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Broad-Based Stock Options and Company Performance: What the Research Tells US

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This is the first study to evaluate whether broad-based employee stock option programs have any effect on corporate performance. Since broad-based options are a relatively recent phenomenon, it is only now beginning to be possible to make a serious assessment of their impact on productivity. The authors found that companies with broad-based stock option plans (here, defined as those where most nonmanagement employees receive option grants) had statistically significant higher productivity levels and annual growth rates than public companies in general and their peers.

This article compares the economic performance of companies that we know have broad-based stock option plans to two comparison groups, namely, all public companies in general and a similar pair of companies in their industry group. With this article, we hope to inaugurate a series of "What the Research Tells Us" articles that will present technical academic studies in a more readable form without sacrificing nuances. In doing this we hope to demonstrate how complicated it is to determine the answers to simple questions about different types of employee ownership. We hope

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Joseph Blasi and Douglas Kruse are professors, and James Sesil is an assistant professor, at the School of Management Relations at Rutgers University. Maya Kroumova is an assistant professor at the New York Institute of Technology. A longer monograph on this topic is available on the NCEO's Web site at <http://www.nceo.org/library/optionreport.html>. An academic version of this study is now under review at an academic journal and is available from the authors. This overview of the study omits some further detail on a number of findings; however, these do not substantively change the conclusions as presented. These findings represent solely those of the authors and do not reflect the views in any way of organizations that assisted with the research project and the collection of the data. The professors conducting this analysis were not compensated by any of the sponsoring organizations. The findings are retrospective and are presented solely for the purpose of research. The authors would like to thank the NCEO and its partners for providing use of the data for this analysis. We would like to thank the Industrial Relations Research Association study group on pay systems and Steve Director of the SMLR for their helpful comments. Sean Way provided research assistance.

that these articles will stimulate discussion, debate, useful criticism of our work, and hopefully some innovation and offers of better data to analyze. In this broad-based stock option study, several different types of performance are examined: productivity, total shareholder return, return on assets, Tobin's q (defined below), and employee compensation. Broad-based stock option plans are important to study because of their possible role in aligning worker and shareholder interests, encouraging job creation in knowledge-related industries, helping corporations cope with tight labor markets, and involving more citizens in sharing the fruits of capitalism. Nevertheless, little is actually known about their objective performance beyond the case histories of specific companies. Two key questions remain unanswered about them: (1) Do they help corporate performance? and (2) Do they provide workers with extra income or are employers cutting fixed wages to fund broad-based stock options?

While often conceding that options help attract high-tech workers, scholars and institutional investors and other observers have been properly cautious about ascribing broad-based stock options a role in positive company performance during a long-running bull market without careful and extensive studies. Yet this has not prevented a lot of theories based on very thin empirical evidence from cropping up in popular parlance and in the press. The plans now appear to be ubiquitous, with regular media stories about stock option bargaining by job seekers with prospective employers, the new Internet rich, high-tech stock option compensation, millionaire janitors, and high school students who get stock options for summer work. The National Center for Employee Ownership (NCEO) estimates that there are over 3,000 active stock option plans in which a majority of full-time employees participate as of May 2000. This initial study initiates the process of objectively assessing the impact of these plans.

It is important to define what we mean by "broad-based." The New York Stock Exchange classifies as "broad-based" those plans that offer options to 20% or more of a company's employees. According to the NCEO, a reasonable definition of a broad-based stock option plan is one where a majority of the full-time employees of a corporation actually receive (rather than are merely eligible for) stock options over a reasonable period of time (Weeden, Carberry, and Rodrick 1998, 185). Our research imposes an even stricter definition: we define a broad-based plan as one that includes most nonmanagement employees. Aside from how many employees are included in such plans, a key metric is what percentage of the stock options in a plan actually go to non-executives. Broad-based plans are unlike corporate plans that only include a small number of top executives and give them all or most of the stock options. The broad-based plans included in this study actually distributed an average of 45% of recent stock option grants to nonmanage-

ment employees according to a survey of part of the companies that we studied. In fact, the biotechnology and computer companies used in our study distributed 55% of recent stock option grants to nonmanagement employees (Weeden, Carberry, and Rodrick 1998).

The wider context of this phenomenon is the quiet shift that has been taking place since 1970 from the exclusive dependence on a system of fixed wages and benefits to a greater role for equity stakes in companies. The shift originally began with the rapid growth of stock option grants to executives. Then employee stock ownership was used to restructure wages and benefits as fixed wage increases in the U.S. economy, as adjusted for inflation, became flat. (See Blasi and Kruse 1991 for a detailed look at this shift.) Now, we see that companies are structuring remuneration for broader groups of employees using stock options. While these options may not be accompanying wage cuts, they may be substituting for wage increases. The phenomenon includes union as well as nonunion employees. In 1995, 8,200 Bakery, Confectionery & Tobacco Workers International employees at Phillip Morris ratified a contract that gave them small fixed wage increases and potentially lucrative stock option-like promissory shares well into the future (Somasundaram 1995). NCEO's 1998 survey of 98 companies found that 36% of them had union employees, and 58% of those companies made union employees eligible to receive options (Weeden, Carberry, and Rodrick 1998, 17). A study of 20 companies with $1 billion to $50 billion in revenue found that half of those with union employees made them eligible for stock options (Hewitt Associates 1997, 20).

How Widespread Are Broad-Based Stock Options?

The NCEO estimates that 7 to 10 million employees actually receive stock options as of May 2000. This represents a substantial increase since 1991, when the NCEO estimated there were about 1,000 companies with 1 million employees in such plans. This number of employees probably surpasses the 8 million-plus employees in ESOPs and stock bonus plans. As Congress debates plans to expand broad-based stock options in the U.S. economy, we need to seek more data about what may be the leading form of employee ownership in America today.

The precise incidence of broad-based stock options in the nation as a whole remains an open question. This and other important questions should be resolved by the end of 2000, when the Bureau of Labor Statistics of the U.S. Department of Labor releases the results of a national random survey of U.S. establishments on the subject of stock options. While research on the incidence of broad-based stock option plans from many quarters suggests that it is a significant phenomenon, one of the problems in these estimates

is that the studies often do not distinguish between employees eligible for stock options and those who actually received them. In 1998, the U.S. Federal Reserve Board's economists in 12 regions surveyed 415 companies in varied industries and found that about a third had broad-based programs and 37% had broadened the degree participation in the last 2 years. And 6.7% of companies offered stock options to employees below the managerial and professional levels. The Federal Reserve Board study concluded that "Over the past few years, stock option grants to employees have become an increasingly common method of compensation" (Lebow, Sheiner, Slifman, and Starr-McCluer 1999, 11).

The Challenges to Studying Broad-Based Stock Options

Despite this growing importance, we actually know very little about these broad-based stock option programs beyond the few details in the public announcements of many public companies in the press. Typically, newspaper accounts focus on the experiences of one or just a few companies. Often popular accounts feature companies when they are at the height of their sales growth and stock price growth. Furthermore, most of what we know about broad-based stock option plans has to do with how they function rather than how they influence company performance or affect individual workers. This is ironic, given the fact that the assumption is that they do improve company performance. A detailed report on the functioning of these plans was issued by the NCEO in 1998, based on surveys filled out by 141 companies (only the 96 companies with broad-based plans—according to the NCEO's definition—who supplied complete data on their plans were included in the analysis). That report, *Current Practices in Stock Option Plan Design* (Weeden, Carberry, and Rodrick 1998) provides detailed information on who gets stock options. It examines how they are allocated; how they are distributed between managers and non-managers; the type of options; vesting periods; and company issues such as repricing, overhang, dilution, and related communication and employee participation programs. (An updated, expanded version of this study, based on a much larger sample, will be available by the end of 2000.)

A further limitation in understanding the performance of companies with broad-based stock option plans is the environment in which such plans diffused as a corporate innovation. Stocks have performed particularly well during this period, and we have witnessed an explosion in the growth of technology companies, an Internet revolution, an Internet start-up boom, and huge run-ups in the stocks of many of these companies. Indeed, "irrational exuberance" has characterized this market until recently.

available to us by the NCEO. This method expanded the number of broad-based stock option companies considered in the study and created yet another group of broad-based stock option companies that had not self-selected themselves into our sample by responding to the survey. The reasoning is that if the study finds consistent results in the analysis of performance using both groups of broad-based stock option companies, there may be higher probability that it may have actually discovered something useful.

The two groups of comparison companies to which the broad-based companies are compared were also carefully chosen to allay questions of bias. The group of all public companies includes all public companies for which information was available in Standard and Poors' Compustat datafile excluding the 490 broad-based stock option companies. While this appears to be an excellent comparison group, we were concerned that it did not make possible as tight a comparison as the skeptic would demand. In addition to this global comparison, would it not make more sense to actually compare a broad-based stock option company to companies that were very closely similar to it? Thus, another comparison group of non-broad-based stock option companies was constructed made up of the next largest and the next smallest company in the industry group of each broad-based stock option company. For example, assume that Texaco is a broad-based stock option company. Lets further assume the industry ranking by employment is Exxon Mobil (no. 1), Texaco (no. 2), and Chevron (no. 3); then, the industry pair for assessing the economic performance of Texaco would be to compare it to Exxon Mobil (the next largest company) and Chevron (the next smallest company). Again, our reasoning is that if the study finds consistent results in the analysis of performance using both comparison groups of presumed non-broad-based stock option companies, there may be a higher probability that it may have actually discovered something useful. There is no question that this is an initial study, and hopefully further studies will critique our approach and improve significantly upon it. However, given the fact that broad-based stock option performance research has been nothing grander than advanced story-telling, we consider this approach to be a constructive beginning. In order to assist the reader in following the detailed review of the findings, we will now describe how we refer to the different groups of companies that we are comparing below:

Our study technique also helps eliminate sample bias questions for some parts of the analysis. Here, we compare companies' performance to themselves. We look at how each company did before and after setting up a plan, indexing out market effects. Thus, even if our sample companies tended to be better performers to begin with, they would have to do better still after their plans were set up if they were to show a difference.

The two groups of broad-based stock option companies combined are

called "All Broad-Based Stock Option Companies." These are the 490 corporations that we know from either responses to the survey (105) or publicly available information (395) have broad-based stock option plans. They are comprised of:

- ***All Surveyed Stock Option Companies:*** These are the 105 corporations who responded to the survey and for whom detailed Compustat information is available. Unlike corporate plans that only include a small number of top executives, the broad-based plans included in this survey actually distributed an average of 45% of recent stock option grants to nonmanagement employees (see Weeden, Carberry, and Rodrick 1998 for detailed data).
- ***Unknown Coverage of Nonmanagement:*** These are the 395 broad-based stock option companies that did not respond to the survey but have been publicly identified as having broad-based plans. Because they did not respond to the survey, we do not know the actual percentage of nonmanagement employees in their stock option plans.

The two groups of comparison companies whom we could not identify as having broad-based stock options are called:

- ***All Public Companies:*** These are the 7,165 U.S. public companies in Standard and Poors' Compustat datafile of all public companies that we were unable to identify as having broad-based stock options. Companies that reported the number of employees in either 1996 or 1997 were included. This group was constructed by taking all of the Standard and Poors Compustat datafile and removing both the 105 companies that responded to the survey and the 385 companies that we identified as having broad-based stock option plans.
- ***All Paired Companies:*** This group of companies was formed in the following way. For each stock option company, the next smallest and the next largest public company without broad-based stock option plans in its industry group (two digit SIC code) was selected. Sometimes both members of a comparison pair (i.e., two companies) were not available. For example, there were times when the stock option firm had no larger company in its industry group to which it could be compared. In such cases, only one company was chosen (i.e. the next smallest). The average performance of the two matched companies was then used as a control measure that could be compared to each stock option company's performance.

Finally, we broke out the broad-based stock option companies into two other groups, to which we will frequently refer:

- ***Surveyed Stock Option Companies With More Than 50% Nonmanagement Employees Participating:*** These are a subset of 73 corporations who responded to the survey whose broad-based stock option programs include more than 50% of their nonmanagement employees.
- ***Surveyed Stock Option Companies With Less Than 50% Nonmanagement Employees Participating:*** These are a subset of 32 corporations who responded to the survey whose broad-based stock option programs include less than 50% of their nonmanagement employees.

The Analytical Methods Used

We do not rely mainly on the results of simple comparisons of the performance of companies with broad-based stock option plans to companies without broad-based stock option plans. Such comparisons can be very misleading. For example, let us assume that we take broad-based stock option companies and measure their productivity in each of the years 1992–1997. Then let us simply compare these to the measurements of the comparison groups for the same years. What conclusions could one draw if the measures of productivity of the broad-based stock option companies are consistently higher? The correct answer to the question is that it really depends on many factors, and probably one cannot draw any conclusions from such a simple analysis. Here are the reasons why. If one misidentified most of the companies as to whether they had or did not have broad-based stock options, that would bias the results. If one used a very small sample of companies to test this finding, that could bias the results. If differences that one found between the broad-based stock option companies and the comparison groups were minor, and one concluded just the same that broad-based options are associated with better performance, that would be wrong. Moreover, if the real explanation of the higher productivity of the broad-based stock option companies was probably something that had a very clear-cut influence that one neglected to measure, then that would also have biased the results. One would have executed a very bad study.

This study uses a variety of techniques to control these different sources of bias that can creep into studies of a possible link between company practices and company performance. First, the results depend on whether the measurements are correct and valid. We have already addressed how we went about identifying a very large group of broad-based stock option companies and their comparison groups. Second, the results depend on a large

enough sample of companies being used so that the findings are not chance findings (i.e., likely not to have occurred randomly). Statistical tests have been developed to measure whether findings are statistically significant. In the discussion that follows, we discuss only statistically significant findings that identify important differences between broad-based stock option companies and the comparison groups. For example, depending on the size of the sample, a difference in productivity between broad-based stock option companies and the comparison groups of 20% versus 18% might not be a statistically significant difference. In this example, it might appear as if the broad-based companies have higher productivity, but this may not in fact be true. Third, the performance of broad-based stock option companies is assessed using multiple regression techniques. Briefly, multiple regression techniques are statistical techniques that allow us to examine the relationship between two variables and decide whether we can use one variable to predict the other.

Multiple regression techniques allow a researcher to separate out the effects of other influences that might affect the phenomenon in which one is interested. For example, we are interested in examining the relationship of broad-based stock option companies to economic performance, but we want to separate out the effects of industry group, size, and capital intensity. Why is that important? If it were true that larger public companies in the U.S. have higher productivity, it would be hard to defend a finding that broad-based stock option companies had better productivity if it were also true that most broad-based stock option companies were large companies and most firms in the comparison groups were smaller companies. If careful measurement of this factor revealed that it was the size of the broad-based stock option companies that determined the productivity differences, this would present a serious problem for the simple conclusion that broad-based stock options were associated with company performance. If a researcher claimed to find a productivity effect of broad-based stock option companies but did not measure the effect of size, a critic could argue that the productivity effect was the result of the size of the broad-based stock option companies. It could be argued that the productivity effect actually had nothing to do with the presence of broad-based stock options. Over the years we have observed a lot of sloppy and biased research on employee ownership. As a result, we use multiple regression techniques to separate out (or "control for" in statistical jargon) the effects of several large influences that we want to be very careful about: the size of the company, its industry group, and its capital intensity. Therefore, when we report findings below, we will tell the reader when we are holding the size, industry group, and the capital intensity of the company constant.

A final analytical method used by us is one that carefully takes into

account the effect of time. We call it a "pre/post study." Briefly, we must be certain that any productivity effects in broad-based stock option companies actually took place after the implementation of the stock options and not before. For example, presume that it is the case that the companies that decide to use broad-based stock option plans already had higher productivity, total shareholder return, return on assets, and employee compensation relative to comparison groups *before* they implemented broad-based stock options. Then, a study that simply compared broad-based stock option companies to comparison groups *today* would miss this fact and draw an incorrect conclusion. The real conclusion would be that successful companies adopted broad-based stock options, not that broad-based stock options were associated with company success after their implementation. A pre/post study measures the economic performance of broad-based stock option companies both *before* the option programs were implemented and after the option programs were implemented and compares these results to the comparison groups at both points in time. In short, this method allows a researcher to begin to assess the explanation that perhaps only the more productive companies actually adopt broad-based stock options in the first place.

The Economic Performance of Broad-Based Stock Option Companies Before the Introduction of Broad-Based Stock Option Plans and the Characteristics of Broad-Based Stock Option Companies

As noted above, it is important to understand the baseline performance of the broad-based stock option relative to the two comparison groups in order to assess whether it is simply more successful companies that adopt broad-based stock options in the first place. For example, presume that it was discovered that broad-based stock option companies had 10% greater productivity than the comparison groups before the introduction of these plans and 10% greater productivity after the introduction of these plans. One might reasonably conclude that the increase after the introduction of broad-based stock options is probably not associated with the introduction of these plans but might be explained by the fact that more productive companies adopt broad-based stock option plans. We chose the years 1985–1987 as a period in which we could safely assume that most of the 490 broad-based stock option companies had not implemented their plans. From the survey we know that 84% of the companies in the survey sample did not adopt their broad-based stock option plans until well after 1987. These

results for 1985–1987 were based on smaller samples than the main results of this study because they were limited to companies that had all the requisite data available. In the interests of drawing fair comparisons, the comparisons hold constant company size by employment, capital intensity, and industry group.

For 1985–1987, we did in fact find that all broad-based stock option companies had significantly higher productivity levels of 9.3%[1] relative to all public companies. All broad-based stock option companies also had significantly higher annual productivity growth of 2.2% per year than all public companies. All broad-based stock option companies had significantly higher productivity levels of 5.4% and significantly higher annual productivity growth of 1.8% per year than all industry group pairs. Thus, companies that adopted broad-based stock options later in the 1990s clearly were companies that were more productive relative to the comparison groups when examined in the mid-1980s. In general, all broad-based stock option companies did not have significantly different levels or growth rates of total shareholder return in 1985–1987 than the comparison groups except that they had 4.1% higher total shareholder return levels than all public companies in 1985–1987.

Using the Tobin's q measure of market value in 1985–1987, broad-based stock option companies had significantly higher levels of Tobin's q of .31 and significantly higher annual growth rates in Tobin's q of 7.5% than all public companies in the 1985–1987 period. In general, all broad-based stock option companies did not have significantly different levels or annual growth rates in return on assets than all public companies or their peers in the 1985–1987 period, except that they did have a 58.3% higher growth rate in return on assets compared to all public companies in the 1985–1987 period. Finally, the compensation levels of all broad-based stock option companies in the 1985–1987 period were 7.8% higher than all public companies, although the annual growth rate in compensation during 1985–1987 was no different than all public companies.

In conclusion, the companies that implemented broad-based stock option programs in the nineties tended to be those companies that were already more productive, more valuable in terms of Tobin's q, and higher compensating companies in the mid-eighties before they implemented the plans. They were not higher return on asset companies on average. *Now, the key question that remains is how the broad-based stock option companies performed after they introduced the broad-based stock option plans relative to the comparison groups.* Remember, when we compare the 1985–1987 period before the implementation of these plans to the 1995–1997 period after the implementation of these plans, we can only say that broad-based

stock option firms have better economic performance if we can establish that they actually expanded their performance beyond their earlier lead. If they simply maintained the earlier lead, that is not evidence of improved performance.

Before beginning a discussion of the results, let us also consider how the broad-based stock option companies and the comparison groups compare in the types of companies they were in 1997. In 1997, all broad-based stock option companies were significantly larger in average sales ($3.5 billion versus $1.1 billion) and employment (14,451 workers versus 5,654 workers) than all public companies. The average capital intensity of the broad-based stock option companies was higher than that of all public companies. All broad-based stock option companies had significantly higher average sales ($784 million more) than their peers and were more capital intensive with 12.2% greater total assets per employee. However, they had similar employment to their peers. The broad-based stock option companies were highly concentrated in manufacturing and services and communications. These differences in characteristics again underline the importance of controlling for the effects of company size, industry group, and capital intensity.

The Results: The Financial Performance of Public Companies With Broad-Based Stock Options Relative to Two Comparison Groups

We will discuss only the statistically significant results on productivity, total shareholder return, Tobin's q, and return on assets separately. Thus, all numbers given in this section can be assumed to be statistically significant at least at the 90% level of probability. The evaluation of the performance of broad-based stock option companies relative to the two comparison groups compares performance in three time periods: (1) the performance levels in 1997, which is the last year for which data is available in this study; (2) the average annual percentage change in performance from 1992–1997; and (3) the change in performance from the period 1985–1987—before the programs were introduced—to the 1995–1997 period after the programs were introduced.

We pursued this study rather like a detective investigation—gaining information, doubting it, and then trying to re-confirm it or disprove it with new methods of analysis. While striving for a nontechnical style without statistical charts and so forth, we do wish to preserve for the reader the ability to observe how we peeled away the layers of the question under study.

The Productivity Evidence

The productivity evidence is particularly important in this analysis because productivity is a factor over which individual employees and groups of employees may have some influence. This may be the result of active components such as work practices, their effort, their motivation, their self- and mutual monitoring, their creative ideas and (or) passive components such as their acceptance of and participation in downsizings, reorganizations, restructurings, new technologies, and so forth. In brief, the productivity findings are that broad-based stock option companies demonstrated statistically significant higher productivity levels and annual growth rates than public companies in general and their peers. Initially, the 1997 levels for broad-based stock option versus non-broad-based stock option companies are examined using simple performance comparisons without holding constant employment, capital intensity, and industry group differences. At the end of the period in which they had broad-based stock option plans, that is, 1997 (the last year for which data is available), broad-based stock option companies had 31% more productivity than all public companies and 37% more than their paired peers. Surveyed broad-based stock option companies had 16% greater productivity than all public companies. And surveyed stock option companies with more than 50% nonmanagement employees receiving grants had 20% more productivity than all public companies and 21% more than their paired peers.

Regarding the average annual change in productivity from 1992 to 1997, broad-based stock option companies had 1% greater average annual productivity than all public companies and 2% more than their paired peers. Surveyed broad-based stock option companies had 1% greater average annual productivity than all public companies. And surveyed broad-based stock option companies with more than 50% nonmanagement employees receiving grants had 1% greater average annual productivity than all public companies but the same annual productivity growth as their paired peers. While these appear to be positive results, it is entirely possible that differences in company size, capital intensity, and industry group actually have a greater role in accounting for the better performance of the broad-based stock option companies. This is less likely because the previous comparison also contrasted the broad-based stock option companies to their peers with similar results. Nevertheless, in order to be more careful about these conclusions, we performed a more rigorous test.

A more rigorous statistical test comparing the productivity of broad-based stock option companies to the comparison groups in 1997 can be achieved by holding constant company size according to total employment, capital intensity, and industry group. This analysis allows a comparison of

the productivity effects of like broad-based stock option versus like non broad-based stock option companies. We find that the results are very consistent with those that have already been discussed. Broad-based stock option companies had 27.7% more productivity than all public companies and 30.6% more than their paired peers. Surveyed broad-based stock option companies with more than 50% nonmanagement employees receiving grants had 22.0% more productivity than all public companies and 21.3% more than their paired peers. Surveyed broad-based stock option companies with less than 50% nonmanagement employees receiving grants had similar productivity to all public companies and their paired peers. And the 385 corporations that the press had publicly identified as having broad-based stock option plans—but that were not surveyed and whose percent of nonmanagement employees receiving grants was unknown—had 30.1% greater productivity than all public companies and 34.4% more than their paired peers.

This appears to constitute very strong and consistent evidence that broad-based stock option companies have higher productivity than two company comparison groups in 1997 after the broad-based plans were introduced. It was also noted earlier that stock option companies were already productivity leaders in 1985–1987 before they introduced broad-based stock option plans. Is the evidence of greater productivity in 1997 simply carrying forward that superiority from the 1985–1987 period or did these companies really improve their productivity after the introduction of the broad-based plans? Certainly, there is a strong clue that the productivity edge is not simply a carry-forward because the broad-based stock option companies had 9.3% greater productivity than all public companies in 1985–1987 and 5.4% than their paired peers, whereas by 1997, as we see above, the findings of their productivity edge over both comparison groups is consistently in the 20% to 30% range. Nevertheless, a rigorous test of this clue is to actually compare the performance of broad-based stock option companies to all public companies and their paired peers before and after they implemented their plans and also look at the within-company changes on a before and after basis.

Now let us examine the change in productivity levels and annual growth rates from the period 1985–1987—before the programs were introduced—to the 1995–1997 period after the programs were introduced. Obviously, this analysis relies on a much smaller sample because the researchers were limited to analyzing firms that had no missing performance data in Standard and Poors' Compustat database in all years of both periods. We continue to hold the size of company by employment, capital intensity, and industry group constant. The results are that broad-based stock option companies had 29.4% greater productivity levels in 1995–1997 than all

public companies, and the productivity level change for broad-based stock option companies was 14.8% between the two periods. Broad-based stock option companies had 22.2% higher productivity levels than their industry pairs companies in 1995–1997, and the productivity level change for the broad-based stock option companies was 16.8% between the two periods. Thus, the stock option companies consistently maintained their earlier edge over their peers and over general market companies and expanded this edge significantly between the two periods. The story was not generally reflected in the results for annual growth in productivity (which measures the percentage increase in productivity from one year to the next, as opposed to absolute productivity scores), but this does not change the strong results on productivity levels.

In order to check this conclusion, it made sense to go one step further. The above before-and-after study for broad-based stock option companies assumes that their year of adoption of the broad-based plan was before 1997 (and after 1987) and that their post-adoption period was 1995-1997. Now, we have decided to focus only on those broad-based stock option companies that filled out the survey where we actually know the exact date on which the plan was adopted. These broad-based stock option companies were compared to all public companies for which data was available over the entire period and all paired peers. Obviously, this analysis relies on a much smaller sample than the initial pre/post comparison, but it is also a more rigorous test. The result is that broad-based stock option companies had 6.3% higher productivity levels pre-adoption than all public companies and they had 14% higher productivity levels post-adoption than all public companies. The difference of 7.7% is statistically significant. Broad-based stock option companies had higher annual productivity growth rates before adoption, but their post-adoption growth rates were lower. These findings now suggest that broad-based stock option companies did increase their productivity levels, although not their rates, after adoption

In conclusion, these findings establish that companies with broad-based stock options had significantly higher productivity levels than non-broad-based stock option companies and their peers. This is true whether one compares their situations in 1997, considers 1992–1997 average annual changes, or considers an analysis based on measuring productivity before broad-based stock options were implemented in 1985–1987 and after they were implemented in 1995–1997. But the annual rates of productivity growth were no different post-adoption for broad-based stock option companies, while they were significantly reduced for a small sample broad-based stock option companies whose actual date of adoption was known.

How should the productivity evidence be interpreted? It is important not to view the productivity evidence in a simplistic fashion as suggesting

that workers just worked harder once their companies announced stock options. Productivity increases could be a result of the active involvement of workers in increasing effort, working smarter, working in redesigned or reengineered work structures, and/or participating in various productivity-increasing employee involvement or team approaches that enhance self- and mutual monitoring. Alternatively, they could be the result of company changes that increased productivity because employees offered or agreed to live with specific creative ideas that originated with the management or the employees. Productivity increases could be the result of passive components such as workers' acceptance of downsizings, reorganizations, restructurings, new technologies, and other major changes in firm organization. These might increase sales per worker by increasing sales with a constant or decreasing base of workers or by decreasing workers and holding sales fairly constant or by increasing sales and workers but doing this with a smaller proportion of workers to sales than in the past. Moreover, a variety of all the above-mentioned components could account for the productivity increases. Or different components could account for productivity increases in different companies. Obviously, it was not possible to measure all the possible answers to this question. This perspective does not underplay the importance of the productivity evidence, but it should serve as a warning against facile formulas to explain it.

The Total Shareholder Return Evidence

The total shareholder return evidence is particularly important in assessing the performance of broad-based stock option plans because of persistent concerns by institutional and other shareholders that these plans may not be paying for themselves over time and may be diluting shareholdings and deluding shareholders. In brief, when all the findings are taken together, the total shareholder return findings are that over the 1992–1997 period, broad-based stock option companies performed as well as all public companies in general and their industry peers and sometimes exceeded the total shareholder returns of these two comparison groups. Those findings that are reported are statistically significant differences unless otherwise noted.[2]

Normally, when a statistical analysis is performed on data, researchers will use various methods to adjust for the scores of outliers (i.e., items in the dataset that are far removed in value from the average). However, in the study of total shareholder returns, because investors and shareholders are specifically interested in achieving outlier returns, this may not be the best way to approach this question. Thus, our method uses all the actual scores on the performance of the total shareholder returns from the Standard and Poors historical dataset available at Rutgers University of all the companies

for which data was available. While we slice these data in several different ways, we analyze all the data.

Let us examine actual total shareholder returns for the individual years 1992–1997, comparing the broad-based stock option companies and all public companies.[3] We use two approaches in order to take full advantage of the data that is available. First, we use all available Standard and Poors Compustat historical data available in order to compute the total shareholder returns for all companies that reported data in any individual year. When one examines total shareholder returns for 1992–1997 based on all companies that report in any individual year, the results indicate that the total shareholder returns of different groups of broad-based stock option companies—all broad-based stock option companies, those with more than 50% nonmanagement coverage, and those with less than 50% of nonmanagement coverage—always and in every year were either not significantly different from the total shareholder return of all public companies or surpassed the returns of all public companies. The two years where broad-based stock option companies total shareholder returns statistically significantly surpassed the average returns of all public companies were 1994 and 1995. In 1994, the broad-based stock option companies surpassed all public companies by a total shareholder return of 10.0% to –4.5% and in 1995 by 51.4% to 31.8%. Moreover, broad-based stock option companies with more than 50% nonmanagement coverage statistically significantly surpassed the average returns of all public companies in 1995 by 72.9% to 31.8%. When closely examining the results, it is obvious that the average and median returns for both broad-based stock option and all public companies fluctuated considerably during the period, depending on the year examined. Moreover, both the broad-based stock option company groups and the all-public company group had individual good and bad years. For example, 1997 was a particularly bad year for broad-based stock option companies, although their returns were not statistically significantly different from all public companies in that year. This is instructive. If shareholders used one bad year as their measuring stick, they could easily dispute the value of a broad-based stock option plan. And the opposite is also true. By using a very good year for broad-based stock option company performance, one can exaggerate the presumed long-term effect on total shareholder return of these plans.

Because the observation of total shareholder return is open to so much diversity in point of view, we decided to use a second method to examine it. This method uses all available Standard and Poors Compustat data for all companies that reported data *only in every year over the entire 1992–1997 period.* When one examines total shareholder returns for 1992–1997 based on all companies that report *in every year over the 1992–1997 period,* the data indicate that the total shareholder returns of different groups of broad-

based stock option companies—all broad-based stock option companies, those with more than 50% nonmanagement coverage, and those with less than 50% of nonmanagement coverage—always and in every year were not significantly different from the total shareholder returns of all public companies, except that they again surpassed the total shareholder return of all public companies a few times. All broad-based stock option companies statistically significantly surpassed the average total shareholder returns of public companies in 1994 by 10.9% to –1.7% and in 1995 by 45.7% to 33.4%. And all broad-based stock option companies with more than 50% nonmanagement coverage statistically significantly surpassed the average returns of all public companies in 1995 by 67.2% to 33.4%. However, when closely examining the results, it is again obvious that the average and median returns for both broad-based stock option and all public companies fluctuated considerably during the period depending on the year examined. Moreover, both the broad-based stock option company groups and all public companies had individual good and bad years.

This perspective suggests to us that the only fair way to assess the total shareholder return results for broad-based stock option companies is to look at some longer-term period rather than some subjectively chosen individual year or years. We expect that shareholder groups that have disagreements with corporate management over broad-based stock option plans in the future will engage in debates over what the length of this term should be. We have no fast and set formula to determine the answer to this question. Our considered view is that the data should be computed for all time periods for which it is available and a variety of different comparison groups should be used. Certainly, the period should be long enough to avoid the suggestion that it was custom-selected by a particular shareholder or management group to defend their narrow interests in a narrow time period rather than to objectively examine a reasonable time period of corporate performance.

While the previous analysis has the advantage of using actual stock market data for all years, it also has the disadvantage of comparing apples and oranges—namely, we may be comparing broad-based stock option companies to public companies that have different compositions and characteristics in terms of capital intensity, industry groups, and sizes. Because we have already established that broad-based stock option companies have some specific characteristics regarding size, employment, and capital intensity relative to all public companies, it certainly makes a good deal of sense to redo our total shareholder return analysis in order to strictly compare apples to apples.

Thus, we add a further analysis that involves a much tighter comparison of the returns of broad-based stock option versus all public companies.

All broad-based stock option companies are now compared to all public companies, but now we control for firm size by employment, industry, and capital intensity using multiple regressions. The results indicate the average percent that the broad-based stock option group overperforms or underperforms all public companies with these controls applied. The results indicate that the previous analysis holds up to this more rigorous test. From 1992–1997, each group of broad-based stock option companies for which the analysis was performed—namely, all broad-based stock option firms, those with more than 50% nonmanagement coverage, those with less than 50% nonmanagement coverage, and all non-surveyed broad-based companies—did not have total shareholder returns that differed statistically from companies of similar sizes, industry group or capital intensity in any year form 1992 to 1997. The only exception is that all broad-based stock option companies had 13.3% significantly higher returns in 1995 using this controlled comparison group and all broad-based stock option companies with more than 50% coverage had significantly higher returns of 18.2% in 1994 and 31.4% in 1995 using this controlled comparison group.

The previous analysis has convinced us that it makes more sense to look at cumulative average total shareholder returns for the different company groups over the entire 1992–1997 period rather than to examine individual years or to tally who beat whom in those years. Cumulative total shareholder returns have the twin advantage of summarizing the results of the comparison between broad-based stock option companies and all public companies in one number *and* avoiding an over-emphasis on up or down years. Indeed, one key question for shareholders, managers, and for employees is: What kind of total shareholder return performance was the granting of stock options to a broad group of employees associated with in the years after they were granted for which data is now available? This question realistically assumes that an individual year or two would be an unreasonable period to examine in order to assess the answer to this question.

Thus, we took all broad-based stock option companies and all public companies for whom share price data was available in Compustat for every year in the 1992-1997 period, and we computed each company's cumulative percentage gains in total shareholder return during that period. Then, we averaged these cumulative returns. The resultant number gives equal weight to every individual firm. It tells both employees and outside shareholders whether the average of the cumulative gains in total shareholder return for broad-based stock option companies did better than, worse than, or the same as typical market averages. The market averages used for comparison purposes in this analysis are all public companies (in Standard and Poors' Compustat for which data was available) and the 500 largest public companies in this datafile by market value.[4] The number we shall cite indicates the

average effect of an individual investing $1,000 in a company on January 1, 1992, by the end of the period on December 31, 1997. For example, a cumulative total average shareholder return of 193.1% over the period means that the $1,000 invested in 1992 would increase to $1,000 + $1,931, or $2,931, at the end of the period in 1997.

Over the 1992–1997 period, all public companies had average individual company cumulative returns of 193.1% (81.8% at the median) while the 500 largest companies in Compustat had returns of 275.0% (151.7% at the median). All broad-based stock option companies had average individual company cumulative returns of 303.2% (163.9% at the median) over the period. This return was statistically significantly greater than the return for all public companies. Broad-based stock option companies with more than 50% of nonmanagement actually receiving grants had average individual company cumulative returns of 232.6% (108.9% at the median). And broad-based stock option companies with less than 50% of nonmanagement actually receiving grants had average individual company cumulative returns of 318.9% (128% at the median). On a 1992-1997 cumulative basis using this measure, the average individual company cumulative return and the median individual company cumulative return of all the broad-based stock option companies as a group surpassed that of all public companies and the largest 500 public companies by market value.

Our final measure of total shareholder return was to compute the average yearly return in every year from 1992–1997. This indicates the average annual appreciation (expressed as a percentage) for every individual year that would deliver the cumulative return when compounded. The average yearly return for all groups of broad-based stock option companies was greater than that of all public companies, and this difference was statistically significant for all broad-based stock option companies. The median yearly return for all three groups of broad-based stock option companies surpassed the median return for all public companies. However, we do see that the average and median returns of broad-based stock option companies with more than and less than 50% coverage did not always beat the 500 largest companies in Compustat.

In conclusion, the total shareholder return data show that over the 1992–1997 period, broad-based stock option companies perform as well as all public companies in general and among their peers. They sometimes exceed the total shareholder returns of these comparison groups or comparable companies based on industry group, size, and capital intensity.

How should the total shareholder return evidence be interpreted? When companies implement broad-based stock option programs, they are taking an action that should, all other things being equal, dilute total shareholder returns. We see clearly that the drop that might have been expected in total

shareholder return in these companies apparently did not take place over the long run, namely, the 1992–1997 period. Total shareholder return for the stock option companies was not statistically significantly different from that of all public companies in most years and for the period as a whole. We interpret this as relatively positive news for shareholders. And the actual cumulative total shareholder returns of every broad-based stock option company group clearly beat a broad market average for public companies. So far, it would appear that the positive performance of the broad-based stock option companies—especially in the productivity area—may have counterbalanced the dilution that these plans would have been expected to cause. With this study, we cannot look into the "black box" of each company and understand precisely what accounted for the productivity increases and changes in total shareholder return. Moreover, obviously, there will be some broad-based stock option companies who had dilution, and we have not explored that group or why that was the case

The Tobin's Q Evidence

The Tobin's q evidence is particularly important in this analysis because the Tobin's q number expresses a ratio of the market value of assets to the estimated replacement cost of assets and tells us whether a company is currently worth more than the replacement cost of its assets. It is a sign that investors believe there are good opportunities for the business. The market value of a company is more than the replacement cost of its assets when q is greater than 1. In brief, the Tobin's q findings are that the levels of Tobin's q of broad-based stock option companies tend to be higher than the Tobin's q levels of all public companies, although there is some mixed evidence, and this is not the case regarding annual growth rates in Tobin's q. Now, let us consider the data in more detail. Those findings that are reported are statistically significant differences unless otherwise noted. Initially, we will examine the 1997 levels for stock option versus all public companies without holding constant employment, capital intensity, and industry group differences. At the end of the period in which they had broad-based stock option plans—that is, 1997, the last year for which data is available—broad-based stock option companies had higher mean Tobin's q levels (their score is 3.67) than all public companies (their score was 2.44) of 1.23. They were more valuable companies. Compared to their industry peers, all stock option companies had a higher mean Tobin's q of 0.51. All surveyed broad-based stock option companies had a higher mean Tobin's q of 0.77 (their score was 3.21) than all public companies (whose score was 2.44). Moreover, surveyed stock option companies with more than 50% nonmanagement employees receiving grants had a higher mean Tobin's q of 0.91 (their

score was 3.35) than all public companies (whose score was 2.44). But surveyed stock option companies with more than 50% nonmanagement employees receiving grants had a mean Tobin's q that was not significantly different than their paired peers.

Regarding the average annual change in Tobin's q from 1992-1997, broad-based stock option companies had 0.9 greater average annual change in Tobin's q than all public companies. However, the average annual change in Tobin's q for broad-based stock option companies was 1.78 less than their paired peers. And surveyed broad-based stock option companies with more than 50% nonmanagement employees receiving grants had 2.28 less average annual change in Tobin's q than their paired peers without broad-based plans.

Now let us look more closely at Tobin's q but perform a more rigorous statistical test by holding constant company size according to total employment, capital intensity, and industry group. This analysis allows us to compare the Tobin's q effects of like broad-based stock option versus like public companies. Using this approach, broad-based stock option companies had 0.61 higher Tobin's q than all public companies and 0.62 more than their paired peers. Surveyed broad-based stock option companies with more than 50% nonmanagement employees receiving grants had 0.53 higher Tobin's q than all public companies but a Tobin's q similar to their paired peers. Surveyed broad-based stock option companies with less than 50% nonmanagement employees receiving grants had similar Tobin's q to all public companies and their paired peers. And the 385 corporations whom the press had publicly identified as having broad-based stock option plans, but were not surveyed and whose percent of nonmanagement employees receiving grants was unknown, had 0.68 higher Tobin's q than all public companies and .824 more than their paired peers. This suggests that broad-based stock option companies were indeed more valuable companies in 1997. But, as emphasized earlier in this article, the key question is whether this increase in value happened after the introduction of broad-based stock options.

Let us now examine the change in Tobin's levels and annual growth rates from the period 1985–1987, before the programs were introduced, to the 1995–1997 period after the programs were introduced. Obviously, this analysis relies on a much smaller sample because we were limited to analyzing firms that had no missing data in all years of both periods. We continue to hold the size of company by employment, capital intensity, and industry group constant. We found that that in 1985–1987, companies that later became broad-based stock option companies had an average Tobin's q that was 0.312 significantly higher than all public companies in 1985–1987 and .269 higher than their paired peers in 1985–1987. This suggests that the companies that

later adopted broad-based stock options were already more valuable companies. Nevertheless, by 1995–1997, broad-based stock option companies still had higher Tobin's q levels than non-broad-based stock option companies. The change in Tobin's q over the period was 0.216 higher for broad-based stock option companies over the change for all public companies. This indicates that the stock option companies maintained their edge in Tobin's q and then improved upon it. One caveat here is that the difference in the 1985–1987 to 1995–1997 change was not significant when broad-based stock option companies were compared to their paired peers.

But the story was quite different for Tobin's q growth. Broad-based stock option companies did have 0.075 higher Tobin's q annual growth in 1985–1987 than all public companies. However, compared to their paired peers, the broad-based stock option companies had lower Tobin's q growth in the 1985–1987 period. But there was no difference in the change in Tobin's q growth of broad-based stock option companies between the 1985–1987 period and the 1995–1997 period. However, compared to their paired peers all stock option companies did have a 1.189 less Tobin's q growth by 1995–1997.

To check this conclusion, we went one step further. The above before-and-after study for all broad-based stock option companies assumes that their year of adoption was before 1997 and that their post-adoption period was 1995–1997. Now we looked only at those broad-based stock option companies that filled out the survey where we actually know the exact data on which the plan was adopted. These were compared to all non-broad-based stock option companies for which data was available over the entire period and all paired peers. In this analysis, broad-based stock option companies do not significantly differ from all public companies or their paired peers in their Tobin's q levels between the 1985–1987 and the 1995–1997 periods. For Tobin's q growth, broad-based stock option companies do not significantly differ from all public companies in their Tobin's q levels between the 1985–1987 and the 1995–1997 periods. But they do have 1.35 less Tobin's q growth than their paired peers, although this is based on a very small sample.

In conclusion, these findings present a mixed to positive picture. Several of the pre/post analyses suggest that stock option companies did have higher Tobin's q before adoption of the broad-based plans. Thus, it appears as with the total shareholder return measure that the more valuable companies adopted broad-based plans. The Tobin's q findings are that the levels of Tobin's q of broad-based stock option companies in general tend to be higher than the Tobin's q levels of all public companies, although there is some mixed evidence and this is not the case regarding annual growth rates in Tobin's q.

The Return on Assets Evidence

In brief, the evidence shows that the levels of return on assets of broad-based stock option companies may be significantly higher than that of all public companies, although there is inconclusive evidence regarding annual growth rates in return on assets. Now let us consider the data in more detail. In this discussion, the results that are reported are statistically significant differences. Initially, we will examine the 1997 levels for stock option companies versus all public companies without holding constant employment, capital intensity, and industry group differences. At the end of the period in which they had broad-based stock option plans—i.e., 1997, the last year for which data is available—broad-based stock option companies had a 6.48% higher mean return on asset levels (their score is 16.5%) than all public companies (their score was 10.02%). But surveyed broad-based stock option companies had a 1.94% lower mean return on asset levels (their score was 8.08%) than all public companies (whose score was 10.02%). Broad-based stock option companies and surveyed stock option companies with more than 50% nonmanagement employees receiving grants had mean return on asset levels that were not significantly different than their paired peers.

Regarding the average annual change in return on assets from 1992–1997, broad-based stock option companies had a 0.98 greater average annual change in return on assets than all public companies. However, the average annual change in return on assets for broad-based stock option companies was not different than their paired peers. Moreover, surveyed broad-based stock option companies and surveyed broad-based stock option companies with more than 50% nonmanagement employees receiving grants did not have average annual changes in return on assets significantly different than non-broad-based stock option companies. And broad-based stock option companies with more than 50% nonmanagement employees receiving grants did not have average annual changes in return on assets significantly different than their paired peers. These findings are mixed. Most of the observations suggest that the return on assets performance of stock option companies is not significantly different than that of all public companies. But this is not true for the paired peers.

Let us look more closely at return on assets but perform a more rigorous statistical test by holding constant company size according to total employment, capital intensity, and industry group. This analysis allows us to compare the return on asset level effects of like stock option companies versus like public companies. Broad-based stock option companies did not have significantly different returns on assets than all public companies or their paired peers. Surveyed broad-based stock option companies with more than

50% nonmanagement employees receiving grants had a significantly lower return on asset levels (6.6% lower) than all public companies of (where it was 6.2% lower compared their paired peers). However, these negative findings are at low levels of statistical significance. (There is a 95% level of confidence in the first figure and only a 50% level of confidence in the second figure.) Surveyed stock option companies with less than 50% nonmanagement employees receiving grants had similar return on asset levels to all public companies and their paired peers. And the 385 corporations who the press had publicly identified as having broad-based stock option plans, but who were not surveyed and whose percent of nonmanagement employees receiving grants was unknown, had a 2.49% higher return on asset levels than all public companies (but levels not dissimilar from their paired peers). On balance, this analysis also suggests that the performance of the stock option companies is not significantly different than that of all public companies. Five of the eight results follow this pattern, while one is positive. The two negative results and the one positive result are at lower levels of statistical significance. One key question remaining is whether there is any systematic evidence that an increase in the level or annual growth rates in return on assets happened after the introduction of broad-based stock options.

Let us examine the change in return on asset levels and annual growth rates from the period 1985–1987, before the programs were introduced, to the 1995–1997 period after the programs were introduced. Obviously, this analysis relies on a much smaller sample because we were limited to analyzing firms that had no missing data in Compustat in all years of both periods. This analysis continues to hold size of company by employment, capital intensity, and industry group constant. We see that in 1985–1987, broad-based stock option companies had an average return on asset levels that were not significantly different than all public companies or their paired peers. Nevertheless, by 1995–1997, broad-based stock option companies did have a 2.5% higher return on asset levels than all public companies and 2.048% higher return on asset levels than their paired peers. This suggests that while the broad-based stock option companies did not have an edge in return on assets in 1985–1987, they significantly improved upon this situation by 1995–1997.

The story was different for return on asset growth. Broad-based stock option companies did have a 0.583% higher return on asset annual growth in 1985–1987 than all public companies, but their growth was not different than that of their paired peers. But there was no difference in the change in return on asset growth of broad-based stock option companies between the 1985–1987 period and the 1995–1997 period when compared to non-broad-based stock option companies and to their peers.

To check this conclusion, we went one step further. The above before-and-after study for broad-based stock option companies assumes that their year of adoption was between 1988 and 1994 and that their post-adoption period was 1995–1997. Now we looked only at those broad-based stock option companies that filled out the survey where we actually know the exact date on which the plan was adopted. These were compared to all public companies for which data was available over the entire period and all paired peers. This portion of our analysis indicates that the return on assets does not vary significantly for either level or growth from the full set of companies generally or when compared to their same industry pair.

These findings present a mixed to positive picture. Several of the simple performance comparisons and the performance comparisons with controls do suggest that broad-based stock option companies did have higher returns on assets in 1997. This is borne out in two pre/post comparisons when broad-based stock option companies are compared to all public companies and to their paired peers. Thus, the available evidence suggests that the levels of return on assets of broad-based stock option companies may be significantly higher than that of all public companies although there is inconclusive evidence regarding annual growth rates in return on assets while there is some mixed evidence of this overall effect.

The Compensation Evidence

Data was available on the total compensation expenses of the companies from the Standard and Poors Compustat database. We should caution the reader that some scholars consider the compensation data available in Compustat to be unreliable. It is certainly missing for many companies (because its reporting is not required), so this part of our study is based on a much smaller sample. Because it is the only public information available, we choose to consider it and report the findings as an initial look at this important question. More definitive conclusions will likely emerge from the U.S. Department of Labor Bureau of Labor Statistics survey in the fall of 2000. For each company in the study a logarithm called labor costs per employee was developed using these data. This allowed a comparison of the compensation levels and growth of the broad-based stock option companies to all public companies in Compustat and to the paired peers. In brief, this analysis found that broad-based stock option companies did not substitute stock options for fixed wage cuts and that they continued to maintain a compensation edge in fixed pay that they had before the introduction of broad-based stock options. However, broad-based stock option companies did not continue to raise fixed wages beyond the raises of all public companies.

Let us look at the findings in more detail. The compensation levels of the broad-based stock option companies were 7.8% higher than all public companies in Compustat in the 1985–1987 period before these firms are assumed to have adopted broad-based stock options. This means that the broad-based stock option companies were firms that compensated their employees more than other companies controlling for employment size, capital intensity, and industry group before the introduction of the plans. By 1995–1997, the compensation levels for the broad-based stock option companies were still 7.7% higher than all public companies in Compustat. However, the difference in both compensation levels and annual growth between the 1985-1987 and the 1995–1997 periods for both groups of firms was not statistically significant. These results indicate that the broad-based stock option companies paid their employees close to 8% more than other companies before they instituted broad-based stock options. They maintained their compensation edge after instituting broad-based stock options, although they did not significantly increase their levels or growth after the introduction of broad-based stock option plans relative to all public companies for which information is available. The broad-based stock option companies were not like little high-tech startups that paid employees poor wages and gave them stock options instead. Also, there is no evidence that the broad-based stock option companies cut fixed wages and substituted stock options for them. This is evidence that the broad-based stock option companies had the same fixed wage increases over the 1985–1987 to the 1995–1997 period as all public companies and that they continued to maintain their relative advantage of higher compensation. But the broad-based stock option companies did not expand their compensation edge either in terms of levels or growth. Thus, the trajectory of further fixed wage increases beyond their earlier edge remained flat after the introduction of broad-based stock option plans, although it was no flatter than all public companies in general.

What are the implications of these findings for the debate between the U.S. Federal Reserve Board and the U.S. Department of Labor regarding the role that broad-based stock options might be playing in wage inflation? Remember that the Employment Cost Index of the U.S. Department of Labor does not include stock option pay, and both Federal Reserve researchers and officials have suggested that the broad use of stock options may represent unmeasured and hidden wage inflation (see Lebow, Sheiner, Slifman, and Starr-McCluer 1998 on the research position and Uchitelle 1999 on the Department of Labor/Federal Reserve discussion and debate on this question). While our data have distinct limitations, they certainly lend some support to the position that broad-based stock option payments during the period studied may have significantly contributed to unmeasured and hid-

den wage inflation. The reason is that this study found no systematic evidence of any kind that companies that adopted broad-based stock option plans reduced their fixed compensation in any significant way relative to all pubic companies for which data was available. There was no wage substitution according to this evidence. This may suggest that stock option payments were on top of fixed wages for a set of companies that the evidence establishes as already being compensation leaders. Indeed, this story is consistent with a number of reports of a tight and tightening labor market where broad-based stock options are playing a role in attracting and retaining employees. Some reports suggest that some employers are frantic and that the situation, especially in technology companies, is reaching crisis proportions.

Conclusion

The results of this study suggest that there is no systematic evidence that publicly traded corporations with broad-based stock option plans had worse performance records than two comparison groups, (1) the larger group of publicly traded corporations and (2) industry group pairs. We looked at productivity, total shareholder return, Tobin's q, and return on assets. Indeed, there is some evidence that the broad-based companies may have performed better. There is consistent and unambiguous evidence that broad-based stock option companies had achieved statistically significantly higher productivity levels compared to all public companies in general and among their peers. This is demonstrated by evidence contrasting the broad-based companies to the comparison groups before they instituted the plans and after they instituted the plans. The total shareholder return findings are that over the 1992–1997 period, broad-based stock option companies performed as well as the comparison groups and sometimes exceeded the total shareholder returns of these comparison groups. The actual average and median cumulative total shareholder returns for all groups of broad-based stock option companies from 1992–1997 exceeded those of all public companies. The average cumulative total shareholder returns of all broad-based stock option companies in the study statistically significantly exceeded those of all public companies. And the actual average and median cumulative total shareholder returns for all broad-based stock option companies in the study as a group also exceeded those of the largest 500 companies in Compustat from 1992–1997. (See table 1.)

For another measure of market value, the levels of Tobin's q of broad-based stock option companies in general tended to be higher than the Tobin's q levels of the comparison groups, although there is some mixed evidence, and this was not the case regarding annual growth rates in Tobin's q. The

available evidence suggests that the levels of return on assets of broad-based stock option companies may be significantly higher than that of comparison groups, although there is inconclusive evidence regarding annual growth rates in return on assets and some mixed evidence of this effect remains.

Table 1. Stock Option Plans and Pre/Post Plan Change in Performance Measures

Dependent variables	Productivity		Total Shareholder Return		Return on Assets	
Comparison Sample	Full	Paired	Full	Paired	Full	Paired
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
All companies w/data in both periods ^						
Broad-based stock option cos.						
1 Average level from 1985-87	9.30% ***	5.40% *	1.003%	0.742%	0.540%	0.354%
2 Average level from 1995-97	29.40% ***	22.20% ***	3.506% *	4.846% **	4.319% **	2.400% ***
Change from 1985-87 to 1995-97						
3 Broad-based stock option cos.	20.10% ***		2.503%		3.779% **	
4 Paired companies	5.30% **		1.680%		1.256% *	
5 **Average difference**	**14.8% *** **	**16.80% *** **	**0.823%**	**4.104%**	**2.523% ** **	**2.048% ** *
Total observations	12,870	768	9,942	636	13,032	774
Within-company change following adoption of non-management stock option plans ^ ^						
6 Pre-adoption	6.30% *	-8.20%	1.978%	-1.619%	3.604% **	1.912%
7 Post-adoption	14.00% ***	0.90%	-0.704%	-0.517%	4.611% *	2.483%
8 **Average difference**	**7.70% ** **	**9.10% ** *	**-2.682%**	**1.100%**	**1.007%**	**0.570%**
Total observations	238	186	207	154	238	188
Demographic Information	SO Cos. w/50% or more of employees receiving options		All non-SO cos.		SO cos. in pairs	
Sales 000,000's	2731.66		1151.26		3515.85	
Employees 000's	10.053		5.654		9.689	
Capital intensity (total assets/employees) 000's	156.061		264.338		143.344	

* p<.10 ** p<.05 *** p<.01

^ Based on robust regressions run on all companies with complete data for the 1985-87 and 1995-97 periods. Controls include ln(employment) and ln(assets) interacted with each period, plus year dummies and 2-digit industry dummies.

^ ^ Based on residuals from robust regressions of performance variables on ln(employment), ln(net assets), and 2-digit industry variables run separately for each year. Reported results are based on stock option companies with at least two pre-adoption observations and two post-adoption observations. Observations were weighted using robust regression weights and number of observations per company so that the weighted number of pre-adoption observations equals the weighted number of post-adoption observations for each company, to provide a balanced pre/post comparison.

We have tried to present the results in this table in the most non-technical manner, but the statistical methodology of the study can be confusing. To help the reader understand the material more fully, we can describe the results in plain English. For instance, the row 5 observations show the average difference in performance measures between companies with broad-based stock options and both comparisons groups of companies (paired and the full set). The paired set compares broad-based option companies to matched non-stock option companies; the full set compares them to the industry. The first percentage stated in row 5 indicates a 16% improvement in productivity experienced by companies with broad-based stock options when compared to those companies in the full industry matched set and then additionally comparing broad-based companies to their paired company matches.

The 14.8% improvement is a strong assessment of productivity performance effects since the company was first compared to its entire industry and then compared to companies of similiar size and operating capacity. If this comparison were made solely on the full set of comparison companies, the market influences specifically impacting that particular size of company would not be captured.

Our interpretation of these findings is that the performance of the firms using broad-based stock options appears to equal or exceed the dilution that these plans initially would have caused. Dilution may have occurred in certain individual cases and, as noted, the total shareholder return performance of broad-based stock option companies clearly varies in individual years. But the systematic analysis of broad-based stock option companies yields little evidence of dilution to shareholders over this entire period and much evidence of opportunities for shareholders. Our view is that on balance, this is acceptable news for outside shareholders. It indicates that the performance of the firms after the introduction of the broad-based stock options essentially paid for the stock options. If these firms installed broad-based stock options to attract and retain workers in a tight labor market in order to realize their expectations of continued returns to shareholders, then the broad-based stock options can be viewed as a success.

Regarding the compensation levels and growth of broad-based stock option firms, this analysis found that broad-based stock option companies did not substitute stock options for fixed wage cuts and that they continued to maintain a compensation edge in fixed pay that they had before the introduction of broad-based stock options. However, broad-based stock option companies did not continue to increase wages beyond their earlier edge. This is evidence that firms that were high compensation firms before the introduction of broad-based stock options may have used the program to restructure their compensation systems. Thus, they may have aligned compensation systems with shareholder value by perhaps abandoning further increases in their fixed wage compensation edge and providing these further increases in the form of broad-based stock options. While our data have distinct limitations, they certainly lend some support to the position that broad-based stock option payments during the period studied may have significantly contributed to unmeasured and hidden wage inflation.

We would caution against simplistic interpretations of our findings. We are not saying that the broad-based stock option plans caused improved performance. We are only observing that they are associated with certain kinds of performance and the absence of a certain kind of dilution. Nevertheless, we have used methods that have taken into account a number of alternative explanations.

It is particularly important not to lose perspective about the productivity findings. While the productivity evidence is particularly relevant to this analysis because the productivity measure is one over which individual employees and groups of employees may have some direct influence or some indirect involvement, it is important not to view the productivity evidence as merely suggesting that workers just worked harder once their companies announced broad-based stock options. Productivity increases

certainly could be a result of the active involvement of workers. However, productivity increases could just as likely be the result of more passive components such as workers' acceptance of restructuring and technologies and other major events that might have the impact of increasing sales while holding the head count constant or decreasing the head count while holding sales constant or increasing sales. It is possible that a variety of these components could account for the productivity increases. Obviously, we were not able to measure all the possible answers to this question. It remains a black box to us. That may be a useful focus of follow-up research. This cautious perspective is not to underplay the importance of the productivity evidence, but it should serve as a warning against facile formulas to explain it.

We would end with one further cautionary note. While our use of the pre/post study discounts the explanation that broad-based stock option companies in 1997 or 1992–1997 were simply displaying earlier performance superiority, there is one important possibility for which we have not accounted. It is possible that companies that decided to adopt broad-based stock options made the decision to adopt these plans as their productivity was going up as a kind of simultaneous event. They could have been motivated by an interest in rewarding employees for positive changes that were currently taking place in the company, and they may have seen this as a way to retain employees as the labor market tightened. They may have been under no illusion that the plans preceded or caused better performance.

The surveyed broad-based stock option companies indicated that the top three objectives for the broad-based stock option plan among their companies were to retain key employees, align employee interests with shareholders, and create an employee ownership culture. Only 3%, 4%, and 12% respectively of the companies reported that these three objectives were not met. Rewarding individual performance was the fourth objective, with all four being chosen as top objectives by 60% of the firms (Weeden, Carberry, and Rodrick 1998). This report has not assessed whether all of these objectives were met for the companies that adopted broad-based stock option plans. Based on our evidence, it does appear that the companies in general did succeed in aligning the interests of employees with those of shareholders. Attaining statistically significantly better corporate performance than all public companies or their industry group peers was not a stated objective of these plans. This study finds some evidence that may have happened.

Further research is needed to understand the details of how a performance improvement after the introduction of broad-based stock options may translate into an minimization of their dilutive effect. We need to understand whether certain ways of structuring broad-based stock option programs or combinations of stock option programs with other human re-

source management practices such as participation programs or teams affect the impact of such programs on corporate performance. We also need to better understand why firms adopt this form of compensation and to learn more about both the employee and company characteristics. We have not explored the impact of these effects on union versus nonunion workforces. We have not explored how the repricing of stock options may affect these questions (Byrne 1998; Morgensen 1998, 2000). We have not presented data on the dollar value of stock options for various classes of employees and the impact of the stock option endowment on their fixed compensation, namely, what proportion of fixed wages it represents.

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Notes

1. Note that results for productivity are actually expressed in natural logarithms (logs). Productivity, sales, and employment level are often expressed in logs as a way to "standardize" the results allowing a "like-to-like" comparison. Throughout the text, readers will note that we refer to the results for productivity in terms of "percentage" gain or loss. Technically, there is a calculation (log transformation) used to convert logs into percentages; however, the natural logarithms are close to percentages (e.g. log-point 9.3 becomes 9.8%) so we express our log results for productivity using percentages. The log-transformations can be obtained by contacting us.
2. The complete monograph (available online at <http://www.nceo.org/library/optionreport.html>) gives more detail about how we arrived at the total share-

holder return conclusions. In that discussion, we demonstrate certain issues regarding the methodology that was used to determine the results. We show how researchers can arrive at different conclusions depending on the method they choose, and we defend the methods that we decided to use. The longer article can be more useful for companies or consultants or law firms involved in debates over the effectiveness of such plans in assessing what the proper method may be for measuring the impacts of these plans and how some methods can introduce improper bias into that process.

3. We also compared broad-based stock option companies to the largest 500 companies in Standard and Poors' Compustat, a kind of proxy for the S&P 500, but we do not discuss those results here due to space limitations. These results do not change our conclusions.

4. In this study, whenever we compared all broad-based stock option companies to all public companies, we subtracted the 490 broad-based stock option companies from the group of all public companies. The reason was to keep the two groups distinct. However, in the case of the comparison of all broad-based stock option companies to the 500 largest public companies in Compustat, we did not do this. The reason is that it is indeed common and customary for investors to compare individual companies that are themselves in the S&P 500 to the entire S&P 500 in order to gauge company versus large company market comparisons. We wanted to preserve this practice for this particular comparison.

In this context, it can be very difficult to draw conclusions from the experiences of one or two companies or to draw conclusions from one or two years of data for a larger group of companies. Indeed, the general media and to some extent the business press have adopted a formulaic explanation of how broad-based stock options work: "Companies use options to attract the best employees, companies are exploding with growth, stock prices soar, thus workers get richer and shareholders benefit." So it is odd indeed that virtually a decade in broad-based stock option boom has taken place without an extensive public assessment of these assumptions. It is very easy for hidden or overt bias to seep into stories of one or a few companies or for the initators of a new company program—namely, management—to give their own program a positive evaluation. Our key challenge is how to structure a study to get beyond the method of "advanced story-telling" employed up to now.

How the Companies to Study Were Chosen

In 1998, the NCEO conducted a unique survey of companies with broad-based stock option plans. (See Weeden, Carberry, and Rodrick 1998, vii and 4–7 for more details; a copy of the survey is in the book's appendices.) A list was made of 1,360 companies that might have broad-based stock option programs. NCEO defined a broad-based stock option program as one where a majority of full-time employees at the company actually receive options over a reasonable period of time. The list included companies that nine major national compensation consulting organizations suspected might have such programs as well as those that had made public announcements in the media about the implementation of such programs. A survey was mailed to each of these 1,360 companies in early 1998, and 141 responses were received, yielding a response rate of 10.4%. Of these 141 responses, the NCEO determined that 96 were both complete enough for its analysis and also met the definition of a broad-based stock option plan. The NCEO published the book *Current Practices in Stock Option Plan Design* in 1998 to report on the characteristics of the broad-based stock option plans of these 96 companies (Weeden, Carberry, and Rodrick 1998).

Our group of researchers at Rutgers University requested permission to use the database to perform an analysis that would focus exclusively on the performance and compensation effects of these plans. The agreement was that Rutgers University team would work independently in arriving at and publishing our results and make them available in a final report to the organizations that facilitated the initial survey. All data on company performance were taken from the publicly available Standard and Poors Compustat database of information on public corporations which is available at Rutgers

University. No performance data were used from the surveys or from management. For our research, we were able to match 105 of the NCEO sample stock option companies to Compustat data, which enabled us to carry out our economic analysis. In addition to these 105 companies, the NCEO and its partners were able to identify another 385 companies, all of which extend stock option grants beyond the senior management level, that we could also match with Compustat data. (Note: The 105 were drawn from the list of 141 companies. This number is greater than the 96 the NCEO analyzed because we did not need all the data the NCEO needed for its work.)

This report focuses on these 490 public companies with broad-based options. The study compares the performance of these broad-based stock option companies to two comparison groups. The first comparison group is all other public companies, obviously excluding the 490 companies that we know have such plans. The second comparison group is made up of the next largest and the next smallest public company in each broad-based stock option company's industry group (in terms of total employment), again excluding the 490 firms that we know have such plans. One disadvantage of this study is that we cannot be absolutely sure that all of the comparison group companies are actually non-broad-based stock option companies and do not have such plans. This may be a particular problem for the technology sector, where broad-based option plans are now the norm. We have made reasonable attempts to do this based on the available information. However, an advantage of the study is that the use of the two comparison groups are large enough to counter-balance this problem.

Why does this research use two groups of broad-based stock option companies and then two groups of comparison companies? It is the best attempt that we could construct to deal with further sources of hidden bias. The survey information on broad-based stock option from the NCEO was used to identify companies that we know have broad-based plans and to assess the percentage of non-management employees in the broad-based stock option plans. Because companies do not have to publicly disclose the percent of non-management employees in the broad-based stock option plans, the only way to find out is to ask them. A skeptical observer could rightly be doubtful if the results of this study were only based on 141 (actually 105 usable replies for our purposes) companies who returned their survey out of 1360 companies who were sent the survey! One could argue that perhaps only the most successful companies had the motivation to return their surveys.

In order to deal with this skepticism and make the analysis as robust as possible, the researchers also used an additional group of broad-based stock option companies that had publicly announced their plans but did not participate in the survey (the 385 companies). This information was made