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Repurchasing Shares on a Second Trading Line*

DENNIS Y. CHUNG[1], DUŠAN ISAKOV[2] and CHRISTOPHE PÉRIGNON[1]

[1] *Simon Fraser University;* [2] *University of Fribourg*

Abstract. This paper studies a unique buyback method allowing firms to reacquire their own shares on a separate trading line where only the firm is allowed to buy shares. This share repurchase method is called the *Second Trading Line* and has been extensively used by Swiss companies since 1997. This type of repurchase is unique for two reasons. First, unlike open market programs, the repurchasing company does not trade anonymously. Second, all transactions made by the repurchasing firm are publicly available in real time to every market participant. This is a case of instantaneous disclosure which contrasts sharply with other markets characterized by delayed or no disclosure. We document that the daily repurchase decision is statistically associated with short-term price changes and the release of firm-specific news. We also find that repurchases on the second trading line have a beneficial impact on the liquidity of repurchasing firms. Exchanges and regulators may consider the second trading line an attractive share reacquisition mechanism because of its transparency and positive liquidity effects.

JEL Classification: G14, G35

1. Introduction

The vast majority of stock buybacks are implemented through open market programs whereby listed companies directly buy their own shares in the stock

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market. This buyback method represents 90% of all repurchase programs in the U.S. (Stephens and Weisbach, 1998), and 87% of all repurchase programs in the rest of the world (Vermaelen, 2005). The main features of open market programs are that (1) the repurchasing firm trades anonymously in the stock market, and (2) the actual number of repurchased shares and the repurchase price are not always disclosed.[1] An implication of this opaque environment is that open market programs may lower the liquidity of repurchasing firms. Indeed, the presence of informed managers in the stock market increases the adverse selection component of the bid-ask spread (Barclay and Smith, 1988). This theoretical spread widening has been recently corroborated by Brockman and Chung (2001) in their empirical study of actual buyback data from the Hong Kong stock market. They find that spreads increase, on average, by more than 10% on repurchase days. A similar conclusion is reached by Ginglinger and Hamon (2007) using French data. Another implication of the lack of information on open market programs is the fact that little is known about the actual implementation of stock repurchase programs. In the US stock market, since most companies repurchase their shares through open market programs with no disclosure requirement, researchers are forced to use monthly or quarterly proxies for share repurchase activity (Stephens and Weisbach, 1998), or questionnaires returned by repurchasing companies (Cook et al., 2003, 2004).[2]

In this paper, we study an alternative repurchase method. This technique allows firms to reacquire shares on a separate market segment, called a *second trading line*, where the repurchasing company is the only entity authorized to acquire shares. This temporary trading platform is opened concurrently with the original trading line on the stock exchange. The second trading line technique has been used by Swiss companies since 1997, and is now the most popular share acquisition method in Switzerland. This type of repurchase is unique for two reasons. First, unlike open market programs, the repurchasing company does not trade anonymously. As a result, this institutional design allows us to study the effect of buybacks on the liquidity of the original trading line when shareholders know that they will not be trading directly with the company (Barclay and Smith, 1988). Second, these separate trading lines are a great resource for analyzing the actual implementation of share repurchases.

[1] Stephens and Weisbach (1998) show that most of the US companies do not complete their buybacks, 10% of the firms repurchase less than 5% of the number of shares targeted, and a substantial number of firms reacquire no share at all.

[2] Current research has investigated actual buyback implementation in countries with more stringent disclosure requirements such as Canada (Ikenberry et al., 2000), Hong Kong (Brockman and Chung, 2001, Zhang, 2005), Japan (Zhang, 2002), and France (Ginglinger and Hamon, 2007).

Indeed, all transactions made by the repurchasing firm on a second trading line are recorded by the Swiss stock exchange and are instantaneously disclosed to all market participants.

There are other important features of the second trading line. The price paid by the firm on the second trading line can differ from the concurrent price on the standard first trading line. The premium on the second trading line is limited by law to 5% and turns out to be rather small in practice. As a result, this type of repurchase fulfills the principle of equal treatment of all shareholders, i.e., those who participate in the buyback program and those who do not. Indeed, unlike Dutch auction offers or tender offers, there are no damaging dilution effects on non-selling shareholders caused by substantial premia paid to selling shareholders.[3] With second trading lines, no disclosure requirements are needed since market participants and financial regulatory authorities can follow the firm's repurchases in real time. Furthermore, the second trading line is a tax-driven innovation allowing repurchasing companies to collect the withholding tax that has to be transferred to the Swiss tax authorities in every buyback leading to the cancellation of the shares.

The second trading line method shares some common features with a trading mechanism commonly known as "sunshine trading". This mechanism aims to reduce the market impact of the large trades that are mechanically triggered by portfolio insurance strategies. Sunshine traders reveal to the market that their trades are not driven by private information by pre-announcing, on a daily basis, the exact time and size of all orders.[4] Admati and Pfleiderer (1991) show theoretically that preannouncement typically reduces the trading cost of the trader. While there is no rigorous empirical work on the impact of sunshine trading, MacKenzie (2004) reports that the implementation of sunshine trading by the firm Leland O'Brien Rubinstein Associates, Inc. has reduced the market impact of large trades. When posting a new buy order on the second trading line, the repurchasing firm also publicly reveals its trading intention, as well as the number of shares to be repurchased.

Despite their apparent similarity, the two systems have two major differences that are relevant for price formation. First, sunshine trading maintains a single

[3] In Dutch auction offers, shareholders submit to the firm the quantities and prices at which they are willing to sell their shares (Comment and Jarrell, 1991). The share price eventually paid is the minimum one allowing the repurchasing firms to reacquire the targeted number of shares. Tender offers are fixed-price offers (Vermaelen, 1984). When the number of tendered shares exceeds the targeted number of shares, the company can either expand its offer or buy shares proportionally.

[4] The sunshine trading mechanism was developed by the firm Kidder, Peabody & Co. in the eighties and was first undertaken by the portfolio insurance firm Leland O'Brien Rubinstein Associates, Inc.

trading platform. Conversely, on the second trading line, buy orders are posted by the company on a separate platform and, as a result, the order book of the regular trading line is not directly affected. The second difference is related to the information asymmetry that exists between the repurchasing firm and other market participants. While sunshine trading is designed to reveal to the market that some trades are not based on information (e.g., they result from the portfolio insurance rule), the second trading line involves an informed agent, namely the firm. Moreover, the company is allowed to pay a premium on top of the concurrent price on the first trading line. Therefore, trades and premia observed on the second trading line can be interpreted as signals by market participants, and thereby might affect the prices and liquidity observed on the first trading line. Because of these two major differences, sunshine trading and second trading line should not be viewed as interchangeable as each can have a different impact on prices and liquidity.

The first objective of this paper is to study the timing of stock repurchases. We investigate whether the daily repurchase decision is related to stock price changes and the release of firm-specific news. Although our first objective is similar to the one in Cook et al. (2004), the information environment we deal with, as well as our findings, are drastically different. They find little evidence that NYSE firms (and no evidence that NASDAQ firms) repurchase more shares on the open market after price drops. They also report that firms' repurchases are not related to future price changes. Finally, they show that firms refrain from repurchasing around public announcements. In this paper, we analyze the daily repurchase decision within a regression framework contrasting pre- and post-announcement periods. We provide evidence that the daily repurchase decision is associated with past and contemporaneous returns, as well as with future returns. While the negative relationship between repurchase activity and past and current returns is consistent with the price-support hypothesis, the link between repurchase activity and future returns strongly contrasts with the US evidence reported by Cook et al. (2004). We claim that this unusual result is caused by the very nature of the second trading line method. Indeed, as transactions on second trading lines are instantaneously disclosed, market participants can interpret a repurchase as a positive signal revealing company management's belief that the company is undervalued (Vermaelen, 1981). Notice that this is not the case in repurchases on the open market since market participants do not observe the firm repurchase activity. We also uncover evidence that repurchasing firms are more active after a public announcement and less active prior to a public announcement. This general reluctance to trade before a news release is particularly strong prior to quarterly and annual earnings announcements. This last point supports the idea that Swiss companies strictly conform to Swiss regulation prohibiting

repurchasing prior to earnings announcements or the release of any price-sensitive information. Our findings are not surprising, considering the legal restriction and the fact that everyone instantaneously knows the company is in the market. A regulatory implication is that having a second trading line makes monitoring of corporate informed trading less costly.[5]

Our second objective is to analyze the impact of share buybacks on the liquidity of the repurchasing firm on the first trading line. As second trading lines are open concurrently with first trading lines in the Swiss stock exchange, it is likely that this parallel trading affects, in some way, the liquidity of the underlying stock. When share buybacks take place on a separate trading line, existing theories linking buybacks and market liquidity do not directly apply. Repurchasing firms do not compete directly with the liquidity providers on the first trading line (Barclay and Smith, 1988, and Cook et al., 2004). Furthermore, this type of repurchase does not increase the probability of trading with an informed trader on the first trading line (Barclay and Smith, 1988, and Brockman and Chung, 2001). In this paper, we posit that the impact of firms' repurchases on the liquidity of the underlying stock is generated, in part, by the information effect of actual buybacks. Since actual buybacks are instantaneously disclosed to all market participants, the firm sends a positive signal to the market every time the firm completes a repurchase transaction. We hypothesize that this signal attracts more investors to the market in reaction to firms' repurchases, and consequently leads to better market liquidity, than on days when the company does not make any repurchases. Furthermore, the expected impact of repurchases on stock market liquidity also depends on the identity of the sellers. If second trading lines capture a substantial part of the trading volume of institutional investors that otherwise would have taken place on the first trading line, the liquidity on the first trading line is likely to worsen. If most transactions on second trading lines are made by arbitrageurs, who simultaneously buy on the first trading line and then resell to the firm, the liquidity of the underlying stock is likely to improve on repurchase days (higher trading volumes and lower bid-ask spreads). Our empirical results confirm that repurchases on the second trading line have an important impact on the liquidity of repurchasing firms. Specifically, the repurchasing firms' trading volumes and total depths on the first trading line tend to be higher, and bid-ask spreads

[5] Because of its high level of transparency, the second trading line prevents the repurchasing firm from abusively exploiting its information advantage when repurchasing shares. However, the second trading line does not facilitate the monitoring of insider trading from executives and directors.

tend to be smaller, on repurchase days. The evidence confirms that this unique parallel trading mechanism improves the liquidity of the underlying stock.[6]

To the best of our knowledge, our paper is the first to analyze share repurchases implemented on an exchange with instantaneous buyback disclosure. While the second trading line is a financial innovation that gets around a specific tax problem, it can be of interest for exchanges and regulators in other countries because of its transparency and positive liquidity effects. The remainder of the paper proceeds as follows. Section 2 describes the institutional and legal setting of stock repurchases in Switzerland, along with the participation rules for all types of stock market participants. Section 3 provides a detailed description of the dataset. We study the timing of share repurchases in Section 4 and we analyze the liquidity effects of stock repurchases in Section 5. Finally, in Section 6 we offer some concluding comments.

2. Share Repurchases in Switzerland

2.1 INSTITUTIONAL AND LEGAL SETTING

The first share repurchase program implemented by a company listed on the Swiss stock exchange took place in 1993, and since then 129 programs have been carried out (see Figure 1, upper graph). Swiss firms buy their own shares using four different buyback methods: open market, distribution of tradable European put options to all shareholders, tender offers, and repurchases on a second trading line. Repurchases on a second line were initiated in 1997 and has become very popular since then (see Figure 1, lower graphs).[7]

Swiss corporate law states that, when shares are repurchased on a second trading line, share buybacks should not exceed 10% of the votes and firm's issued share capital; they should not take place ten days prior to the earnings announcement date; daily repurchases should not exceed 25% of the average daily volume on the first trading line over the last month; and the premium paid on a second trading line should not be in excess of 5% of the price prevailing in the stock market at that time. Moreover, the firm shall interrupt repurchases if it is in possession of price sensitive information. Furthermore, any repurchase program exceeding 2% of the share capital has to get the approval of the Swiss Takeover Board since a buyback program is considered as a takeover by the company of its own shares. Once approval is granted,

[6] As suggested by the referee, it is conceivable that repurchases made by the company represents a response to improved liquidity in the market.

[7] The interruption in the use of put options between 1994 and 1999 is because put options were threatened to be taxed twice: first when granted, and later when exercised. In May 1999, the highest court in Switzerland ruled that options should only be taxed at the exercise date.

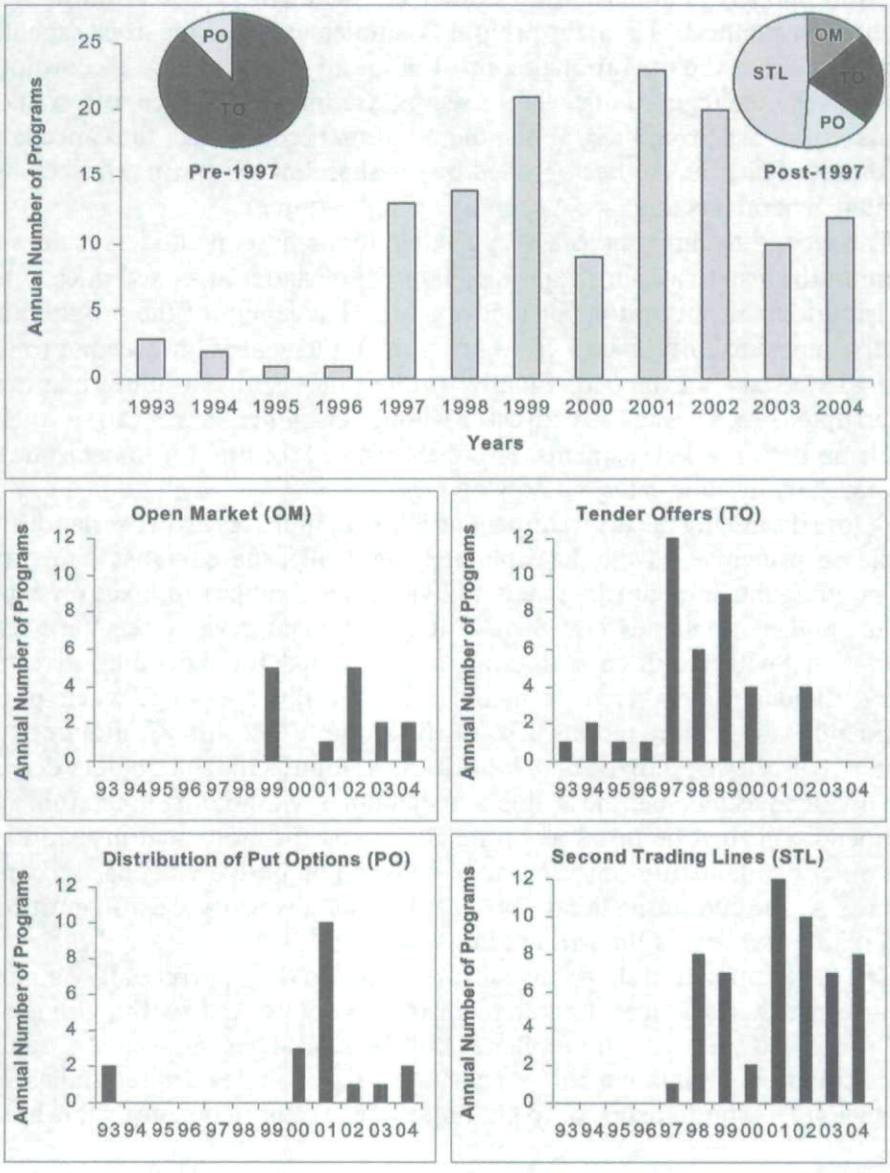

Figure 1. Share buybacks in Switzerland. In the upper graph, the bars present the annual number of repurchase programs implemented by companies listed on the Swiss stock exchange between January 1993 and August 2004. The pie charts display the relative frequency of each repurchase method before the introduction of the second trading line in December 1997 (left chart) and after December 1997 (right chart). The lower graphs show the popularity of the different repurchase methods: Open market (OM), tender offers (TO), distributions of European put options (PO), and repurchases on a second trading line (STL).

the firm publicly announces all the details of the buyback (size, duration, and repurchase method). Then, the program is implemented on the stock exchange, typically under the operational control of an investment bank. According to Swiss exchange regulations, when a second trading line is open, off-exchange transactions are prohibited. When the program is completed, the cancellation of shares, if any, has to be approved by the shareholders during the following annual general meeting (see Appendix for an example).

The second trading line is a very flexible repurchase method as it does not commit the firm to acquire a specified number of shares at a fixed price, unlike distributions of put options or tender offers. The length of the program also offers some flexibility since a given program implemented on a second trading line can be easily extended. Finally, trading on the first trading line is not interrupted. As a result, any investor willing to sell her shares can, in theory, trade on both market segments. However, we will see that for tax reasons this choice may, in some cases, be only on paper.

Before discussing the tax treatment of share repurchases in Switzerland, a few basic tax principles have to be explained. Generally, share buybacks are taxed as capital gains in countries where individuals are subject to taxes on capital gains, and as dividends elsewhere (for an excellent review, see Vermaelen, 2005). In Switzerland, capital gains are not taxed for individual investors, while dividends are taxed as income. Technically speaking, when paying dividends, a company retains 35% of the amount (i.e., the withholding tax), which is directly paid to the tax authorities. As long as the shareholder declares the dividend as income, she is able to reclaim her withholding tax in full.[8] The dividend will then be taxed as ordinary income for individual investors. On the other hand, institutional investors are taxed on both dividends and capital gains.[9] At the end of the fiscal year, institutional investors are also entitled to full reimbursement of the withholding tax.

The tax treatment of share buybacks depends on their purpose. If companies repurchase shares in order to hold them as treasury stock, no withholding taxes will be levied and stock repurchases will be considered as ordinary sales.[10] This situation is encountered, for instance, when shares are repurchased to finance stock option plans, or to guarantee the execution of convertible bonds,

[8] For foreign investors, the portion that can be reclaimed is determined by bilateral tax treaties. For instance, US and British investors are eligible for a 20 percent points tax return.

[9] Some institutional investors, such as pension funds and holdings, are totally exempted from taxes on dividends and capital gains, although the withholding tax is still required.

[10] Swiss companies can hold treasury stocks for a limited time period only (i.e., two years for the first part of our sample period and six years for the second part). However, if at the end of this period the shares have not been resold in the market, the firm will have to pay the withholding tax.

or to prepare for future acquisitions. In this case, open market buyback is the most flexible repurchase method. However, if companies repurchase shares in order to cancel them, the difference between the repurchase price and the nominal value, or par value, of the stock is then treated as a liquidation dividend.[11] The withholding tax is then equal to $0.35 \times (P_{2,t} - V)$, where $P_{2,t}$ is the stock price on the second trading line and V is the nominal value of the stock. The repurchasing company will then have to transfer the withholding tax to the tax authorities. If the firm is not able to identify the seller of the stock, the firm itself will be responsible for paying the withholding tax. As fiscal authorities consider that the amount paid to shareholders was reduced by the withholding tax amount, the company bears a 53.85% tax rate, i.e., $0.35 \times (1/0.65) = 0.5385$. This specific tax regime called for the creation of a new share acquisition mechanism allowing the firm to pay only the net price to the shareholders. The goal for the firm is to be able to immediately collect the withholding tax when the stock is tendered, while keeping a flexible "open-market type" program.[12] Actually, on a second trading line, participating shareholders only get the price net of the withholding tax so that the company does not bear the risk of paying additional taxes. From the firm's perspective, the use of a second trading line is a tax-efficient way of cancelling shares.

2.2 BUYBACK PARTICIPATION RULES

We study from a tax point of view the conditions under which a given market participant may take part in a second trading line repurchase program. We compute the percentage premium the price should include to make the second trading line attractive to this participant. We consider individual investors, institutional investors, and arbitrageurs. We compute the reserve premium of each participant, which is defined as the premium for which the after-tax price on the second trading line is equal to the after-tax price on the first trading line. Consequently, when the actual premium (*Premium*) exceeds the reserve premium, the investor is better off selling her shares on the second trading line rather than on the standard trading line.[13]

[11] Typically, for Swiss companies, the nominal value is less than 1% of the current market stock price.

[12] Tender offers or put option-based repurchase programs also allow the company to pay only the net price, but with much less flexibility, since both the price and the number of shares are fixed.

[13] The following analysis remains valid for foreign investors but they usually would not be entitled to a full refund of the withholding tax. As a result, their reserve premium is higher than the one of their domestic counterparts.

When an individual investor sells some shares in the stock market at the current stock price, no taxes are paid since capital gains are tax free for individual investors. If the same investor tenders her shares on the second trading line, she receives today the second trading line price net of the withholding tax. At the end of the fiscal year, she will be entitled to a full refund of the withholding tax, and the difference between the repurchase price and the nominal value of the stock will be taxed as income. Therefore, an individual investor would prefer the second trading line if and only if:

$$P_1 < \underbrace{P_1(1 + Premium) - [P_1(1 + Premium) - V]0.35}_{2^{nd}\ trading\ line\ price\ less\ withholding\ tax}$$

$$+\underbrace{[P_1(1 + Premium) - V]0.35d}_{Present\ value\ of\ withholding\ tax\ refund} - \underbrace{[P_1(1 + Premium) - V]t_I d}_{Present\ value\ of\ income\ tax}$$

or equivalently,

$$Premium > \frac{0.35(1-d)\left(1-\frac{V}{P_1}\right) + t_I d\left(1-\frac{V}{P_1}\right)}{0.65 + 0.35d - t_I d} \tag{1}$$

where P_1 is the market stock price, t_I is the marginal income tax rate, and the expression on the right hand side of the inequality is the reserve premium. The discount factor d is defined as $(1+r)^{-\tau}$ where r is the risk-free rate with a τ maturity and τ is the time period from the transaction day to the end of the fiscal year.

When an institutional investor sells some shares in the stock market, capital gains are taxed at the effective marginal rate t_G and $t_I = 0$. Therefore, the reserve premium for an institutional investor is:

$$\frac{0.35(1-d)\left(1-\frac{V}{P_1}\right)}{0.65 + 0.35d - t_G d} \tag{2}$$

As the firm's shares are traded concurrently on two parallel market segments, arbitrageurs may seek to exploit any significant price difference. Following a similar approach, it can be shown that the reserve premium for an arbitrageur is equal to the reserve premium for an institutional investor, given in Equation (2).

The numerator in Equation (2), which also appears in Equation (1), corresponds to the opportunity cost of the withholding tax to the investor. Of course, the actual reserve premia will depend on the marginal tax rate

of the different types of investors. By plugging realistic values for the key parameters in the reserve premia presented in Equations (1) and (2), one can show that the reserve premium of an individual investor turns out to be very large, and always greater than the 5% level authorized by law. It is therefore never optimal for an individual investor to sell shares on a second trading line. On the other hand, the reserve premium of institutional investors and arbitrageurs always remain below the legal threshold. The bottom line is that the tax treatment of second line trading makes it attractive for institutional and professional investors only.

3. Characterizing Repurchase Trading

Our sample contains all buybacks implemented by firms listed on the Swiss stock exchange (SWX) or Virt-X through a second trading line between its introduction in December 1997 and August 2004.[14] For each of the 55 programs, we obtained from SWX the daily transaction price on the second trading line and the Swiss Franc repurchase, which is the total amount spent in repurchasing shares by the firm on a given day. Our sample contains a total of 11,742 day/program observations. In addition, we collect from the Swiss Takeover Board website (www.copa.ch), the start and the end dates, the maximum cost and the percentage issued share capital reduction of each program, along with the main motives for repurchasing shares claimed by each firm. We also retrieve contemporaneous daily stock prices on the first trading line for all repurchasing companies from Thomson Financial Datastream. Furthermore, we collect from the same source the market capitalizations and book-to-market value ratios of the repurchasing companies during all programs.

Within a given repurchase program i, we measure the trading activity using four different variables, which capture different facets of stock repurchases. The first variable is a binary variable that is assigned a value of one if the company repurchases any stock on day t, and 0 otherwise:

$$Buyback_{i,t} = 1 \text{ if } SR_{i,t} > 0 \text{ and } Buyback_{i,t} = 0 \text{ if } SR_{i,t} = 0 \tag{3}$$

where SR_i is the Swiss Franc repurchase. The second variable captures the intensity of the repurchase activity and is defined as the fraction of the announced program size repurchased on day t:

$$Intensity_{i,t} = SR_{i,t}/Program\ Size_i \tag{4}$$

[14] Virt-X, a separate trading platform for Swiss blue chip companies, was launched on June 25, 2001. Swiss firms are listed either on SWX Swiss Exchange or Virt-X.

where *Program Size*$_i$ is the maximum cost of program i announced and authorized prior to the program implementation. The third variable is the percentage premium paid on the second trading line on a given day:

$$Premium_{i,t} = (P_{2,i,t} - P_{1,i,t})/P_{1,i,t} \tag{5}$$

where $P_{1,i}$ is the stock price on the first trading line while $P_{2,i}$ is the stock price on the second trading line. The fourth variable is the completion rate, which is the fraction of the program completed to date:

$$Completion_{i,t} = \sum_{s=t_i^{start}}^{t} SR_{i,s}/Program\ Size_i \tag{6}$$

where t_i^{start} is the start date of program i.

Table I presents some descriptive statistics on repurchasing and non-repurchasing firms. A salient feature of our dataset is that repurchasing firms tend to be larger and have higher market-to-book value ratios (growth firms) than non-repurchasing firms. Among repurchasing firms, the largest caps primarily use the second trading line or the open market methods. Typically, these buyback programs last between six months and a year. Regardless of the selected technique, each program targets a significant portion of the firms' share capital ranging from 4% to 12%. As expected, all second trading line programs aim at canceling the repurchased shares.

During our sample period, all programs conducted on a second trading line amounted to a total cost of 56.5 billion Swiss Francs (hereafter CHF). While repurchase programs exhibit great diversity in their size, the average program size is slightly above CHF1 billion (see Table II). The average share capital reduction is 6.70%, which is comparable with the target percentage of shares in the U.S. (Cook et al., 2004). The typical completion rate of 70% is slightly below the figures reported by Stephens and Weisbach (1998) for US firms, which range from 74% to 82%. On average, firms buy 28.81% of the trading days, but repurchasing frequencies vary considerably across firms. Swiss companies tend to repurchase shares more aggressively at the beginning of the buyback program, but do not seem to favour any particular day of the week.

We also report in Table II two measures of relative repurchase cost. The first measure (RC_1) is defined as the ratio of the actual cost of the program to the average cost of a buyback plan that yields the same number of reacquired

Table I. Summary statistics on repurchasing and non-repurchasing firms

This table presents some summary statistics for all of the companies that have repurchased shares (*Repurchasing Firms*) on the Swiss stock market between January 1993 and August 2004. Buyback programs are implemented either through a second trading line, open market, tender offer, or distribution of tradable European put options. *Non-Repurchasing Firms* is a control sample that contains all of the firms included in the Swiss Performance Index that did not repurchase any shares over the sample period. *Market Capitalization*, *Market-to-Book*, *Program Length*, and *Share Capital Reduction* are the average values for each acquisition method and, when applicable, for the control sample. CHF stands for Swiss Francs. *Share Cancellation Programs* indicates the portion of programs leading to the cancellation of the shares. *Average Premium* is defined as the average difference between the stock price on the first and second trading lines for second trading line programs, as the average difference between the offer price and the stock price five days before the offer for tender offers, and the average difference between the strike price of the put option and the stock price five days prior to the distribution of puts for option-based programs. AAR(−1, 0) is the average abnormal return computed around the announcement date of each buyback program. We measure the normal return using a market model estimated over a 200-day window prior to the event window.

	Repurchasing Firms				
	2nd Trading Lines	Open Market	Tender Offers	Put Options	Non-Repurchasing Firms
Number of Firms	31	8	20	13	189
Number of Programs	55	15	40	19	—
Market Capitalization (CHF Mio)	27,254.4	25,379.0	1,850.2	4,419.8	1,651.4
Market-to-Book	3.39	3.47	2.83	2.37	2.20
Program Length (trading days)	214.5	336.8	12.6	19.0	—
Share Capital Reduction (%)	6.70	4.23	11.77	8.27	—
Share Cancellation Programs (%)	100.0	0.0	77.5	100.0	—
Average Premium (%)	0.78	0.00	6.95	40.86	—
AAR(−1, 0) (%)	1.03	0.13	1.41	2.04	—
t-statistic AAR	3.02	0.14	2.78	3.25	—

Table II. Summary statistics on second trading line programs

Panel A presents some summary statistics for all buyback programs conducted on a second trading line between January 1997 and August 2004. *Program Size* is the maximum cost announced and authorized prior to the program implementation in millions of Swiss Francs, *Final Completion Rate* is the percentage of the program that has been repurchased at the end of the program, *Average Premium* is the weighted-average premium paid on the second trading line, *Repurchase Days* is the percentage of trading days with repurchase activities during the life of the program, and *First Quintile* and *Last Quintile* are the percentage of trading days with repurchase activities during the first and final 20% of the program, respectively. *Monday* denotes the percentage of repurchase days that are Mondays, and so forth for the other days of the week. *Relative Repurchase Cost 1* (RC_1) and *Relative Repurchase Cost 2* (RC_2) are two measures of repurchase cost. RC_1 is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares. RC_2 is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares, except that the average price is computed over the period following a given repurchase day. Panel B presents the reasons claimed by the repurchasing firms to motivate the buybacks: *Capital* (reduce share capital), *Cash* (distribute excess cash flows), *EPS* (increase the earning-per-share ratio), *Structure* (optimize the capital structure), *P/E* (increase the price-earning ratio), *Signal* (signal undervaluation), *Acquisitions* (get shares to finance future acquisitions), and *Value* (create more value for shareholders). Firms can claim more than one reason at a time.

Panel A: Repurchase Programs on a Second Trading Line

	Mean	Minimum	Maximum
Program Size (CHF Mio)	1,026.54	21.5	6,000
Final Completion Rate (%)	69.96	17.70	109.50
Average Premium (%)	0.78	0.00	5.09
Repurchase Days (%)	28.81	0.19	77.42
First Quintile (%)	35.52	0.00	100.00
Last Quintile (%)	17.36	0.00	64.52
Monday (%)	17.55	0.00	27.78
Tuesday (%)	21.55	0.00	66.67
Wednesday (%)	21.75	0.00	100.00
Thursday (%)	19.88	0.00	50.00
Friday (%)	19.27	0.00	100.00
Relative Repurchase Cost 1	1.022	0.695	1.535
Relative Repurchase Cost 2	1.016	0.671	1.646

Panel B: Claimed Reasons for Repurchasing Shares on a Second Trading Line

Capital	100.00%	EPS	16.36%	P/E	9.09%	Acquisitions	3.64%
Cash	74.55%	Structure	16.36%	Signal	5.45%	Value	1.82%

shares.[15] Our second measure (RC_2) is obtained by dividing the actual cost of the program by the average cost of a buyback plan that yields the same number of reacquired shares, except that the average price is computed over the period following a given repurchase day.[16] This new measure of relative repurchase cost is consistent with the fact that a buyback program is an option owned by the firm to buyback stock, as suggested in Ikenberry and Vermaelen (1996). Indeed, open market and second trading lines programs give managers the opportunity—but not the obligation—to buyback shares during a given time period. Consistent with this analogy between buybacks and financial options, RC_2 compares, on each repurchase day, the price paid by the firm (i.e., the "strike price") to the average price during the rest of the buyback program (i.e., during the "remaining life of the repurchase option").[17] We show in Table II that the actual repurchase cost, on average, does not differ significantly from the average price during the reference period. However, in our sample, some companies repurchase shares at a very low price (see maximum RC_1 and RC_2), while other repurchase shares at a very high price (see minimum RC_1 and RC_2).

As shown in the lower panel of Table II, firms report that they set up second trading lines to reduce share capital and, at the same time, distribute excess cash to the shareholders. One reason for cancelling shares is that a heavy tax penalty would be levied if firms kept the reacquired shares as treasury stock beyond a specified period (see Section 2.1). Furthermore, under Swiss law, companies may hold treasury stock up to only 10 percent of the issued share capital. These two reasons explain why Swiss firms, unlike US firms, often cancel the repurchased shares.

The choice of the repurchase method in Switzerland critically depends on whether or not the firm wants to reduce its capital once the repurchase is completed. If the firm does not wish to cancel the repurchased shares, it will use an open market program since this method requires no premium and does not commit the firm in any way. Conversely, when the firm aims to cancel the repurchased stocks, it needs a method that permits the immediate collection of the withholding tax from the selling shareholders. Three different methods can then be applied: the second trading line, distribution of put options, and

[15] Applying this approach to data from the Hong Kong stock exchange, Brockman and Chung (2001) find that managers pay, on average, less than the average cost of a random repurchase strategy leading to the same number of reacquired shares.

[16] We thank Theo Vermaelen for suggesting the idea underlying this second measure.

[17] Since the stock price on the second trading line, P_2, is only observed when a transaction takes place on this market segment, we replace each missing P_2 by the concurrent price on the first trading line times one plus the average premium paid during this program. This approach is more conservative compared to replacing the missing P_2 by P_1.

tender offers. The final choice of the method further depends on (1) the cost involved by each method, and (2) the flexibility of the program. Assuming that the implementation costs (i.e., fees to be paid to the investment bank) are identical across the different methods, the smaller the premium, the smaller will be the repurchase cost for a given program. Furthermore, the flexibility of a repurchase method can be assessed on two dimensions: the *length* of the program, since longer programs allow the firm to better time their repurchases, and the *fraction* of the announced amount that is eventually repurchased.

Table I shows that firms acquiring shares on a second trading line pay an average premium of 0.78% on top of the stock market price. The level of the premium on the second trading line is substantially smaller than the ones paid in tender offers (6.95%), or in buybacks involving the distribution of put options (40.86%). Furthermore, the cost advantage of the second trading line should be greater when interest rates are low since, as shown in Equation (1), the sellers' reserve premium depends positively on the interest rate level. We empirically test the validity of this prediction by estimating a PROBIT model over the 1997–2004 period, in which the dependent variable takes a value of one if the repurchase is conducted through a second trading line, and zero otherwise (i.e., distribution of puts or tender offers).[18] The list of regressors includes the Swiss three-month risk-free interest rate at the beginning of the repurchase, the program size expressed as a fraction of the firm capital, and the firm market capitalization. Interestingly, the coefficient estimate on the interest rate variable is −0.243 (p-value = 0.058), which confirms that second trading lines are most attractive for repurchasing firms when interest rates are low, ceteris paribus. The coefficient on program size is negative (p-value = 0.106) and the coefficient on the market capitalization is positive (p-value = 0.071) which is consistent with the evidence in Table I. We conclude that, among the repurchase methods used to reduce capital, the cheapest one is the second trading line.

As far as flexibility is concerned, Table I indicates that the second trading line programs last much longer (214.5 days on average) than tender offers (12.6 days) and repurchases with put options (19.0 days). Table II shows that the average final completion rate of second trading lines is 69.96%, which contrasts with the completion rates for tender offers and repurchases with put options that are usually close to 100%. These results indicate that firms using second trading lines take advantage of the possibility to only partially buyback the amount initially announced. This is not the case with the other two methods.

[18] We focus only on repurchases leading to share cancellation. Buybacks in which the firm aims to keep the reacquired shares as treasury stocks are all conducted through open market repurchases.

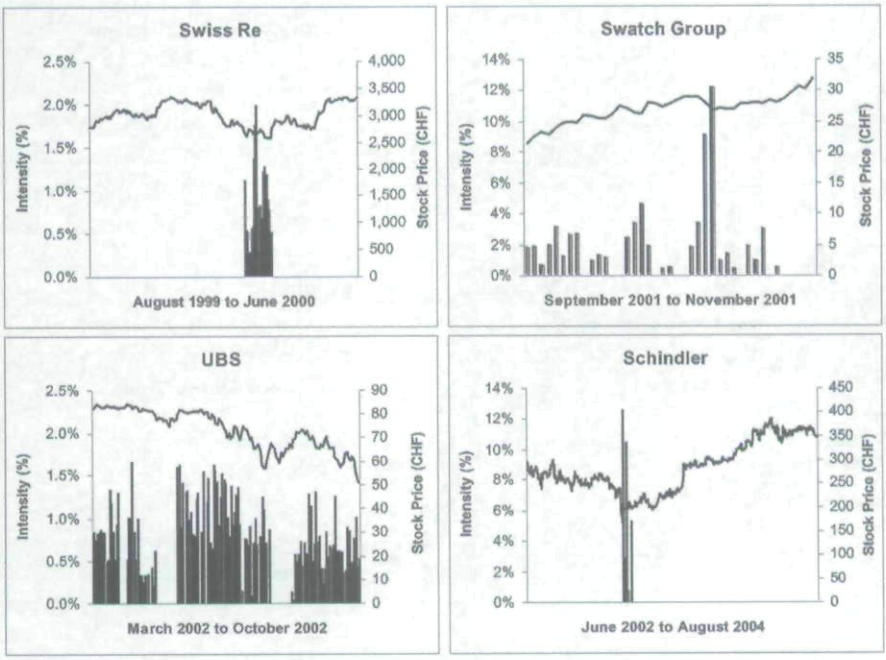

Figure 2. Repurchase activity. The four graphs present the daily *Intensity* of a buyback program, which is the fraction of the announced program size repurchased on a given day (vertical bars, left axis) and the daily current *Stock Price* in the stock market (line, right axis) for Swiss Re, Swatch Group, UBS, and Schindler.

As a result, the second trading line appears to be the most flexible repurchase method.

Figure 2 displays the daily repurchase activity of Swiss Re, Swatch Group, UBS, and Schindler. We see clearly in this figure that these firms adopt a variety of execution styles. For instance, Swiss Re and Schindler concentrate their repurchase activity during a single short period following a strong bearish period for the companies. This trading pattern is consistent with the price-support hypothesis, which states that buyback can be used to support a falling stock price by absorbing sell-side pressure. Both firms have been able to repurchase shares at the lowest possible price during their buyback.[19] In contrast, actual repurchases of Swatch Group and UBS are more evenly spread out during the course of their program. UBS repurchase between 0.5% and 1.5% of the program on a daily basis, with only two blackout periods preceding the firm's earnings announcements.

[19] The relative repurchase cost measures RC_1 are the following: Swiss Re 1.333, Swatch Group 1.025, UBS 1.001, and Schindler 1.471.

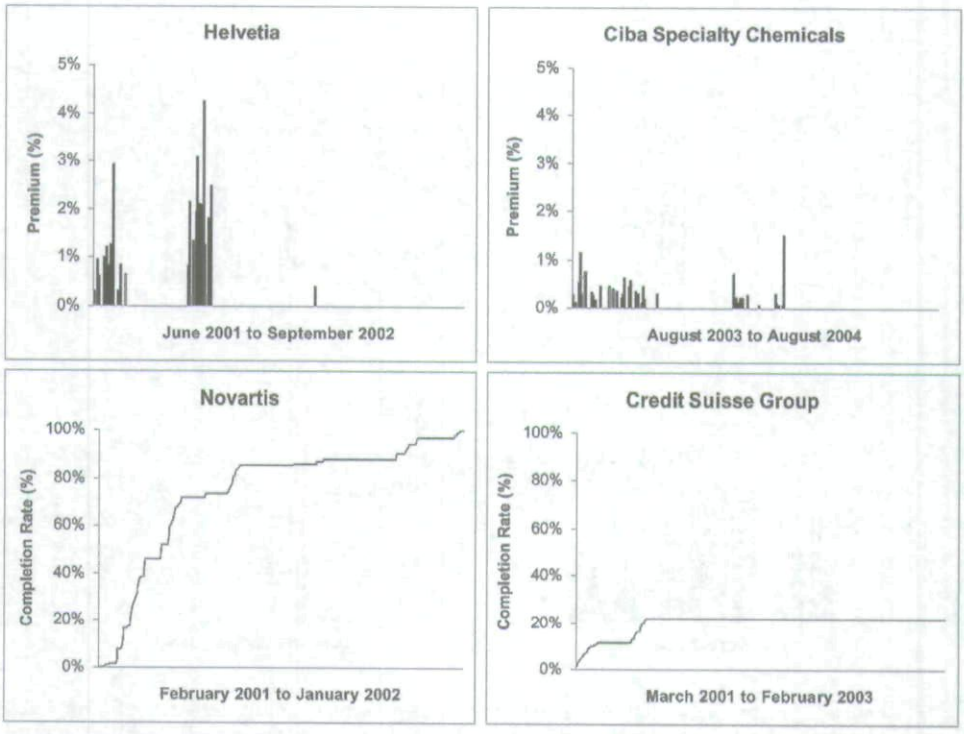

Figure 3. Premium and completion rate. The two upper graphs present the daily percentage *Premium* paid on the second trading line by Helvetia and Ciba Specialty Chemicals. The percentage premium is the difference between the prices on the first and second trading lines divided by the stock price on the first trading line. The two lower graphs plot the daily *Completion Rate* or percent of the program completed to date by Novartis and Credit Suisse Group.

Figure 3 presents the premia paid by Helvetia and Ciba Specialty Chemicals on the second trading line, along with the cumulative percentage of the program completed by Novartis and Credit Suisse Group. While the premia always remain below the 5% legal threshold, the ones paid by Helvetia in 2001 tend to be larger than the ones paid by Ciba Specialty Chemicals in 2003. Since interest rates have a positive impact on the level of the premium, the lower premium paid by Ciba Specialty Chemicals can be explained by the very low interest rate during August 2003 (around 0.5% vs. 3% in June 2001). The lower graphs in Figure 3 present one firm (Novartis) that fully completes its buyback program, and one firm (Credit Suisse Group) that stops repurchasing after completing only 20% of its buyback program. While both companies seem to favor the first portion of the program to reacquire shares, Novartis keeps buying shares until the very end of its program.

4. Repurchase Timing

In this section, we study the daily repurchase decision of repurchasing firms. Specifically, we test to what extent daily repurchases are related to stock price changes and to the release of firm-specific news. Analyzing the behavior of managers around corporate announcements is of primary importance since they are potentially better informed about the company than the rest of the market. Their actions may, however, be restricted by guidelines or safe harbor's bounds established by stock exchanges, or even blackout periods preceding earnings disclosures. Cook et al. (2003) use questionnaires returned by US repurchasing firms to document claimed and actual compliance to the Securities and Exchange Commission (SEC) guidelines. They show that virtually all sample firms violate, at one time or another, the safe harbor's bounds advised by the SEC. Using the same sample, Cook et al. (2004) show that repurchase activity is significantly curtailed around firm-specific information releases. They conclude that trading on private information is not evident in their sample.

We pool all the programs and estimate the following PROBIT regression model:

$$Buyback_{i,t} = \alpha + \beta_1 R_{i,t-5,t-1} + \beta_2 R_{i,t} + \beta_3 R_{i,t+1,t+5} + \gamma_1 News_{i,t-5,t-1} + \gamma_2 News_{i,t} + \gamma_3 News_{i,t+1,t+5} + \delta_{1-5} Controls_{i,t} + e_{i,t} \quad (7)$$

where $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise, and R_i is the stock return of firm i on a given day. The variable *News* is a binary variable set to one if the firm makes a public announcement on a given day, and zero otherwise. We retrieve every news item using the Dow Jones & Reuters Factiva database.[20] We break down the period surrounding a firm-specific information release into a five day pre-release period, a release day, and a five day post-release period. *Controls* represents a set of control variables including the firm's market capitalization and market-to-book ratio, the program length and percentage share capital reduction, and the buyback completion rate up to date.

Since the buyback decision and the contemporaneous return of the stock return are determined at the same time, there might be an endogeneity problem

[20] We limit the search to news items announced by the *Swiss News Agency* (ATS). We only consider firm-specific news items and do not include general news items in which a company is only mentioned. In the eventuality that the release takes place after the closing time of the stock market, we use the following day as the announcement day.

in Equation (7).[21] We use a two-step approach to take this potential problem into account. Specifically, we perform a Rivers and Vuong (1988) test for the existence of endogeneity in a PROBIT framework. We first regress the contemporaneous return on a set of genuine exogenous variables that are the explanatory variables in Equation (7), except for the contemporaneous return that is replaced by the market return. We use the market return as an instrument for the firm stock return for two reasons. First, it is highly correlated (0.45) with the firm return and second, it is unlikely that the whole market return would be affected by the repurchase decision of a single firm. The test for the existence of endogeneity amounts to replacing the contemporaneous return by the residual of the first-step regression and testing for its significance. In our case, we reject the null of no endogeneity and use a two-step instrumental variable procedure where the stock return is replaced by the instrumental variable formed in the first step.

We report in Table III the parameter estimates for all programs. We find that firms repurchase more frequently in days following price drops ($\hat{\beta}_1 < 0$), but that this coefficient is not statistically significant. This finding is consistent with the results in Cook et al. (2004) which are based on daily US repurchase data. It is also consistent with US and Canadian evidence reported by Stephens and Weisbach (1998) and Ikenberry et al. (2000) using quarterly and monthly data, respectively, except that in these two studies the coefficient is significant. Furthermore, we find that firms repurchase more frequently when the contemporaneous return on the stock is negative ($\hat{\beta}_2 < 0$). These first two pieces of evidence are consistent with the price-support hypothesis.

Unlike previous empirical studies, we find that repurchasing firms appear to consistently repurchase in advance of price increases ($\hat{\beta}_3 > 0$).[22] One potential interpretation of this result is that Swiss managers can anticipate future price changes. Instead, we claim that this unusual result is caused by the very nature of the second trading line method. Indeed, as transactions on second trading lines are instantaneous public information, market participants can interpret a repurchase as a positive signal revealing company management's belief that the stock is undervalued. Overall we conclude that the firms included in our sample are price- sensitive repurchasers.

In our sample, we find that repurchasing firms are more active after a public announcement and less active prior to a public announcement. Other things

[21] We thank the referee for pointing out the endogeneity problem and suggesting this direction of additional testing.

[22] An investment strategy that consists in systematically buying shares when the firm repurchases and reselling them one week later yields an average annualized raw return of 5.32% when applied to all sample firms. However, this positive average return is not significantly different from zero.

Table III. Repurchases, stock performance, and news

This table presents the parameter estimates and marginal effects from a pooled-sample PROBIT regression:

$$Buyback_{i,t} = \alpha + \beta_1 R_{i,t-5,t-1} + \beta_2 R_{i,t} + \beta_3 R_{i,t+1,t+5} + \gamma_1 News_{i,t-5,t-1} + \gamma_2 News_{i,t} + \gamma_3 News_{i,t+1,t+5} + \delta_{1-5} Controls_{i,t} + e_{i,t}$$

$Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise, and R_i is the return of firm i. The contemporaneous return is replaced by an instrumental variable that includes all other variables and the market return. The variable *News* is a binary variable set to one if the firm makes a public announcement on a given day and zero otherwise. In the last column, the news variable is defined using earnings related news only. *Controls* represents a set of control variables including the firm's market capitalization and market-to-book ratio, the program length and share capital reduction (in %), and the buyback completion rate up to date. The *p*-values presented in parentheses have been computed using Huber-White heteroskedasticity-consistent standard errors. Marginal Effect is the change in the repurchasing probability due to a change in a continuous independent variable of a $\pm\frac{1}{2}$ standard deviation around the mean, or to a change in a binary variable from 0 to 1 assuming that all other variables are at their mean value. [a] indicates that the coefficient estimate has been multiplied by 10^5.

		All Public Announcements		Earnings Announcements	
		Coefficient (*p*-value)	Marginal Effect	Coefficient (*p*-value)	Marginal Effect
Intercept	α	−0.3666 (0.000)		−0.3416 (0.000)	
5-day Lagged Return	β_1	−0.3021 (0.476)	−0.0033	−0.2191 (0.601)	−0.0021
Return (Instrumental Variable)	β_2	−7.2032 (0.000)	−0.0181	−7.507 (0.001)	−0.0165
5-day Lead Return	β_3	0.7962 (0.011)	0.0079	0.8608 (0.007)	0.0074
After News-Announcement Day	γ_1	0.1256 (0.001)	0.0277	0.2292 (0.001)	0.0460
News Announcement Day	γ_2	0.0540 (0.451)	0.0117	0.0043 (0.977)	0.0008
Before News-Announcement Day	γ_3	−0.1508 (0.000)	−0.0302	−0.9192 (0.000)	−0.1196
Market Capitalization	δ_1	0.5100[a] (0.000)	0.0551	0.5150[a] (0.000)	0.0486
Market-to-Book	δ_2	−0.0594 (0.000)	−0.0276	−0.0606 (0.000)	−0.0246
Program Length	δ_3	−0.0026 (0.000)	−0.1258	−0.0026 (0.000)	−0.1114
Share Capital Reduction	δ_4	3.9191 (0.000)	0.0273	3.9304 (0.000)	0.0239
Completion Rate	δ_5	0.0510 (0.388)	0.0033	0.0523 (0.375)	0.0029
McFadden R^2		0.145		0.153	
Number of Observations		11,742		11,742	

being held constant, the marginal effect of releasing a piece of news in the next five days is a 3.02% reduction in the probability of a repurchase. This general reluctance to trade before a news release is particularly strong prior to quarterly and annual earnings announcements (the marginal effect drops to −11.96% in this case). This last point supports the idea that Swiss companies strictly conform to Swiss regulation prohibiting repurchasing during the 10-day period preceding earnings announcements or the release of any price-sensitive information. Our findings are not surprising considering that it is illegal and considering that everyone instantaneously knows that the company is in the market. Note that such an instantaneous disclosure is a very effective monitor, as investors can file complaints if they see the company engaging in informed trading. A major regulatory implication is that having a second trading line makes monitoring of corporate insider trading less costly.

The findings regarding control variables are generally consistent with our expectations. For instance, large firms, which have been very active in repurchasing shares over our sample period, tend to trade more frequently, everything else being constant. Moreover, the daily repurchase decision turns out to be negatively related to the length of the program and positively related to the relative size of the buyback program.

To further investigate the effect of public announcements on the daily buyback decision, we contrast trading patterns around good news and bad news. We pool all the programs together and estimate the following PROBIT regression model:

$$\begin{aligned} Buyback_{i,t} = {} & \alpha + \beta_1 R_{i,t-5,t-1} + \beta_2 R_{i,t} + \beta_3 R_{i,t+1,t+5} \\ & + \gamma_1 \, Good\ News_{i,t-5,t-1} + \gamma_2 \, Good\ News_{i,t} \\ & + \gamma_3 \, Good\ News_{i,t+1,t+5} + \gamma_4 \, Bad\ News_{i,t-5,t-1} \\ & + \gamma_5 \, Bad\ News_{i,t} + \gamma_6 \, Bad\ News_{i,t+1,t+5} \\ & + \delta_{1-5} \, Controls_{i,t} + e_{i,t} \end{aligned} \tag{8}$$

where *Good News* (respectively *Bad News*) is a binary variable that is assigned a value of one if the firm releases a good (bad) news on a given day. We designate every piece of news as good (respectively bad) if the return of the concerned company is positive (negative) on the announcement day.[23] Table IV presents the regression results. The model is estimated with an instrumental variable instead of the contemporaneous return, since the Rivers-Vuong (1988) test rejects the null of no endogeneity. We find that firms are

[23] We repeat our analysis using abnormal returns in excess of the market return instead of raw returns to separate good news and bad news. Our conclusions remain unchanged.

Table IV. Repurchases, stock performance, and good vs. bad news

This table presents the parameter estimates and marginal effects from a pooled-sample PROBIT regression:

$$\begin{aligned} Buyback_{i,t} = {} & \alpha + \beta_1 R_{i,t-5,t-1} + \beta_2 R_{i,t} + \beta_3 R_{i,t+1,t+5} + \gamma_1 \, Good\ News_{i,t-5,t-1} \\ & + \gamma_2 \, Good\ News_{i,t} + \gamma_3 \, Good\ News_{i,t+1,t+5} + \gamma_4 \, Bad\ News_{i,t-5,t-1} \\ & + \gamma_5 \, Bad\ News_{i,t} + \gamma_6 \, Bad\ News_{i,t+1,t+5} + \delta_{1-5} \, Controls_{i,t} + e_{i,t} \end{aligned}$$

$Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise, and R_i is the return of firm i. The contemporaneous return is replaced by an instrumental variable that includes all other variables and the market return. The variable *Good News* (respectively *Bad News*) is a binary variable set to one if the firm releases a good (bad) news on a given day. We designate every piece of news as good (respectively bad) if the raw return of the concerned company is positive (negative) on the announcement day. In the last column, the news variable is defined using earnings related news only. *Controls* represents a set of control variables including the firm's market capitalization and market-to-book ratio, the program length and share capital reduction (in %), and the buyback completion rate up to date. The *p*-values presented in parentheses have been computed using Huber-White heteroskedasticity-consistent standard errors. Marginal Effect is the change in the repurchasing probability due to a change in a continuous independent variable of a $\pm\frac{1}{2}$ standard deviation around the mean, or to a change in a binary variable from 0 to 1 assuming that all other variables are at their mean value. [a] indicates that the coefficient estimate has been multiplied by 10^5.

		All Public Announcements		Earnings Announcements	
		Coefficient (*p*-value)	Marginal Effect	Coefficient (*p*-value)	Marginal Effect
Intercept	α	−0.3515 (0.000)		−0.3428 (0.000)	
5-day Lagged Return	β_1	−0.4283 (0.332)	−0.0046	−0.2689 (0.533)	−0.0025
Return (Instrumental Variable)	β_2	−7.6666 (0.001)	−0.0198	−7.4790 (0.000)	−0.0169
5-day Lead Return	β_3	0.5630 (0.048)	0.0055	0.8232 (0.010)	0.0071
After Good News-Announc. Day	γ_1	0.1454 (0.004)	0.0327	0.2843 (0.002)	0.0599
Good News Announc. Day	γ_2	0.2853 (0.008)	0.0695	0.1007 (0.640)	0.0196
Before Good News-Announc. Day	γ_3	−0.0401 (0.451)	−0.0083	−0.7943 (0.000)	−0.0962
After Bad News-Announc. Day	γ_4	0.0321 (0.529)	0.0069	0.1443 (0.182)	0.0285
Bad News Announc. Day	γ_5	−0.2484 (0.027)	−0.0454	−0.0771 (0.736)	−0.0135
Before Bad News-Announc. Day	γ_6	−0.3243 (0.000)	−0.0584	−1.1006 (0.000)	−0.1137

Table IV. Repurchases, stock performance, and good vs. bad news (continued)

		All Public Announcements		Earnings Announcements	
		Coefficient (p-value)	Marginal Effect	Coefficient (p-value)	Marginal Effect
Market Capitalization	δ_1	0.5190[a]	0.0559	0.5120[a]	0.0482
		(0.000)		(0.000)	
Market-to-Book	δ_2	−0.0603	−0.0279	−0.0606	−0.0243
		(0.000)		(0.000)	
Program Length	δ_3	−0.0026	−0.1255	−0.0026	−0.1108
		(0.000)		(0.000)	
Share Capital Reduction	δ_4	3.9271	0.0271	3.9091	0.0237
		(0.000)		(0.000)	
Completion Rate	δ_5	0.0417	0.0003	0.0536	0.0003
		(0.478)		(0.367)	
McFadden R^2		0.147		0.152	
Number of Observations		11,742		11,742	

less likely to repurchase their shares prior to releasing good and bad news, and are more likely to do so after releasing good news, but not after releasing bad news. This evidence suggests that firms do not opportunistically exploit their information advantage by buying before (after) the announcement of good (bad) news. We reach a similar conclusion when we limit the analysis to earnings announcements but, in this case, the pre-announcement trading blackout is much stronger. Alternatively, we include in Equations (7) and (8) a complete series of fifty-two dummy variables that capture potential program-specific fixed-effects.[24] Our results are robust to this alternative specification (results not reported in Tables).

5. Trading Activity and Corporate Liquidity

While in the previous section we intended to answer the question "When do firms repurchase?", we now consider the related question "Is the liquidity on the first trading line different when firms repurchase?". Two competing hypotheses have been developed to explain the liquidity effect of open market share buybacks. Barclay and Smith (1988) posit that a repurchasing company can narrow the bid-ask spread by maintaining a minimum price on the market, and thus tends to improve market liquidity. Alternatively, Barclay and Smith (1988) suggest that the presence of a repurchasing firm with superior

[24] Note that including fixed effects into a PROBIT model can provide inconsistent estimators (see Greene, 2003, page 697).

information may widen spreads, and thus decrease the stock market liquidity, because the probability of trading with an informed trader increases. The empirical evidence on the effects of open market repurchases on stock market liquidity is conflicting. On the one hand, Franz et al. (1995) and Cook et al. (2004) conclude that open market repurchases by US firms positively contribute to market liquidity by narrowing bid-ask spreads. On the other hand, Barclay and Smith (1988), Brockman and Chung (2001), and Ginglinger and Hamon (2007) find that open market repurchases in the U.S., Hong Kong, and France, respectively, have a detrimental effect on liquidity. However, other studies, such as Wiggins (1994), Singh et al. (1994), and Miller and McConnell (1995) find no significant impact on the bid-ask spread of repurchasing firms. With a second trading line, the repurchasing company is not trading directly on the main market. Therefore, the two mechanisms proposed by Barclay and Smith (1988) to explain the potential impact of share repurchases on liquidity do not directly apply. Indeed, when trading on a separate trading line, the company is not competing directly with the liquidity providers, and the probability of trading with an informed trader is not affected. We claim that the existence of the second trading line affects the liquidity of the first trading line through (1) the information effect of actual buybacks, and (2) the identity of the sellers on the second trading line.

The information effect works as follows. Since actual buybacks on the second trading line are instantaneously disclosed to all market participants, the firm sends a positive signal to the market every time the firm completes a repurchase transaction. If the firm's managers are better informed than the rest of the market, the positive signal from the firm attracts more investors on the first trading line which, ceteris paribus, tends to increase trading activity and improve liquidity.

The impact of second trading line programs on the stock market liquidity also depends on the identity of the sellers on the second trading line. First, if second trading lines capture a substantial part of the trading volume of institutional investors that otherwise would have taken place on the first trading line, stock market liquidity is likely to deteriorate. Second, if most of the trading on second trading lines is made by arbitrageurs, who simultaneously buy on the first trading line and resell on the second trading line, stock market liquidity is likely to benefit from this parallel trading. Indeed, arbitrage activity maintains a minimum price in the stock market, which tends to raise trading volumes and lower bid-ask spreads. As shown in Section 2.2, institutional investors and arbitrageurs are equally likely to participate in a second trading line program since their reserve premia are equal. We then conduct an empirical analysis to see which scenario is borne out by the data.

We first analyze the effects of actual buybacks on the repurchasing firms' trading volumes on the first trading line. The key variable is the firm's trading volume, measured in number of shares. Daily trading volumes, opening prices, and closing prices are collected from Thomson Financial Datastream. In order to contrast the trading activity during repurchase days and non-repurchase days, we compare the average and median trading volumes when the company does repurchase with the average level of the variable when the company does not repurchase.[25] We find that, on average, trading volumes are higher on repurchase days than on non-repurchase days. Around 84.6% of the firms in our sample experience a rise in average trading volumes on the buyback execution dates. Moreover, standard univariate tests show that this increase is statistically significant for average trading volumes (Student Test p-value = 0.052) and median trading volumes (Kruskal-Wallis Test p-value = 0.000).

To further investigate the effects of repurchases on trading volumes, we pool all the programs together and estimate the following regression model:

$$Volume_{i,t} = \alpha + \beta\ Buyback_{i,t} + \delta_1\ Price_{i,t} + \delta_2\ Volatility_{i,t} + \delta_3\ Market\ Volume_{i,t} + \sum_{j=1}^{N-1} \gamma_j\ Program_{ji} + e_{i,t} \quad (9)$$

where *Volume* represents the daily number of shares traded on the first trading line. The parameter estimate that captures the systematic effect of buybacks on trading activity is the one associated with the *Buyback* variable, which is a binary variable equal to one if the firm repurchases some shares, and zero otherwise. Note that we also use the *Intensity* variable in replacement of the *Buyback* variable to check whether our conclusions depend on the portion of buyback program reacquired on a given day. The control variables used in our regression model are rather standard: *Price* denotes the closing price of the stock, *Volatility* is the absolute open-close return of the stock, *Market Volume* is the daily total number of shares traded on the Swiss stock market, and the $Program_j$ variables capture program-based fixed effects, $j = 1, \ldots, N-1$, where N is the number of sample programs.

Table V presents the OLS parameter estimates and associated p-values for Equation (9). All p-values are adjusted for serial correlations and heteroskedasticity using the Newey and West (1987) procedure. Consistent with the univariate tests, we find that repurchasing on a second trading line contributes to increase trading activity in the stock market ($\hat{\beta} > 0$ with p-value = 0.002). On average, the trading volume on repurchase days exceeds

[25] In order not to give excessive weight to firms with large trading volumes, we scale the liquidity measures in each sample by the firm's unconditional average liquidity measure.

Table V. Effects of repurchases on trading activity

This table presents the parameter estimates computed from a pooled-sample OLS regression:

$$Volume_{i,t} = \alpha + \beta\ Buyback_{i,t} + \delta_1\ Price_{i,t} + \delta_2\ Volatility_{i,t} + \delta_3\ Market\ Volume_{i,t} + \sum_{j=1}^{N-1} \gamma_j\ Program_{ji} + e_{i,t}$$

Volume represents the firm's daily number of shares traded on the first trading line. $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise. *Intensity* is the fraction of the announced program size repurchased on a given day and is used in replacement of the *Buyback* variable. *Price* denotes the bid-ask midpoint price of the stock, *Volatility* is the absolute open-close return of the stock, *Market Volume* is the daily total number of shares traded on the Swiss stock market (in thousands of shares), and $Program_j$ is a binary variable equal to one if $i = j$ and zero otherwise, $j = 1, \ldots, N-1$, where N is the number of sample programs. The p-values presented in parentheses have been computed using Newey-West standard errors.

		Volume	
Intercept	α	587.4651	682.7184
		(0.000)	(0.000)
Buyback	β	196.4206	—
		(0.002)	
Intensity	β	—	46.2558
			(0.021)
Price	δ_1	0.5360	0.4783
		(0.001)	(0.004)
Volatility	δ_2	1.1886	1.2382
		(0.172)	(0.157)
Market Volume	δ_3	0.0262	0.0259
		(0.000)	(0.000)
Program Fixed Effects	γ_j	Yes	Yes
Adjusted R^2		0.802	0.802
Number of Observations		11,742	11,742

the trading volume on non-repurchase days by 196,420 stocks. We reach a similar conclusion when the portion of the buyback program reacquired on a given day, *Intensity*, is used in place of the repurchase-day binary variable. Our results show that a 1% increase in the fraction of shares repurchased increases the trading volume by 46,255 stocks.

To study the liquidity effects of actual buybacks on the first trading line, we compile bid-ask spread and depth measures using trade and quote data over a 21-month period from October 1, 2002 to June 30, 2004. Seventeen of our buyback programs occurred during this period. We collect detailed intraday data for this subset of firms from the Bloomberg financial information network. For each firm over each trading day, we obtain the median measures across

all trades on three liquidity variables: relative bid-ask quoted spread, total depth in number of shares, and total depth in value. Relative bid-ask quoted spread is the quoted spread (i.e., difference between the lowest ask price and highest bid price) divided by the bid-ask midpoint. Total depth is the number of shares offered at the highest bid price plus the number of shares offered at the lowest ask price. Total depth in value is the number of shares at the bid and ask multiplied by their respective prices. Following prior research, we also use price, volatility and volume as control variables in our analysis. *Price* is the median transaction price across all trades during the day, *Volatility* is the intraday volatility of trade-by-trade logarithmic returns across all trades, and *Volume* is the daily trading volume in number of shares.

To examine the liquidity effects, we pool all the programs together and estimate the following regression:

$$Liquidity_{i,t} = \alpha + \beta\ Buyback_{i,t} + \delta_1\ Price_{i,t} + \delta_2\ Volatility_{i,t} + \delta_3\ Volume_{i,t} + \sum_{j=1}^{N-1} \gamma_j\ Program_{ji} + e_{i,t} \quad (10)$$

where *Liquidity* represents, alternatively, the relative bid-ask quoted spread, total depth in number of shares, and total depth in value. As in the *Volume* regression in Equation (9), we also use the *Intensity* variable in place of the *Buyback* variable. Table VI presents the OLS parameter estimates and associated *p*-values for Equation (10). When the explained variable is *Relative Spread*, the estimated coefficient associated with the *Buyback* binary variable or the *Intensity* variable is negative and highly significant. The economic interpretation is that the relative spread on repurchase days is 0.030% lower than on non-repurchase days. When the explained variable is *Total Depth* or *Total Depth in Value*, the estimated coefficient associated with the *Buyback* binary variable or the *Intensity* variable is positive and highly significant. Depth in shares (in value) on repurchase days exceeds that on non-repurchasing days by 2,127 stocks (CHF258,375). This result also indicates that buyback activity on the second trading line has a beneficial effect on the firm liquidity on the first trading line.

We investigate whether the positive liquidity effect of repurchases reported in Tables V and VI is driven by a simultaneity bias between volumes and prices in Equation (9), and between the liquidity measures, prices, and volumes in Equation (10). We repeat the estimations using a two-stage least squares instrumental variable approach, and we use the lagged dependent variables

Table VI. Effects of repurchases on corporate liquidity

This table presents the parameter estimates computed from a pooled-sample OLS regression:

$$Liquidity_{i,t} = \alpha + \beta\ Buyback_{i,t} + \delta_1\ Price_{i,t} + \delta_2\ Volatility_{i,t} + \delta_3\ Volume_{i,t} + \sum_{j=1}^{N-1} \gamma_j\ Program_{ji} + e_{i,t}$$

Liquidity alternatively represents the acquiring firm's relative bid-ask quoted spread (quoted bid-ask spread divided by midpoint price), total depth in number of shares, and total depth in value on the first trading line. The depth variables are expressed in thousands. The alternative liquidity measures are the median values across all trades during the day. $Buyback_i$ is a binary variable equal to one if the firm repurchases some shares and zero otherwise. *Intensity* is the fraction of the announced program size repurchased on a given day and is used in replacement of the *Buyback* variable. *Price* denotes the median transaction price across all trades during the day, *Volatility* is the intraday volatility of trade-by-trade logarithmic returns across all trades during the day, *Volume* is the daily trading volume in number of shares, and $Program_j$ is a binary variable equal to one if $i = j$ and zero otherwise, $j = 1, \ldots, N-1$, where N is the number of sample programs. The p-values presented in parentheses have been computed using Newey-West standard errors. [a] indicates that the coefficient estimate has been multiplied by 10^5.

		Relative Spread		Total Depth		Total Depth in Value	
Intercept	α	0.0046	0.0045	−0.5639	−0.3804	−10.0274	8.9578
		(0.000)	(0.000)	(0.079)	(0.177)	(0.793)	(0.801)
Buyback	β	−0.0003	—	2.1274	—	258.3706	—
		(0.000)		(0.002)		(0.000)	
Intensity	β	—	−0.0088	—	39.9585	—	5911.2830
			(0.019)		(0.015)		(0.001)
Price	δ_1	−0.9220[a]	−0.9220[a]	0.0022	0.0023	0.4652	0.4716
		(0.000)	(0.000)	(0.003)	(0.002)	(0.000)	(0.000)
Volatility	δ_2	0.0033	0.0033	−0.4536	−0.5114	−64.4272	−70.9912
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Volume	δ_3	0.0000[a]	0.0000[a]	0.2520[a]	0.2520[a]	0.0001	0.0001
		(0.530)	(0.365)	(0.000)	(0.000)	(0.001)	(0.001)
Program Fixed Effects	γ_j	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2		0.636	0.635	0.771	0.770	0.677	0.671
Number of Observations		7,324	7,324	7,324	7,324	7,324	7,324

for prices and volumes as instruments. The results are qualitatively similar and therefore not reported.[26]

In summary, we find that when one controls for the key variables affecting stock liquidity, the trading volumes and total depth on the first trading lines are significantly higher on repurchase days and bid-ask spreads are significantly smaller on those days. Our results are consistent with the presence of arbitrageurs taking simultaneous positions on both market segments. The evidence is also supportive of the beneficial impact on market liquidity resulting from new investors entering the market in reaction to the firms' actual repurchases.

6. Conclusion

This paper studies a unique buyback method allowing firms to reacquire shares on a separate trading line where only the firm is allowed to buy shares. This temporary trading platform is opened concurrently with the original trading line on the stock exchange. This method is called the Second Trading Line and has been extensively used by Swiss companies since 1997. We theoretically derive the buyback participation rules for every type of stock market participant, and we show that it is never optimal for an individual investor to sell her shares on a second trading line. Using actual repurchase data from all buyback programs implemented through a second trading line on the Swiss stock market, we find that the daily repurchase decision is statistically associated with short-term price changes. In particular, we find that firms increase repurchasing in days following price drops and in advance of price increases. We also report that repurchasing firms are more active after a public announcement and less active prior to a public announcement, which suggests that Swiss companies strictly conform to Swiss regulation.

Since the second trading line eliminates the adverse selection problem inherently associated with trading directly with the company, the Swiss setting offers a unique opportunity to test the impact of buybacks on the liquidity of repurchasing firms. We empirically show that repurchases on second trading lines do have a beneficial impact on the liquidity of the underlying stock.

[26] One may also suspect that there is also a simultaneity bias in Equations (9) and (10) between the explained variables (*Volume*, *Spread*, or *Depth*) and the repurchase activity variable (*Buyback* or *Intensity*) since they all have the same time index. However, the value of the explained variable is only available at the end of the trading day, while the value of the *Buyback* variable is known as soon as there is a trade on the second trading line. Therefore, the daily repurchasing decision cannot be driven by the end-of-day value of the trading activity or of the liquidity variables. However, based on our results, we cannot completely rule out the possibility that the causal relationship between liquidity and buyback can be reversed.

We find that, after controlling for the key variables affecting stock liquidity, trading volumes and total depths on the first trading line are significantly higher, and bid-ask spreads are significantly smaller, on repurchase days.

Second trading lines offer many attractive features to financial regulatory authorities and market participants. The key advantage for regulatory bodies is that firms' actual repurchases can be tracked in real time, which makes disclosure requirements totally unnecessary. In particular, having a second trading line makes monitoring of corporate informed trading less costly, as all market participants can observe the repurchase activities. Furthermore, second trading lines offer alternative trading platforms for all market participants, provide arbitrage opportunities, and allow investors to capture some undervaluation signals sent by the firms. Second trading lines also reduce the pernicious effects of information asymmetry caused by the presence of an informed trader (i.e., the repurchasing firm). Given that open market buybacks are predominantly used to repurchase shares and that recent studies have documented detrimental effects on stock market liquidity (Brockman and Chung, 2001 and Ginglinger and Hamon, 2007), second trading lines may become an attractive trading device for exchanges around the world.

While the optimal level of information disclosure in financial markets remains a highly debatable issue, recent changes in the regulation of repurchase activity in the U.S. call for more disclosure. Indeed, according to the newly mandated disclosure rule (SEC Rule 10b-18), the number of shares and the average price paid by the repurchasing firms are required in quarterly and annual reports for periods ending after March 15, 2004. With this change in regulation, the US buyback information environment evolves from one with no disclosure requirement (a level 0 requirement) to a compulsory delayed disclosure environment (a level 1 disclosure). This higher level of disclosure requirement is found, for instance, in Canada, France, Hong Kong, and Japan. As exposed in this paper, a level 2 requirement would be the instantaneous disclosure implemented through second trading lines. Conceptually, an even more stringent information disclosure requirement (a level 3 requirement) would require a firm commitment and systematic pre-announcement of the size and timing of the buyback, in the spirit of the "sunshine trading" mechanism.

Since the early work of Barclay and Smith (1988), numerous studies have examined the effect of share repurchase on stock market liquidity. It is, however, conceivable that the relationship can be reversed, and that the decision to repurchase is a function of market liquidity. For example, recent work of Brockman, Howe and Mortal (2006) suggests that a manager's preference for share repurchases over dividends is affected by the firm's

liquidity position. Future research is needed to refine our understanding of the interactions between stock repurchases and stock liquidity.

Appendix

Chronology of a typical repurchase program on a second trading line:

Repurchasing firm: **UBS**
Repurchase method: Second trading line on the Virt-X exchange
Investment bank in charge of the program: UBS Warburg
Board of Directors decision of initiating a repurchase program: February 11, 2003
Public announcement date of the buyback: February 18, 2003
Expected number of shares to be repurchased: 85,000,0000
Maximum issued share capital reduction: 6.8%
Maximum cost of the program: CHF5,000,000,000

Starting date of the program: March 6, 2003
First repurchase: March 6, 2003
Last repurchase: January 26, 2004
End date of the program: March 5, 2004
Length of the program: 262 trading days
Number of days with some repurchase (%): 108 trading days (41.2%)

Actual repurchases: During this program, 59,482,000 shares were repurchased at an average price of CHF75.93 for a value of CHF4,500,000,000. At the April 2004 annual general meeting, shareholders accepted to cancel the repurchased shares on July 2004. Consequently, the number of UBS shares has decreased to 1,125,400,202.

Sources: Swiss Takeover Board (www.copa.ch) and UBS (www.ubs.com) websites and SWX Swiss Exchange.

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