signals of industry-wide prospects, low-levered rivals are expected to receive more impact since they have less financial constraints. We measure leverage by the median value of the ratio of long-term debt to total assets one year preceding the announcement in the industry portfolio.

Level of cash flow

The signaling hypothesis states that a share repurchase conveys information about current undervaluation, and thus leads to upward revisions in financial analysts' forecasts. However, not every firm is able to convey information by share buybacks, since it takes capital resources out from the repurchasing firms. Stephens and Weisbach (1998) argue that firms with a higher level of cash flow are more likely to undertake share repurchases. Therefore, we hypothesize that to the extent that a share repurchase signals industry-wide undervaluation, rivals with greater cash flow are more likely to conduct share repurchases.

Firm size

If share repurchases convey favorable information about firms' future prospects that had been previously ignored by investors, the unanticipated surprise is expected to be greater for smaller rival firms. Since large firms tend to be more widely followed by financial analysts and receive greater coverage and attention, share buybacks may have less information content for large rivals than that for small ones, as information production and dissemination is a positive function of firm size (Atiase, 1985; Hertzel and Smith, 1993; Kang and Stulz, 1996). Therefore, firm size is expected to be inversely related to the market reaction to buyback announcements in the

corresponding industry. To control for this effect, we measure rivals' firm size by the median logarithm value of firm size in the rival portfolio, where firm size is measured by market value of assets for the year preceding the announcement.

Size of share repurchase

If a share repurchase conveys signals to the market, the power of the signal may depend on the size of share repurchases. A larger amount of share repurchases may send more credible and stronger signals since the implementation is more costly (Myers and Majluf, 1984). We measure size of share repurchases by dividing number of repurchased shares to total number of shares outstanding.

Multivariate results

We construct multivariate regression models to test the determinants of intra-industry effect of a share repurchase. Since abnormal returns for the rival portfolio are significant on the day after the announcement,¹¹ we use the three-day rival portfolio cumulative abnormal returns ($CAR(-1, +1)$) as the dependent variable. The regression results are presented in Table 5. The t -values reported are computed with heteroskedasticity-consistent standard errors (White, 1980).

Model 1 tests the contagion effect. The results show that returns correlation between repurchasing and rival firms is positively associated with the rivals' announcement-period abnormal returns. This suggests that the contagion effect is stronger for rival firms that have more similar pattern of cash flow with repurchasing firms. The result is consistent with the US evidence as in Erwin and Miller (1998).

Model 2 shows that rival's abnormal returns are positively correlated with the repurchasing firm's share returns, which shows that the magnitude of signals conveyed in share repurchases has an important impact on the market reactions received by competing rivals. Hertzal (1991) and Erwin and Miller (1998) also find similar evidence.

Model 3 tests the competitive effect. No significant association is found between Herfindahl index and rivals' announcement-period abnormal

¹¹Including the day after announcement eliminates some of the microstructure effects that could arise because of order flow imbalances on the day of the announcement and because of the existence of price limits (Kang and Stulz, 1996) in Taiwan.

Table 5. Cross-sectional regression of rival portfolio abnormal returns on industry characteristics.

Three-day (-1, 1) announcement-period abnormal returns are estimated using the standard market model procedure with the parameters estimated for the period 250 days to 51 days before the announcement. The returns correlation is the correlation between the industry rival portfolio and the repurchasing firm's stock return for the year preceding the announcements. Announcement CAR is the three-day cumulative abnormal returns of repurchasing firm to the announcement of share repurchases. Herfindahl index is calculated as the sum of the squares of each firm's sale as a proportion of total sales in the industry with the same two-digit SIC code. Cash flow is the median of the ratio of the industry rivals' cash flow from operating-activities to total assets one year preceding the announcement. Leverage is estimated as the median of the ratio of the industry rivals' book value of long-term debt to the book value of total assets one year preceding the announcement. Firm size is the median value of rival firm's market value for the year preceding the announcement in the industry portfolio. Repurchase Size is the number of repurchased shares to total shares outstanding. Purpose Dummy 1 proxies for Purpose I as "For transferring shares to its employees" and Purpose Dummy 2 proxies for Purpose III as "For maintaining the company's credit and the shareholder's equity". Values in the parenthesis are White t-statistics computed with heteroskedasticity-consistent standard errors (White, 1980). "***", "**", and "*" represent 1%, 5%, and 10% significance levels, respectively.

Variable	Model			
	1	2	3	4
Constant	-0.75 (-0.80)	0.33 (2.11)*	0.54 (2.29)**	-1.32 (-1.23)
Stock Correlation	2.25 (1.65)*			2.92 (2.52)**
Announcement CAR		0.12 (3.65)***		0.13 (3.88)***
Herfindahl Index			0.99 (0.79)	1.21 (1.52)
Cash Flow				0.74 (1.68)
Leverage				0.99 (0.25)
Firm Size				-0.09 (2.13)**
Repurchase Size				0.12 (1.90)*
Purpose Dummy 1				0.36 (1.30)
Purpose Dummy 2				0.29 (0.69)
Adjusted R-square	0.011	0.094	0.065	0.187
F value	3.38*	23.71***	0.61	5.26***
No. of Observations	218	218	218	218

returns. The insignificance of Herfindahl index suggests that the intra-industry competitive effect, if any, is very weak in our sample. This finding is different from Erwin and Miller (1998) that document significant competitive effects for American share repurchases.

There are several possible reasons for the different results. First, when we compare our sample with that in Erwin and Miller (1998), we find that the median value of Herfindahl index in our sample (0.09) is much smaller than that in Erwin and Miller's study (0.23). This suggests that, in comparison with Erwin and Miller's study, the sample industries in our study are less concentrated. Since the competitive effect is expected to be stronger in a concentrated industry, it is not surprising to find a weak competitive effect in our sample. Secondly, as mentioned before, the deregulation and monitoring effects of share repurchases in Taiwan may magnify the contagion effect such that the signal of competitive balance change within the industry diminishes. We believe both factors contribute to the insignificance of competitive effect in our sample.

In Model 4, we include other potential variables that could also influence rival's announcement-period abnormal returns in the regression. The results show that returns correlation and announcement CAR both remain statistically significant with the predicted signs. It should be noted that the insignificance of the leverage ratio could be due to two opposing effects. While highly leveraged firms are less flexible in responding to changes in market condition (Bolton and Scharfstein, 1990), their shareholders may benefit from the greater elasticity of the equity value to cash flows (Lang and Stulz, 1992). Consequently, the effect of leverage is ambiguous. Cash flow has a positive coefficient but it is not significant. Because cash flow from operations may have been reinvested in long-term assets or may have been distributed as dividends, we redo the analysis by using cash balances (as a proportion of total assets) as a substitute measure of "excess cash". The result does not change the previous empirical finding. Cash balance is insignificantly associated with rival's announcement abnormal returns and the results of other variables remain the same with either of those two measures.¹²

Consistent with prior studies, we find small rivals experience greater intra-industry effect. The results also show that repurchase size is marginally significantly positively associated with rivals' abnormal returns. This is

¹²The empirical results are available upon request.

expected since a larger share repurchase conveys a stronger message of undervaluation, and rivals consequently experience greater contagion effects.

5.2.3. *Other possible incentives*

Even though policy makers as well as the press claimed that share repurchase deregulation in Taiwan was mainly motivated by undervaluation, firms may still buy back shares for other reasons. To test this possibility, we first test if share repurchases are likely to be motivated by excess cash flow by investigating the trend of cash flow before share repurchases. If excess cash flow is the underlying motive, then we are likely to see an increasing pattern of cash flow before the announcements. Following Healey, Palepu and Ruback (1992) and Jain and Kini (1994), we measure cash flow by operating cash flow to total assets. The results show that the operating cash flow to assets is 10.3%, 9.9% and 9.7% for three, two and one year before repurchase announcements, respectively, and 9.6% at the announcing year. When we test the yearly change (-3 to -2 , -2 to -1 and -1 to 0), no statistically significant result is found. Thus, the evidence provides no support for the motives of excess cash flow.

Secondly, we examine if capital structure change is likely to be the underlying motivation. If firms buy back equity primarily for adjusting capital structure, then the capital structure of repurchasing firms is likely to display a different pattern from other firms in the corresponding industry. We measure industry-adjusted leverage by subtracting debt ratio of announcing firms with the median ratio in the associated industry portfolio, where debt ratio is measured by long-term debt to total assets one year preceding the announcement. The results show the industry-adjusted leverage is $+0.5\%$, -0.1% , $+0.3\%$, for three, two and one year before the announcement, respectively, and -0.1% at the announcing year. The t-statistics indicate that both the adjusted leverages for the individual years as well as the yearly changes are not statistically significant. We find no evidence that capital structure of repurchasing firms is different from other firms in the same industry.

Thirdly, in order to check if the repurchases are motivated by takeover deterrence, we examine if any news of takeover appeared in the period of 6 months before repurchase announcements. The news of takeover is examined through the Excellent Business Database, which provides news-service abstracts from major Taiwanese journals and magazines. None of our sample firms were involved in takeover discussions in the 6 months before their buyback announcements.

Finally, we check if share repurchases were made with the intention of substituting for the cash dividend. We search the Excellent Business Database for corporate news about the association between a share repurchase and cash dividend for every one of the sample firms from one year before to one year after the announcements. We find no discussion from repurchasing firms regarding a change in dividend policy. There is no evidence suggesting share repurchases in our sample are related with dividend policy.

6. Conclusion

Prior studies documented mixed evidences on the intra-industry effect of share repurchases. Because the motives of share repurchases may vary across time (Dittmar, 2000), studies investigating share repurchases distributed over a long period of time are likely to include various motivations and thus produce inconclusive results. Our paper contributes to the literature by testing the intra-industry effects of share repurchases under a unique environment where stock buybacks are primarily motivated by market undervaluation. Moreover, this study provides international evidence of share repurchases. This is important since Rau and Vermaelen (2002) demonstrate that the findings of share repurchase studies in the US market may not be generalized to other countries since different business environments and legal systems could result in dissimilar behaviors. Therefore, our evidence augments the understanding of share repurchases in an international context.

We find that both the announcing and rival firms experience significant market undervaluation before the announcements of share repurchases. We also find that shareholders of both the repurchasing firms and their rivals receive significant wealth gains upon the repurchase announcements. This evidence indicates that the contagion effect dominates the competitive effect in our sample. Moreover, we find that industry characteristics have an important influence on the intra-industry effect. The contagion effect is found to be stronger for rival firms with small size, and similar pattern of cash flow to those of the repurchasing firms. The intra-industry competitive effect, however, is not found to be important in explaining the variation of rival portfolios. Finally, we find that the effect on the rival firms is more pronounced when the size of share repurchases and the magnitude of the announcement-period abnormal returns for repurchasing firms are larger.

The above findings hold even after controlling for other effects that could influence the valuation of the rival firms.

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