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The Determinants of Stock Option Compensation: Evidence from Finland¹

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Abstract:

A new, long and rich panel data set consisting of all Finnish publicly traded firms is used to study how firm characteristics and stock market developments influence the adoption and targeting of stock option compensation. Stock option adoption is found to be a pro-cyclical phenomenon. Findings from firm-level econometric analysis often corroborate those based on U.S. data, but important differences also emerge. Findings include: (i) firms with higher market value per employee are more likely to use stock option compensation; (ii) share returns from the past year affect the adoption of targeted stock options, but not broad-based plans; (iii) typically larger firms with dispersed ownership adopt selective plans, while small “new economy” firms favor broad-based plans.

Keywords: stock options, compensation, corporate governance

JEL-codes: J33, M52

¹ This paper has benefited from comments from participants at the 30th EARIE conference in Helsinki, August 2003, the ASSA conference in San Diego, January 2004, the IAFEP Conference in Halifax, July 2004, the EEA congress in Madrid, August 2004, and various seminars at the Helsinki School of Economics and Helsinki Center for Economic Research. The authors are extremely grateful to Seppo Ikäheimo for sharing his data on options and for his helpful comments, to Antti Kauhanen, Hannu Piekkola, Iikka Kuosa and Alexander Corporate Finance for sharing some of their data, to Uwe Jirjahn, Antti Kauhanen, Jeffrey Pliskin, Staffan Ringbom, Juuso Toikka and Otto Toivanen for helpful comments, and to Mikael Katajamäki for his outstanding research assistance. Kalmi and Mäkinen gratefully acknowledge a research grant from the LIIKE-program of Finnish Academy of Science that has made this research possible. In addition, Kalmi gratefully acknowledges financial support from Marcus Wallenberg Foundation and Helsinki School of Economics Research Foundation. Mäkinen thanks Yrjö Jahansson Foundation, Helsinki School of Economics and Foundation Kluuvi for financial support. All support from the Research Institute of Finnish Economy is gratefully acknowledged.

I Introduction

During the 1990s, stock options have become an increasingly popular compensation method in a wide range of countries (e.g. Hall, 1998; Murphy, 1999). Although stock options were initially associated mainly with managerial compensation, this changed rapidly after more and more companies worldwide started to issue stock options to the workforce more broadly (Blasi, Kruse and Bernstein, 2003). In turn this growth of stock options has generated heated public discussion with some viewing stock options as a device by which managers transfer excessive benefits to themselves, while others see options as a major innovation in managerial and personnel compensation.

In this paper, we examine the adoption of selective and broad-based stock option programs. A main focus is to examine how firm characteristics and stock market conditions influence adoption patterns. In addressing these questions we assemble and then use an exceptionally rich, new and long panel data set. Whereas most of the published literature uses U.S. data (and generally has been forced to rely on non-representative samples) our data are for *all* publicly traded firms in the interesting case of Finland. Most importantly, since our data span the years 1992-2003, for the first time we are able to analyse how stock market downturns, as well as upturns, affect the popularity of option schemes.

Our rich data enables us to investigate a large number of firm-level hypotheses. We pay special attention to the links between market value of equity and stock option compensation. While some recent literature has stressed the role of *changes* in market value and stock option compensation, we argue that there might be also an overlooked link between the *level* of market value (per employee) and stock option compensation. Firms with higher level of market value per employee are able to provide incentives at lower cost, thus encouraging the use of stock option compensation. This has implications both at the level of the stock market and at the level of the firm that we address in our empirical research. Moreover, by providing new evidence for firms that exist in a very different institutional context than the U.S. we examine the generality of conclusions concerning the impact of various firm characteristics on the adoption of different forms of stock options.

II Conceptual framework

In this paper, we examine the determinants of whether a firm opts for a *selective* or a *broad-based* option scheme. By selective schemes we mean schemes that are targeted to selected group(s) among the workforce. These include managerial schemes, but also schemes targeted to key personnel (e.g. R & D workers). In broad-based schemes, the majority of the workforce is eligible to participate. Broad-based schemes are all encompassing, including managers, and they do not have to be egalitarian in the sense of all participants receiving the same number of options.ⁱ

Broadly speaking, the literature that can be drawn on to identify hypotheses on the incidence of stock options is of two types. First is the *stock options* literature, which is of rather recent vintage (e.g. Ittner et al., 2003). The other literature examines a closely related topic, namely the incidence of *employee stock ownership plans* (e.g. Jones and Kato, 1993; Kruse, 1996). In the following by carefully examining this broad body of work we identify a number of hypotheses that we will subsequently test with our new data set. Our discussion proceeds with an eye to subsequent model selection and a desire to maintain comparability with previous empirical research on stock options.ⁱⁱ

Share return performance. Bergman and Jenter (2004) develop an elaborate argument to try to account for the puzzling observation that stock options are used at all to compensate risk-averse employees. They argue that it is necessary that employees have more optimistic expectations concerning stock price developments than do outside investors. They attribute this optimism to “excessive extrapolation”, where employees form expectations based on past share returns and believe that high returns will continue in the future. Thus firms with high share returns find it cheaper to pay employees partly in equity instead of cash, and these equity payments are valued more by employees than by risk-neutral investors. The argument requires a degree of irrationality on the part of employees, compared to the rational expectation benchmark provided by outside investors.ⁱⁱⁱ

Market value per employee. The growth in share values may not be the only channel how equity prices influence the adoption of option schemes. It is also possible that firms with higher *levels* of share values are more likely to provide option compensation. To understand the basic idea, consider two firms that have identical growth prospects. However, in firm A the market value of equity per employee is 2000 units, while in firm B it is 1000 units (perhaps because the work is less physical

capital-intensive than in firm A). The expected growth rate of market value of equity is 10 % for both firms. Giving employees options corresponding to 10 % of total equity would yield an expected pay-off of 20 units ($2000 \times 0.1 \times 0.1$) in firm A and 10 units in firm B. Thus, in firm A the value of a given amount of equity compensation is higher than in firm B or, alternatively, firm A can provide the same expected compensation to its employees as firm B with lower dilution costs to shareholders. Notice that it is the market value per employee, rather than market value *per se*, which is relevant for compensation purposes. Kalmi (2004) has shown in a formal model that firms that have higher levels of market values per employee are more likely to use stock options as a compensation method, and also more likely to include the overall workforce in the scheme.

Both the argument concerning the growth in market values and the argument on the level of market value per employee suggest that stock options would be used especially during bull markets. However, these two arguments have different implications concerning what the key variable is in explaining the adoption of broad-based stock options, so we can differentiate between the two models in firm-level econometric analysis.

To the best of our knowledge the only paper that discusses what happened to the stock option compensation when stock prices fell recently is Murphy (2002). He suggests that many option schemes went underwater when stock values declined and thus provided virtually no incentive effects. Consequently, firms tried to offset these declines by launching new option schemes where exercise prices were considerably lower than in previous programs. This argument suggests that the stock market decline would not decrease the number of new option plans, and perhaps would increase them temporarily, while firms would update their schemes to reflect the new stock market realities. However, the argument on market value per employee outlined above suggests that option schemes would become more expensive for shareholders when market values decline. This suggests that in a declining stock market, the number of option schemes in general will diminish, and that this is particularly the case with broad-based option schemes.^{iv}

Risk. A standard prediction from the principal-agent theory suggests that, *ceteris paribus*, risk-averse employees would dislike schemes where a part of pay is tied to a volatile measure, and where a significant part of the volatility is beyond the control of employees. However, Prendergast (2002) has argued that empirical

research often finds a positive relation between risk and incentives, since in more uncertain settings the principal is often better off delegating responsibility to the agent(s), and the delegation necessitates the use of incentives. Oyer (2004) argues that when uncertainty is high, fixed wage contracts require frequent revision, but the transaction costs of rewriting the contracts become prohibitively costly. To retain the best employees, it is better to tie compensation to a measure that correlates with the business cycle. Again this gives rise to a positive correlation between risk and option compensation, which Oyer and Schaefer (2004) observe in their empirical analysis. In sum, theoretical predictions concerning the relationship between risk and options use appear to be rather ambiguous.

The effect of group size. The famous 1/n problem (Alchian and Demsetz, 1972) suggests that group-based incentive schemes, such as equity pay, become ineffective when the size of the group grows. According to Alchian and Demsetz, larger groups necessitate hierarchical monitoring and giving residual revenue rights to the central monitor. This can be seen as an argument for providing equity compensation to management but not to employees more broadly. However, empirical research on share schemes and profit sharing has typically found that the likelihood of sharing schemes increases with firm size, rather than vice versa (e.g. Jones et al., 1997; Sesil et al., 2003). Possible explanations for this anomaly are either the existence of fixed costs associated with establishing the schemes, or mutual monitoring of employees or employee co-operation that eliminates the negative impact from firm size (e.g. Blasi et al., 1996).

Human capital intensity. Earlier research suggests that human capital intensity in the production process should be an important determinant of option plans (Core and Guay, 2001; Ittner et al., 2003; Kroumova and Sesil, 2003). When work is human capital intensive, it becomes difficult to monitor and, in lieu of direct supervision, employees need self-motivating incentive schemes. Accounting based group incentive schemes, such as profit-sharing, may be problematical since it is often difficult to value intangibles correctly in R & D intensive organisations. Therefore, accounting based measures may bias compensation, if the accounting figures themselves are suspect. Moreover, R & D investment that pays off only after relatively long period of time tends also to depress current accounting figures, whereas forward looking investors are more likely to reward R & D investments. Therefore, market based compensation seems to be preferred in situations where R & D work is crucial.

Monitoring difficulties. The monitoring argument also carries over to the use of *sales growth* as a proxy for monitoring difficulties. The monitoring difficulties argument suggests that sales growth should be positively related to the adoption of broad-based stock option schemes.

Liquidity constraints. According to Core and Guay (2001), firms with severe cash constraints and high capital needs may substitute equity compensation for cash pay. For instance IT companies that have not yet secured positive income streams and are investing heavily relative to their assets may use equity based pay for this reason.

Foreign ownership. If options are believed to solve the principal-agent problem between owners and managers, then the presence of significant foreign ownership would increase the probability of observing option schemes (Pasternack, 2002). An alternative explanation as to why we might expect a positive relationship is that, initially, foreign owners are more familiar with such schemes than are others, since such schemes were often imported from the U.S. (Huolman *et al.*, 2000.)

Ownership concentration. According to the principal-agent theory, more concentrated equity ownership would decrease the likelihood of stock options, since large shareholders can resort to alternative means of monitoring (Ittner *et al.*, 2003). The managerial power approach of Bebchuk and Fried (2003) predicts that since managers are more weakly monitored under dispersed ownership, they are more likely to grant themselves options. Concentrated share ownership may also reduce share liquidity which inhibits information production in the stock market, distorting the signals from share prices and reducing the attractiveness of equity-based compensation measures such as stock options (Holmström and Tirole, 1993). Thus we expect ownership concentration to be negatively related to the use of options.

III Institutional environment

In this section, we briefly review relevant institutional developments, paying special attention to the development of corporate governance, industrial relations, and taxation. In the main we find that developments in corporate governance and industrial relations have been favourable to the adoption of option schemes. However, the effects from taxation have been detrimental, though apparently not of decisive importance.

In the end of 1980s, the Finnish corporate governance system in listed firms was very much bank-centred and resembled the German system.^v Financial institutions owned around 25% of the value of shares in the Finnish stock exchange. Bank loans were the most significant source of external funding for listed companies. On the other hand, at the end of the 1980s, the stock market was booming and the number of firms listing was at a record high.

During the early 1990s Finland suffered the most severe depression in any OECD country since World War II. For example, during 1990-1993 unemployment soared close to 20 % and GDP plummeted by 14 % (Kiander and Vartia, 1996). This also caused a significant change in financial markets: bank loans dropped significantly, as did share prices. After the devaluation in 1991 and the floating of Finnish currency Markka in 1992, the stock market started its recovery, but bank lending continued to decline throughout the 1990s. Nowadays, the equity market has become an important source for external funding for publicly traded firms, and Finland has shifted from a bank-based financial intermediation to a market-based system.

Turnover on the Helsinki Stock Exchange grew dramatically during the 1990s (although this is partly because of the growth of Nokia) and the number of firms listed also increased significantly, especially in the late 1990s and 2000. No doubt this has contributed to the prevalence of option schemes. Now stock markets are much thicker, more informative and more transparent. This reduces the possibility that managers may manipulate stock prices and that options would only be an instrument in self-serving deals by managers. At the same time, both monitoring of insider trading and legal punishments have become stricter.

Another important development is the increase of foreign ownership. The Finnish stock market was opened to foreign investors only in 1992, but today foreigners are the largest ownership group (although this is largely because of Nokia). By 2000, foreign ownership had increased to 53%, while ownership by domestic financial institutions had dropped at the same time from 20% to 4% (Hyytinen *et al.*, 2003). The increase in foreign ownership has contributed to the transformation of the Finnish business towards a more competitive and open culture where shareholder value is given a high priority (Tainio and Lilja, 2003). As noted above, foreign owners may have also played a large role in demanding that firms use stock options.

Finally, we note that the largest increase in the use of options took place in 1998-2000, when the stock market was at record highs. Table 1 depicts the growth in share prices at the Helsinki Stock Exchange between 1990 and 2002. The difference between the “general index” and the “portfolio index” is that in the latter the maximum weight of any one company is limited to 10 % (the portfolio index is available only starting from 1996). After the decline in stock prices during the early 1990s, the stock market started its recovery in 1992, while 1993 was a year of extraordinarily good performance with stock prices almost doubling. After two more moderate years, extraordinary growth resumed in 1996. In 1999 the general index grew by a spectacular 167%. The portfolio index, where the impact of Nokia has been curtailed,^{vi} has behaved more moderately, but even the portfolio index rose over 72% in 1999. During the boom years many investors believed that, thanks to the arrival of the “new economy”, stock prices would continuously rise. Investors’ “over-optimism” may in part explain the increased use of options and also why owners were not very responsive to the concerns of shareholder value dilution. However, stock market prices started to fall after May 2000, accelerating further in 2001 and 2002.

Turning to industrial relations, we observe both continuity and change.^{vii} Consensual collective bargaining and centralised income agreements have continued as the norm for decades. Since the late 1960s, the unionisation rate of the workforce has been around 70-80%, and collective agreements are typically binding also for non-union workers or workplaces. Wage increases consist of a collectively agreed element that typically is economy-wide. In addition, firms can adapt their internal wage structures according to their financial possibilities. Throughout the 1990s, profit-sharing and other forms of performance-related pay have become common compensation methods throughout the economy (Kauhanen and Piekkola, 2002). Forms of performance-related pay are not negotiated in collective bargaining rounds, but employers can decide on their use unilaterally. The widespread use of performance-related pay, as well as the popularity of stock options, represents a change in industrial relations.

While the tradition of egalitarianism may have contributed to the increase in broad-based stock options, the negative attitudes of trade unions may have reduced their use. In public debate, options are seen mainly as a managerial compensation device. Public opinion has largely condemned managerial options while supporting the broadening of option schemes to the workforce at large.^{viii}

While the impact of changes in corporate governance and the transformation of industrial relations have benefited the diffusion of stock options, changes in tax laws and regulations have not been supportive. Of special importance are the changes that occurred in 1995; until then options were taxed as capital gains, thereafter they have been taxed as income. Typically this means (at least for all managers and most employees) that the tax rate is in the highest possible bracket (namely 58 %), compared to a top capital gains tax rate of 29% (recently dropped to 28%). Thus a significant tax disincentive to issue options was created, although in the end these adverse changes in taxation did not undermine the popularity of stock option compensation.

IV The increase in stock options in Finland

To provide comprehensive quantitative information on the nature and scope of stock option plans for all publicly traded firms in Finland, we integrate data from several sources. Option data are collected mainly from annual reports and stock exchange reports.^{ix} Financial data are obtained from a database maintained by Balance Consulting, while the data on foreign ownership and market values of companies are from the Helsinki Stock Exchange (HEX).^x Ownership data are collected from Pörssitieto-handbooks^{xi} and from the annual reports of companies. Finally, the data of stock returns and volatility are provided by the department of finance and accounting, Helsinki School of Economics (originally from the HEX).

While our discussion focuses on publicly traded firms, we believe that the omission of private firms is not an important limitation of our analysis, because the use of option schemes has been concentrated mainly in public firms.^{xii} This is a natural consequence of the fact that options can work properly only in situations where the value of shares can be assessed by the stock market. However, options are also used by firms that expect to get listed in the relatively near future, especially in firms within the ICT sector.

In the analysis that follows, we distinguish between broad-based schemes and selective schemes. The latter can be only managerial schemes, but in fact they often include also a substantial proportion of other (key) personnel. However, in order to qualify as a broad-based scheme, all employees (or at least a great majority of them) should be eligible. Some researchers have used the inclusion of at least 50 % of the workforce as their definition of broad-based schemes (Kroumova and Sesil, 2003).

Unfortunately, without asking firms directly, there is no way of knowing the particular participation ratio^{xiii}. Instead, we use the classification that the firms self-report, between selective and broad-based schemes. To be classified as broad-based, the firm has to report that *all employees* are eligible. Thus in this paper, selective schemes do not qualify as broad-based schemes, even if a majority of workforce is included.

The remainder of this section describes the evolution of option schemes among firms listed in the HEX. This is done to provide the reader with a better understanding of the development and prevalence of option schemes in Finland. Our discussion also includes reporting evidence for a simple test of the hypothesised correlation between stock market movements and options use.

Table 2 describes the evolution of stock option plans in publicly traded firms in Finland between 1987 (when the first personnel stock option scheme was launched) and 2003. Our data consists of firms that are traded on the Helsinki Stock Exchange.^{xiv} Since 1997 HEX has taken over the smaller lists and also has started to operate two additional lists besides its main list: the “I” (Investor) -list and the “NM” (New Market)-list. The “I-list” consists of firms that are traded infrequently and are often majority-owned by large investors. The “NM” list consists of smaller IT and high technology firms, similar to the NASDAQ or the Neuer Markt in Frankfurt. Thus, we have information on the presence of option schemes on the main list throughout the period and on the minor lists since 1997. We do not have information on firms that have not been listed in the HEX. However, we have included option schemes prior to the listing for such firms that enter the HEX before 2002. Typically, these option programs are adopted close to the listing (often one or two years before the listing).

Column 1 in Table 2 gives the number of firms in the main list during the period of our focus, while column 2 gives the total number of observations including the two minor lists (from 1997). As is apparent from the Columns 1 and 2, the number of firms at HEX fluctuates a lot with the business cycle.

Column 3 indicates how many firms adopted their *first* option scheme in a given year. Column 4 indicates that 59 of 127 firms initially adopted broad-based schemes. Note that the first broad-based scheme (column 4) is not necessarily the first option scheme shown in column 3: in fact, in 47 of 59 cases the first broad-based scheme is also the first scheme in general. This means that in 80 cases, the first

scheme has been a selective scheme, and that only 12 of 80 (or 15%) of firms that have first adopted a selective scheme have decided to broaden it later to the entire workforce. In other words, it appears that if a firm is to give stock options to a broad range of personnel, it is more likely to do this from the inception of an options scheme rather than extend a scheme that initially was a narrow plan.

From Column 3 we observe that while seven pioneering firms installed their stock option plans as early as the 1980s, very few plans were launched during the depression years of 1990-1993. The renewed interest in option plans began in 1994 when 20 firms (almost one third of listed firms at that time) adopted option schemes. Relatively few firms adopted schemes during 1995-1996 (possibly because of the adverse taxation changes described earlier), but since 1997 options became widely popular again. The rise of option schemes during 1999-2000 is fuelled by new listings and when new listings stop after 2000, so does the introduction of new option schemes.

The first adoption of broad-based schemes has slightly different dynamics (Column 4). Although they have been used since 1989, they become popular only in 1998, when 14 firms adopted broad-based schemes. They retained their popularity until 2000.

Firms often launch new option schemes when existing schemes are due to expire, or they may operate many schemes simultaneously.^{xv} 86 of the 127 firms (68%) that had adopted an option scheme have installed more than one scheme (three firms have reached 7 successive schemes). An interesting finding about the successive option schemes (not apparent from the table) is that firms that initially choose a selective scheme are very likely to stick with that scheme. Of the 80 firms that installed a selective plan as their first plan, 55 (69%) had at least one successive scheme, and in 43 cases out of 55 (78%) all the successive schemes were targeted to a select group of personnel. In contrast, 31 of 47 (66%) firms that have a broad-based plan as their first plan installed at least one successive plan, but only in 7 cases of 31 (23%) were all the successive plans broad-based. Thus, while firms that first install a selective plans do not tend to broaden their plans, firms that initially adopt a broad-based stock option plan often subsequently adopt more selective schemes.

Column 5 shows the number of option schemes launched each year (including successive schemes) for firms in the main list and reveals dynamics that are very similar to the patterns reported in column 3. The early peak years are 1994 (16 main

list firms adopt) and 1997 (17). In later years the adoption rate increases; in 1998 and 2000 more than 40 % of the main list firms adopted option schemes. However, after 2000 the adoption rate slows down with 25 new schemes in 2001, 22 in 2002, and only 15 in 2003.

Column 6 shows the number of broad-based schemes in the main list. The introduction of such schemes is concentrated in the years 1998-2000. In 1999 and 2000, almost half of the new option schemes in the main list are broad-based. However, when the stock market performance plunges, the adoption of broad-based schemes declines faster than that for selective schemes and only a handful of broad-based schemes are adopted in the main list after 2000. In total we identify 240 adoptions for main list firms between 1987 and 2003, of which 63 (26%) are broad-based.

Columns 7 and 8 use similar information as reported in columns 5 and 6, but do so for all firms. This data thus includes observations from minor lists, as well as observations from the pre-listing period for some main list firms. A total of 318 option adoptions are identified, of which 104 (33%) are broad-based. Interestingly, while 40 % of broad-based adoptions happen outside the main list, only slightly more than 10 % of selective schemes are adopted outside the main list.

In columns 9-12 we approach this issue from another angle and provide time series data on the existence of option schemes in main list firms (columns 9-10) and including all firms (columns 11-12). In these columns, we also use information on the timing of the scheme as well as on the launching of the scheme.^{xvi} The data in column 9 indicate that the proportion of firms with an existing option scheme increases slowly but steadily until 1993, by which time a fifth of listed firms had an option scheme. This proportion jumps to around 40 % in 1994, after which it increases slowly for three years, until it starts to jump again in 1998 to 65%. The temporary maximum is reached in 2001 when almost 85 % of the main list firms have an existing option scheme. Thereafter the proportion declines to 78 % in 2003.^{xvii} Also the number of main list firms with broad-based schemes increases rapidly during 1998-2000, and in 2001 37 % of main list firms have broad-based schemes. This proportion declines to 34 % in 2003 (see column 10). Finally, columns 11-12 show developments for all firms, and also for those outside the main list.

In section II, we argued that the use of stock option compensation is likely to be related to the market value of firms. In Figure 1 we plot the stock price index

(portfolio index) against the adoption new stock option plans and new broad-based option plans in the main list. The figure appears to provide support for the contention that increases in the stock market index and option use are related, although for broad-based plans this connection is not apparent before 1998 (due to infrequent use of broad-based plans before 1998.) We can examine this relationship more carefully by investigating the correlations between stock option use and market conditions. In the correlation analysis below, we restrict the analysis to main list firms, because we have comparable data only for main list firms. We calculate the correlation coefficient between the stock market portfolio index (general index used up to 1995), lagged by one year^{xviii}, and new stock options launched in the main list (as a percentage of all main list firms). The correlation coefficient is considerably large, 0.55. The correlation coefficient between the stock market performance and new broad-based stock options is also remarkably large, though slightly smaller, at 0.43. Broad-based stock options appear to be less sensitive to stock market performance because there were only few broad-based stock options before 1998. But after this point there has been a remarkable correlation between stock market conditions and the incidence of broad-based stock option plans. In general, there appears to be a large and significant correlation between the stock market conditions and the use of stock option compensation. In particular, our results show that there was indeed a significant drop in the number of option schemes after 2000, and that remaining schemes were targeted to a selective group of employees. This finding is entirely consistent with the hypothesis that the decline in market values would cause a decline in options issued and especially in the number of broad-based plans, but it is inconsistent with Murphy's (2002) previous empirical finding that during downturn, firms would replace their old under-water schemes with new schemes with lower exercise prices. Based on the results at the level of the stock exchange, it is not possible to determine whether the decline is due to the fall in market values or in expectations of share price development. We address this issue in the firm-level econometric analysis.

There are clear differences between the two groups in size (measured by dilution)^{xix}. The average broad-based plan involves 5.2% of outstanding shares and new shares potentially available through options, while the size of the average narrow-based plan is 3.1% of outstanding and new shares. The difference in means is significant at the 1% level. This indicates that when a large proportion of employees are included in the plan, the plan has to be fairly sizable in order to provide

meaningful incentives. At minimum, this suggests that having broad-based schemes for the entire workforce has some real economic consequences for shareholders.

The use of stock option compensation in Finland appears to be comparable with the U.S. and other EU countries. Oyer and Schaefer (2004, pp.4-6) cite figures from the B.L.S. survey on stock option grants in 1999. These statistics indicate that 12% of U.S. publicly traded firms issued stock options broadly to their employees in that year, and that broad-based schemes comprised 54% of all schemes in publicly traded firms. These figures are very comparable to our figures for Finnish main list firms in 1999 (15 % and 49%). For Europe, data for 2001 (Kalmi *et al.*, 2004) show that the use of option schemes in countries including the UK, Germany, France and the Netherlands is comparable and in some cases even exceeds levels observed for Finland. However, apart from Finland, we do not know of any representative data showing how major movements in stock markets have influenced the use of stock options.

V Econometric analysis

In testing hypotheses on the role of firm characteristics and stock market conditions in affecting the incidence of options, in the main we closely follow the approaches adopted in earlier work. This enables us to make comparisons with findings from previous studies. Thus we follow the literature concerning the way key variables are measured.^{xx} All monetary variables have been deflated by the consumer price index and, to address simultaneity concerns, all explanatory variables are measured for the year prior to the adoption decision.

Our data are an unbalanced panel of 799 observations for publicly traded firms at HEX.^{xxi} The data are from the years 1992-2003. The data is unbalanced because many firms enter the stock market during the period of observations, and some exit the stock market. The number of firm-observations ranges from 18 in 1992 to 121 in 2000, with an average of 73 firm-observations by year. In total there are 127 firm observations.

Our data are exceptional in representing *all* the firms in the stock exchange and during a long time period (1992-2003). Many the U.S. studies have relied on non-representative surveys and their data are for shorter time periods (e.g. Kroumova and Sasil, 2003; Ittner *et al.*, 2003). While Execucomp data (e.g. Core and Guay, 2001) has the advantage of comprising data on individuals, since the data are restricted to

managers, this means that aggregation to the firm level is not possible without guesswork. By contrast, our data are at the firm-level. The number of observation is admittedly smaller than in some of the U.S. studies, but this is a constraint imposed by the size of the Helsinki Stock Exchange.

The basic econometric approach is to estimate multinomial logit models.^{xxii} Our investigation focuses on the decision to *launch a scheme*. We believe this is the natural question that flows from our conceptual framework since *adoption* is likely to be very reflective of changes in stock market conditions and firm characteristics, unlike the *incidence* of a plan that is often fixed for years ahead. Furthermore, our key focus is on whether the firm decides to target its stock options either to a selected group or more broadly. Thus the dependent variable has three levels in our econometric models: 0 = firm *i* does not adopt any scheme at year *t*+1, 1 = firm *i* adopts a selective scheme at year *t*+1, and 2 = firm *i* adopts a broad-based scheme at year *t*+1. In total there are 193 stock option scheme adoptions in this data set, of which 56 (29%) are broad-based schemes.

Our firm-level measures of independent variables are as follows:

Market value per employee is related to the cost efficiency of incentive provision, as explained above. It is included in logarithmic form.

Share return performance is measured by the continuously compounded daily stock market returns over a one-year period, in logarithmic form. This measure includes also dividends.

Risk is measured as the volatility (standard deviation) of daily stock market returns over a one-year period.

The effect of group size is proxied by the number of employees, measured in logarithmic form.

Human capital intensity. This is measured by using the ratio of intangible assets to the sum of tangible and intangible assets (as given on balance sheets). Thus high levels of intangibles are assumed to indicate higher human capital intensity in production.^{xxiii}

Liquidity constraints. We use the interest rate burden (the ratio of net interest expenses to sales) as a measure of liquidity constraints. As a robustness check, we also have checked our results by using alternative measured suggested in the literature, such as cash level per employee and cash flow per assets. The results are not significantly altered by the choice of the proxy variable.

Ownership concentration is measured as the sum of the voting rights of the three largest owners (% of total votes). This variable addresses corporate governance concerns.

Foreign ownership is measured as the percentage of shares held by all foreign owners in that firm. Our data consists only of firms that are registered in Finland-- we do not include any subsidiaries of foreign firms. This variable also addresses corporate governance concerns.

Monitoring difficulties are measured by (real) sales growth.

Existence of previous option scheme takes the value 1 if the firm has an ongoing previous option scheme at year t and the value 0 if not.

The mean, standard deviation, minimum and maximum of these variables appear in Table 3.

We proceed by piecewise augmenting of a basic specification. First, reflecting our focus on stock market conditions, we estimate a “baseline model” that includes only firm market value per employee, share returns, and volatility, as well as controls for industries and years. In the second stage we augment the baseline model and include several other variables that are identified in the literature and which mainly reflect other firm-level characteristics. One interest is to determine whether the results from the basic model survive after the inclusion of these additional variables.

The estimation results from the baseline model are presented in Table 4 where two sets of parameter estimates corresponding to each specification are reported. The first set indicates how much the probability that a firm adopts a selective scheme, rather than no scheme, changes when the explanatory variable increases by one standard deviation. The second set of coefficients indicates the similar probability effect when a broad-based scheme is adopted (versus no scheme.) Looking at the first set of coefficients in columns A1 and A2, the estimated baseline probability of adopting a selective scheme is 16.2% and the corresponding probability for a broad-based scheme is 4.3%. The variables are jointly significant. Market value per employee, which is (negatively) related to the cost of providing equity compensation, is strongly statistically significant for both the broad-based decision and also for selective schemes. A one-standard deviation increase in (the log of) market value per employee would increase the probability of observing a selective scheme by 4.9 percentage points, and the probability of observing a broad-based scheme by 4.1 percentage points. When the effect is translated into percentages (instead of

percentage points), it is in fact much larger for broad-based schemes. Specifically, when (the log of) market value per employee increases by one standard deviation, the probability of adopting a selective scheme increases by 30% while the probability of observing a broad-based scheme increases by 95%. This pattern is consistent with the hypothesis that the costs of stock option compensation are lower for firms with higher market value per employee.

For selective schemes, annual share returns seem to matter also a great deal: a one-standard deviation change in annual returns increases the probability of observing a selective scheme by 4.5 percentage points, while there is no significant effect for broad-based schemes. Thus this result is contrary to the findings of Bergman and Jenter (2004), who suggest that the impact from share returns should be higher for broad-based schemes. Finally, a one standard deviation increase in annual volatility increases the probability of observing a broad-based adoption by 1.6 percentage points, while volatility has no effect on the likelihood of observing an adoption of a selective scheme. While the first result is at odds with the hypothesis that high risk is expected to decrease the use of volatile compensation for risk-averse employees, the result is not surprising since it has often been observed in literature.

In columns B1 and B2, we add two industry controls: a dummy for firms in information technology, telecommunications, and electronics and a dummy for other manufacturing firms (service is the industry reference group.) A likelihood ratio test rejects the hypothesis that the coefficients on these two dummies equal zero. In addition, the main results remain unaffected. For broad-based schemes, the impact of market value per employee remains highly significant but it is now 2.6 percentage points and thus somewhat smaller than previously. The effect of market value per employee for selective schemes is estimated to be 4.4 percentage points. The impact from share returns on the likelihood of adopting a selective scheme increases somewhat to 5.0 percentage points. The impact for broad-based schemes is now marginally significant, although relatively small. Volatility is no longer a significant predictor for either group after the inclusion of industry dummies. It is possible that the inclusion of the ICT and electronics dummy captures the delegation and monitoring difficulties that Prendergast (2002) suggested to be the major reasons for the positive relationship between risk and incentives. The ICT-electronics dummy is significant for broad-based schemes at the 1% level and for selective schemes at the 10% level. Firms in ICT and electronics are roughly three times as likely to adopt broad-

based schemes and around 1.5 times as likely to adopt selective schemes as are service firms.

The last step in this first phase of model specification is to include year dummies in the baseline model. These estimates are reported in columns C1 and C2. Reassuringly the addition of time dummies does not produce any marked changes in the reported findings. Likelihood ratio tests indicate that specifications C and B are preferred over specification A, but when we compare specifications B and C, the likelihood test does not reject the null hypothesis that the year coefficients equal zero.

Finally, in columns D1 and D2 we augment the baseline specifications reported in Table 4 with seven additional controls. The additional variables in this extended model are: number of employees (to control for the effects of group size); percentage of intangibles (to control for human capital intensity); real sales growth (to control for monitoring difficulties); real interest burden (to control for liquidity constraints); to address corporate governance concerns, two measures of ownership, namely foreign ownership and ownership concentration; and a dummy for the presence of an earlier option scheme.

A key finding of the results reported in columns D1 and D2 of Table 4 is that likelihood ratio tests always reject the hypothesis that the coefficients on these seven additional variables equal zero. In these preferred specifications, we again find that firm market value per employee is an important explanatory variable. However, the inclusion of additional variables causes the coefficient for broad-based schemes to fall to 1.4 percentage points (and the significance level falls from 1 % to 5 %), while for selective schemes it remains approximately at the same level as before, at 4.4 percentage points. In percentages, these represent a 29 % increase (selective schemes) and a 42% increase (broad-based schemes) compared to the baseline probabilities. While the percentage effect is higher for broad-based schemes than for selective schemes, this difference does not appear to be significant (the z-value is actually higher for selective schemes). It appears safe to conclude that the effect is large and significant for *both* selective and broad-based schemes, even when we control for the impact coming from variables such as monitoring difficulties and human capital intensity that are also significant in their own right.

The impact from share returns remains high for selective schemes but, as noted previously, share returns have no impact concerning the adoption of broad-based schemes. This is in sharp contrast with earlier research that has found that high

returns lead firms to adopt broad-based plans. While earlier researchers have not included the market value per employee variable in their estimates, even if we drop the market value per employee variable from our regressions, we do not find a significant coefficient for the share returns variable in the broad-based specification. The finding that high returns predict selective schemes is somewhat of a puzzle, since it is at odds with previous findings. If we accept the argument that agents' expectations of future returns depend on current returns then, consistent with the argument of managerial opportunism presented by Bebchuk and Fried (2003), it may be that managers target options to a more select group of people when prospects are good.

There are also a number of other interesting results, some of which are in line with previous research, and also some more surprising results. Both types of option schemes are more common in the field of ICT & electronics, although this effect is stronger concerning broad-based schemes. The findings that sales growth (that proxies monitoring costs due to growth) and human capital intensity (that can also be understood as increasing monitoring difficulties, although from a different angle) are important in determining the adoption of broad-based plans are in line with the principal-agent story and results from several previous studies.^{xxiv}

The coefficient for ownership concentration is significant and negative concerning selective schemes. This is supportive of both the agency and share liquidity arguments presented in section II. The coefficient for employment is positive and significant for selective schemes, while insignificant for broad-based schemes. This appears to support the monitoring argument of Alchian and Demsetz (1972). However, there is also an alternative interpretation. Option adopters appear to be divisible into two distinct groups. Large firms, where ownership is dispersed, are more likely to adopt selective plans. But firms in the ICT and electronics sector, and which often have high human capital intensity and monitoring difficulties, are more likely to adopt broad-based plans. This suggests that small "new economy" firms are more likely to adopt broad-based schemes, while firms that target shares to a select group of employees are more likely to be in more mature industries. This interpretation is consistent also with the results of Ittner *et al.* (2003).

There are also some more unexpected and non-significant results. The coefficient for interest burden (a proxy for liquidity constraints) is not significant. The proxies for liquidity constraints have produced inconclusive results in prior

research,^{xxv} so our finding may not be that surprising. Volatility as a proxy for risk did have in the first specification a significant coefficient, but this finding did not survive the inclusion of additional variables. Given the ambiguous nature of theoretical predictions, this was not too surprising. Since previous work (Huolman *et al.*, 2000; Pasternack, 2002) has identified foreign ownership as a major determinant of the adoption of Finnish option plans, surprisingly this variable was not found to be statistically significant in any of our specifications. However, since previous results apply to early experience with option schemes, it may be that the impact of foreign ownership on option adoption has declined in importance more recently. Finally, the dummy for a previous option scheme was insignificant. This may be due to conflicting influences: on the one hand not having an option scheme may indicate that a firm does not consider options to be a part of the optimal compensation strategy. In this case, the dummy should be positively related to the likelihood of the stock option adoption. On the other hand, having an option scheme in place may also reduce the need to adopt a new scheme, thus presenting a countervailing negative effect.

Since share returns form a part of firm's market value, there is a possibility that the significant impact of market value per employee for selective schemes is partly driven by multicollinearity problems between that variable and share returns. To test this possibility, we replaced the current value of the market value per employee by its lagged value (measured at $t-1$). This is a good proxy for the current market value since the correlation coefficient between the two variables is high (0.84) and it is not correlated to the share returns. However, the downside is that since the information on lagged market value is missing for 106 observations, the sample size shrinks to 693. The number of broad-based stock adoptions decreases from 56 to 38. Keeping this in mind, when we re-estimated the specifications reported in Table 4, if anything these results are even more supportive of our basic hypotheses than those reported above. For example, while the results concerning share returns remained essentially similar and the impact of market value per employee remained similar concerning broad-based schemes, the coefficient for selective scheme decreased considerably and was no longer significant in the full model. In these results, the impact of lower cost of equity schemes leads to the adoption of broad-based, rather than selective, schemes. However, a robustness check of these results (i.e. with the current value of market value to employees replacing the lagged value but using the restricted, rather than the full, sample), finds that the results are essentially the same

in the two sets of estimation using the restricted sample. In other words, the different results appear to be driven mainly by differences in the sample compositions, and do not mainly reflect the multicollinearity problem. This being the case, although we cannot completely exclude the possibility of multicollinearity affecting the estimates, we put more confidence in the reported results (that were obtained by using the largest possible number of observations.)^{xxvi}

VI Conclusion

In this paper a new, long and rich panel data set consisting of all Finnish publicly traded firms is assembled and then used to provide the most reliable evidence to date on a number of hypotheses relating to the adoption of selective versus broad-based stock options. As well as testing many standard hypotheses, we pay a special attention to the hypothesis that firms with higher market value per employee will find it cheaper to provide equity incentives to a larger group of employees. Our analysis leads us to expect that stock option compensation should correlate positively with stock market developments. We also present a number of competing hypotheses, of which we pay especial attention to the hypothesis that the adoption of option compensation is expected to be related to changes in market value.

At the stock market level we find that general patterns concerning the adoption of option schemes correlate strongly with overall market developments and that stock option adoption is a pro-cyclical phenomenon, becoming more common and inclusive during a stock market upturn, and less common and selective during a downturn. Specifically, option schemes were first introduced in Finland in the late 1980s, and after the deep depression they were revived again in 1994, after a particularly prosperous year in the stock market. The stock option boom coincided with the bull market of the late 1990s. In the years 1998-2000, broad-based stock options became very popular, especially in newly listed firms. However, after the stock market downturn the number of newly launched option schemes, especially broad-based ones, declined markedly.

These findings are consistent both with an explanation that stresses *changes* in market values as a primary explanatory variable as well as an explanation based on the importance of the *levels* of market values. However, firm-level analysis enables us to probe deeper concerning the two competing explanations. In this firm-level analysis, we find that higher market values per employee lead to higher probabilities

of the adoption of both broad-based schemes and selective schemes, while higher returns predicts exclusively selective schemes.

We also test extant hypotheses concerning the impact of firm characteristics on the adoption of stock options. Often these findings corroborate those based on U.S. data. Thus consistent with previous results in the literature (and providing support for the view that more mature firms would be expected to operate selective schemes), we find that the adoption of broad-based plans is related to monitoring difficulties and human capital intensity hypotheses. But in other cases findings differ. Thus we find that share returns from the past year affect the adoption of targeted stock options, but that there is no effect on broad-based plans. Also typically larger firms with dispersed ownership adopt selective plans, while small “new economy” firms adopt broad-based plans. We also find that larger firms with dispersed ownership are more likely to adopt selective schemes. We find no evidence for a liquidity constraint hypothesis or that foreign ownership influences the adoption of option schemes.

Since the use of option schemes is correlated with market values and stock market conditions, it is interesting to conjecture as to whether a similar increase in stock options will take place when the stock market revives. If not, and stock options prove to be a one-time management fad, will something else replace them during the next stock market upturn? Our sense is that the long-term importance of the stock options boom may have been that equity compensation instruments have been introduced in places where previously their broad use was rare, such as in Finland. Equity compensation, whether in form of options, restricted stock or other instruments, is likely to remain popular in listed firms.

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Table 1: Change in HEX stock market indices

Year	General index	Portfolio index
1990	-0.380	n.a.
1991	-0.113	n.a.
1992	0.077	n.a.
1993	0.657	n.a.
1994	0.164	n.a.
1995	-0.062	n.a.
1996	0.411	0.322
1997	0.301	0.273
1998	0.524	0.138
1999	0.982	0.541
2000	-0.098	-0.242
2001	-0.367	-0.191
2002	-0.376	-0.150

Source: Helsinki Stock Exchange / Department of accounting and finance, Helsinki School of Economics

Notes: 1. The general index is the trade-weighted average share returns. Portfolio-index is calculated similarly, but the maximum weight assigned to one company is limited to 10 %.

2. Entries represent changes from the previous year and are in logarithmic scale.

Table 2. The prevalence of stock option plans in Finland

Year	1.Nr of firms in the main list	2. Nr of firms in total	3. First option plan	4. First broad-based option plan	5. Nr of new plans in the main list (% of main list firms)	6. Nr of new broad-based plans in the main list (% of main list firms)	7.Nr of new option plans (all)	8. Nr of new broad-based option plans (all)	9. Nr of main list firms having option plans (% of main list firms)	10. Nr of main list firms having broad-based option plans (% of main list firms)	11. Nr of firms having option plan (% of all listed firms)	12. Nr of firms having broad-based option plan (% of all listed firms)
1987	52		1	0	1 (1.9%)	0	1	0	1 (1.9%)	0	1	0
1988	70		2	0	2 (2.9%)	0	2	0	3 (4.3%)	0	3	0
1989	82		4	1	5 (6.1%)	0	6	1	6 (7.3%)	0	7	1
1990	77		2	2	2 (2.6%)	1 (1.3%)	3	2	7 (9.1%)	1 (1.3%)	8	2
1991	66		3	0	4 (6.1%)	0	4	0	9 (13.6%)	1 (1.5%)	10	2
1992	65		1	0	1 (1.5%)	0	1	0	8 (12.3%)	1 (1.5%)	11	2
1993	60		4	0	5 (8.3%)	0	6	1	12 (20.0%)	1 (1.7%)	15	2
1994	68		20	2	16 (23.5%)	1 (1.5%)	21	2	27 (39.7%)	2 (2.9%)	34	3
1995	74		5	0	6 (8.1%)	1 (1.4%)	7	1	34 (45.9%)	2 (2.7%)	38	3
1996	73		3	2	7 (9.6%)	1 (1.4%)	9	3	34 (46.6%)	3 (4.1%)	36	6
1997	82	115	12	2	17 (20.7%)	3 (3.7%)	22	4	40 (48.8%)	4 (4.9%)	46 (40.0%)	7 (6.1%)
1998	92	119	24	14	37 (40.2%)	12 (13.0%)	47	17	60 (65.2%)	17 (18.5%)	69 (58.0%)	21 (17.6%)
1999	102	137	21	17	31 (30.4%)	15 (14.7%)	42	23	77 (75.5%)	30 (29.4%)	91 (66.4%)	36 (26.3%)
2000	107	150	20	16	44 (41.1%)	18 (16.8%)	61	30	88 (82.2%)	39 (36.4%)	113 (75.3%)	54 (36.0%)
2001	103	145	4	1	25 (24.3%)	7 (6.8%)	33	11	87 (84.5%)	38 (36.9%)	112 (77.2%)	54 (37.2%)
2002	99	137	1	0	22 (22.2%)	2 (2.0%)	33	6	82 (82.8%)	35 (35.3%)	101 (73.7%)	49 (35.8%)
2003	97	134	0	2	15 (15.5%)	2 (2.1%)	20	3	77 (79.4%)	33 (34.0%)	95 (70.9%)	44 (32.8%)
Total			127	59	240	63	318	104				

Source: Option database, Helsinki School of Economics. All our data on options presented in subsequent tables are from this source.

Table 3. Summary statistics

Variable	Mean	Standard deviation	Minimum	Maximum
Market value per employee (EUR)	206051.5	515397.6	4384.4	5629089
Share returns (ln)	0.006	0.559	-2.98	2.08
Annual volatility (std)	0.464	0.228	0.029	2.800
Foreign ownership (%)	17.87	20.36	0	97
Voting share of three largest owners (Ownership concentration) (%)	48.21	24.75	0.67	100
Net interest expenses / sales (Interest burden) (%)	1.17	2.97	-15.3	28.3
Number of employees	4920.57	8103.61	56	58708
Sales growth (%)	18.98	78.35	-69.3	1935.7
Intangibles / fixed assets (%)	23.40	21.78	0.4	97.2
Previous option scheme	0.67	0.47	0	1

Note: 1. All monetary variables are measured in real terms.
2. Number of observations is 799.

Table 4. The determinants of option scheme adoption: multinomial logit models

	A1. Selective scheme	A2. Broad- based scheme	B1. Selective scheme	B2. Broad- based scheme	C1. Selective scheme	C2. Broad- based scheme	D1. Selective scheme	D2. Broad- based scheme
Market value per employee (ln)	0.049*** (3.93)	0.041*** (6.23)	0.044*** (3.18)	0.026*** (4.20)	0.047*** (3.22)	0.021*** (3.64)	0.044*** (2.74)	0.014** (2.53)
Share returns (ln)	0.045*** (2.98)	0.004 (1.06)	0.050*** (3.28)	0.008* (1.84)	0.041** (2.51)	0.000 (0.35)	0.039** (2.31)	-0.001 (-0.10)
Annual volatility	-0.000 (-0.19)	0.016*** (2.61)	-0.007 (-0.38)	0.006 (1.03)	-0.008 (-0.37)	0.009 (1.55)	0.000 (0.05)	0.004 (0.80)
Foreign ownership							0.005 (0.35)	0.001 (0.19)
Ownership concentration							-0.026* (-1.92)	-0.007 (-1.27)
Interest burden							0.025 (1.56)	-0.011 (-1.46)
Number of employees (ln)							0.056*** (3.42)	0.000 (0.33)
Sales growth (ln)							-0.009 (-0.42)	0.010** (2.06)
Intangibles / fixed assets							0.013 (0.96)	0.013** (2.38)
Previous option scheme							-0.011 (-0.44)	-0.018 (-1.24)
ICT & electronics			0.071* (1.82)	0.095*** (2.86)	0.066* (1.71)	0.093** (3.02)	0.080* (1.79)	0.065** (2.48)
Manufacturing			0.040 (1.11)	0.004 (0.28)	0.039 (1.12)	0.005 (0.34)	0.018 (0.54)	0.007 (0.45)
Year dummies	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.162	0.043	0.168	0.047	0.164	0.040	0.153	0.034
Wald Chi2	83.79***		101.37***		123.75***		174.66***	
Pseudo R2	0.066		0.091		0.111		0.157	

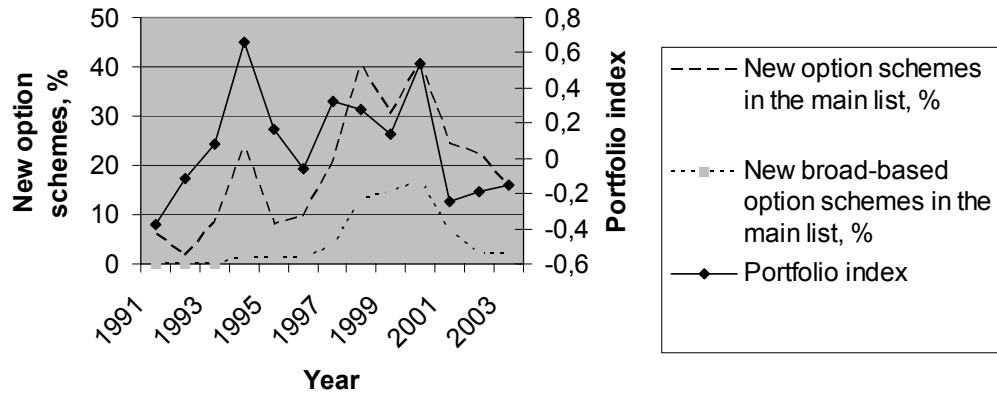
Notes: 1. Significance levels: * 10 %, ** 5 %, *** 1 %.

1. We estimate the probabilities that that the firm adopts a selective or broad-based scheme at time $t+1$ vs. non-adoption of any scheme.

2. The reported coefficients denote the increase in probability of adoption when the explanatory variable increases by one standard deviation –unit (or changes from 0 to 1 for dummy variables). We report the z – statistics in parenthesis.

3. The number of observations is always 799.

Figure 1. New option schemes in the main list and portfolio index



NOTES

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- ⁱ In Finland, broad-based schemes always include managers and they are rarely egalitarian.
- ⁱⁱ There are other hypotheses on the reasons behind the popularity of options that we do not test in this paper. According to the accounting myopia hypothesis advanced by Hall and Murphy (2003) the main reason for the popularity of options, and especially broad-based option schemes, is that since they are not treated as an accounting cost, apparently they are a “free” form of compensation, although they include a real cost in the form of shareholder dilution, which the owners do not fully appreciate. Another approach, advanced by Bebchuk and Fried (2003), is based on managerial power. According to this view a main reason for the increased use of stock options is that managers are weakly monitored and they are able to increase their compensation excessively by various methods including, inter alia, overly generous option deals. Finally, the arguments concerning the use of options as recruitment and retention devices get relatively little attention in this paper. See Oyer and Schaefer (2004) for an elaborated empirical treatment on these issues. In addition there have been two unpublished studies concerning the use of option schemes in Finland namely Pasternack (2002) and Pasternack and Rosenberg (2003). However these differ in important crucial respects from our approach. For example, Pasternack (2002) focuses on the adoption of the first option scheme and does not distinguish between managerial and broad-based schemes.
- ⁱⁱⁱ The positive correlation between share returns and option use is posited also by Liang and Weisbenner (2001), who argue that options reward past performance.
- ^{iv} This hypothesis is supported by the observation by Holmström and Kaplan (2001, p. 140), who write that stock options were popular during the stock market boom of the 1960s, but they disappeared during the downturn in 1970s.
- ^v For a more detailed exposition of corporate governance changes in Finland, see Hyttinen et al. (2003).
- ^{vi} At its peak, Nokia represented well over 50 % of the value of the stock exchange.
- ^{vii} Vartiainen (1998) is a good overall presentation of the Finnish industrial relations in English.
- ^{viii} According to a 1999 poll organised by Gallup Finland and commissioned by SAK (trade union confederation), only 4 % of the population accepts managerial option schemes uncritically and only 22 % think managers should be entitled to a substantially larger performance-pay component than other employees. 75% of respondents think that all employees should be entitled to stock options. Information taken from <http://www.rakennusliitto.fi/press/gallup> (26.3.2001)
- ^{ix} The first attempt at organizing these data was by Professor Seppo Ikäheimo. These data are described in Ikäheimo et al. (2004); we are grateful to Professor Ikäheimo for giving us access to these data. Subsequently the authors have complemented these initial data in a number of ways including augmenting them by drawing on annual reports and stock exchange releases. We also thank Alexander Corporate Finance for their help in assembling the data that are analyzed in this paper.
- ^x We thank Antti Kauhanen and Hannu Piekkola for their help with these data.
- ^{xi} A description of these handbooks can be found in <http://personal.inet.fi/yrittys/porssitieto> (30.11.2003). We thank Iikka Kuosa for pointing us out the data and providing some sample data he had collected.
- ^{xii} Moreover, data on privately owned firms were not available.
- ^{xiii} While all publicly traded firms have to disclose certain aspects of their schemes, such as the number of shares that can be purchased, the duration of the scheme, and the method of calculating the exercise price, they do not have to disclose the participation ratios. Only a minority of firms do this voluntarily. Second, even if we knew the participation ratios of all schemes, it would still be difficult to evaluate how many employees are covered at any particular time, since firms tend to have multiple schemes simultaneously. For example, if a firm would launch at year t a multiyear scheme in which 50 % of the employees participate, and at the year $t+1$ another scheme also with a 50 % participation rate, then the total number of employees covered by the scheme might be 50 % (if there is a complete overlap of the participants), or 100% (if the schemes are complementary), or anything between these polar cases. If we take into account employee turnover, the situation gets even more complicated.
- ^{xiv} Other lists consist of firms that are of rather low economic significance compared to firms included on the main list. These smaller lists are maintained by investment banks and stock brokerage companies and are excluded from our analysis.
- ^{xv} Firms may adopt simultaneous schemes for many reasons. The firm may want to broaden its schemes. Alternatively they may want to include new hires in a scheme. Or they may want a new scheme with conditions that better reflects the business prospects of the firm (for instance, if the

scheme is far out of the money, the management may want to install a new scheme with lower exercise prices for incentive reasons).

^{xvi} A firm is coded as having a scheme in year t if it has at least one scheme that has started in year t or earlier and if the final date for exercising options in this scheme is in year $t+1$ or later.

^{xvii} We saw from Column 5 that new adoptions fell already after 2000, but since the option schemes are typically multi-year, the total number of option schemes reacts to the economic development with a lag.

^{xviii} This variable is lagged by one year since the decisions on option schemes are typically done in the shareholder annual meeting which is typically held during the spring, so the decision reflects the previous year's economic situation.

^{xix} Dilution is defined here as the number of shares than can potentially be purchased by using the options, relative to the number of shares outstanding at the time of issue plus the number of shares available through options.

^{xx} This is, of course, not always possible since some variables are constructed to investigate hypotheses that have not yet been subject to empirical scrutiny (e.g. market value to employees and foreign ownership.)

^{xxi} We exclude financial and real estate companies from the analysis. In the three first regressions presented in Table 4 the number of observations potentially was 853. However, 54 observations were dropped due to missing values in some variables in the full specification. To maintain comparability, we used the restricted sample in all estimations. The results would not change substantially, even if all the available observations were used.

^{xxii} The multinomial logit method is sensitive to the problem known as “independence of irrelevant alternatives” (IIA), which means that the odds between any pair of alternatives do not depend on other outcomes that are available. This assumption may be problematic especially if two classes are perceived to be very similar to each other. We tested the IIA assumption formally by using the test suggested by Hausman and McFadden (1984). We implemented the test in STATA using the `mlogtest` command written by Long and Freeze (2003, p. 207-8). For the estimates reported here this test consistently indicated that the IIA assumption was not violated.

^{xxiii} Alternative approaches would have been to use the market value of shares to the book value of assets or to wages. However, the former was rejected because of its high correlation with the market value to employees, and the second because wages may be partly endogenous to the stock option variable, since both are forms of compensation. However, all the three aforementioned variables are strongly intercorrelated.

^{xxiv} Note in particular findings reported in Core and Guay (2001), Kroumova and Sesil (2003), and Ittner *et al.* (2003).

^{xxv} While Core and Guay (2001) find support for the liquidity hypothesis, Ittner *et al.* (2003) and Kroumova and Sesil (2003) do not.

^{xxvi} These unreported results are available upon request from the authors.