

December 1993

Why Small Manufacturing Firms Shun DCF

Joe Walker

University of Alabama, Birmingham

Richard Burns

University of Alabama, Birmingham

Chad Denson

North Georgia College

Follow this and additional works at: <https://digitalcommons.pepperdine.edu/jef>

Recommended Citation

Walker, Joe; Burns, Richard; and Denson, Chad (1993) "Why Small Manufacturing Firms Shun DCF," *Journal of Small Business Finance*: Vol. 2: Iss. 3, pp. 233-249.

DOI: <https://doi.org/10.57229/2373-1761.1138>

Available at: <https://digitalcommons.pepperdine.edu/jef/vol2/iss3/4>

This Article is brought to you for free and open access by the Graziadio School of Business and Management at Pepperdine Digital Commons. It has been accepted for inclusion in The Journal of Entrepreneurial Finance by an authorized editor of Pepperdine Digital Commons. For more information, please contact bailey.berry@pepperdine.edu.

Why Small Manufacturing Firms Shun DCF

Joe Walker, Richard Burns, and Chad Denson

Although there is ample literature on the use of capital budgeting techniques by small firms, there is practically no research available on *why* small firms don't use discounted cash flow methods. This paper looks at this *rationale* issue in the light of Brigham's 10 hypotheses (in *Fundamentals of Financial Management*, sixth edition). Support is found primarily for Brigham's ignorance hypothesis, but also for his other hypotheses concerning small firms' short-run cash flow orientation, the comparatively small size of their projects, the managers' overall knowledge of their firms, and the irrelevance of value analysis when the value of the firm itself is unknown. Furthermore, small firms seem quite satisfied with their present techniques. Since the chief difficulty of small firms is forecasting future cash flows, changing to more sophisticated techniques offers no obvious and effective remedy for that problem.

I. INTRODUCTION

Studies of *larger* American firms reveal an extensive and growing use of discounted cash flow (DCF) models, particularly IRR, in capital budgeting decision making. Classic studies of this genre are Gitman and Forrester [7], and Petty, Scott, and Bird [10]. Useful reviews of this literature can be found in Mukherjee [9] and Scott and Petty [14]. However, results from studies conducted in the United Kingdom, Australia, and the U.S. indicate that *small* manufacturing businesses typically undertake little or no formal quantitative analysis of capital expenditure projects [see 8, 12, 13, 15]. Soldofsky [15], in his widely-known but now dated (1966) study, found in his sample of 126 small manufacturing firms that more than 50% of them relied solely on a simple payback criterion, and over 40% used no formal analysis. Of the 135 small manufacturers in the Scott, Gray and Bird 1972 study [13], about 51% used a payback criterion, and about 10% used DCF methods. Of the 214 small manufacturers in the 1983 Runyon [12] study, almost 70% relied upon either

Joe Walker • Associate Professor of Finance, School of Business, University of Alabama at Birmingham, University Station, Birmingham, AL. Richard Burns • Associate Professor of Finance, School of Business, University of Alabama at Birmingham, University Station, Birmingham, AL. Chad Denson • Assistant Professor of Finance, North Georgia College, Dahlonega, GA.

The Journal of Small Business Finance, 2(3): 233-249
ISSN: 1057-2287

Copyright © 1993 by JAI Press, Inc.
All rights of reproduction in any form reserved.

payback or some similar criterion; only 14% used a DCF analysis, and about 9% said they used no formal analysis at all. In this regard, the present study updates a 10-year hiatus on small firm capital budgeting surveys and finds that out of 213 firms 44% of them use a payback criterion, 22% use no formal analysis at all, and only 9% use DCF methods.

In particular, small manufacturing firms seem to shun discounted cash flow (DCF) techniques like net present value, internal rate of return, profitability indices, and discounted payback in favor of simpler methods like payback and accounting rate of return (when they use *any* formal method at all).

The goal of this study, however, is *not* to simply update previous studies and merely list what techniques small firms use but to investigate the *reasons* why small firms shun DCF capital budgeting models. The secondary goals of this study are to look at the reasons why some small firms *do* use discounted cash flow models and to investigate the problems *both* groups encounter with their capital budgeting methods.

Of special interest, therefore, to this topic is the sixth edition of *Fundamentals of Financial Management* [4, pp. 363-365] wherein Brigham submits ten hypotheses why small firms shun DCF. This list was chosen because of its convenience, the author's stature, and because it seemed to cover the major concerns in regard to small business capital budgeting expressed in the literature [1]. In summary form, they are:

1. The managers of small businesses are simply uninformed about the existence of these tools.
2. *Even if* the managers of small businesses did know about DCF methods, they wouldn't have the detailed knowledge to use them effectively.
3. The time and specialized talent for using DCF tools are lacking.
4. The small project sizes don't justify the costs of using formal DCF methods.
5. The managers of small businesses don't *need* these tools since they have a better *overall* picture of the firm and its markets.
6. The managers of small businesses have a short time horizon and, hence, are more cash and survival oriented.
7. Small firms face greater uncertainty in their estimates of long-term cash flows.
8. The values of small firms are not as easily observable. Therefore, NPV would not be as appealing since it measures a project's impact on such an unobservable value.
9. In addition, the small firms' managers may be more subject to achieving other goals beyond just those relating to firm value maximization.

10. It is more difficult for small firms to estimate their cost of capital. Since small firms are not usually publicly traded, neither their stock price nor beta is observable, parameters which are critical for DCF methods.

The design of the survey will be discussed in Part II, the results of the survey will be given in Part III, and summary, conclusions, and suggestions for future research will be given in Part IV.

II: SURVEY DESIGN AND SAMPLE CHARACTERISTICS

After an initial telephone contact, a questionnaire was mailed to the persons (usually president/owner) responsible for capital budgeting in small manufacturing¹ firms (under 500 employees²) from a nationwide business mailing list³. The survey was started in October, 1990, and was completed in November of 1991.

“The” survey was actually composed of three different sub-surveys (although many of the same questions appeared on each sub-survey) due to the possible responses to the two basic questions asked of the respondents in the initial telephone contact: (1) “Are you familiar with DCF?” and (2) “Do you use DCF?”⁴ The three possible combinations of answers to these questions are: “yes and yes” (YY), “yes and no” (YN), and “no and no” (NN). Most of the questions in the three sub-surveys are specific and provide a multiple-choice answer or fill-in-the-blank, but some were purposefully open-ended (e.g., what kinds of problems do you have with your capital budgeting method(s)?).

Out of 812 survey mailouts culled from 1558 telephone contacts, an *initial* 190 plus a *later* followup sample of 23 usable responses were obtained for a usable (mailout) response rate of 26.2% (or a *contact* response rate of 13.7%). Some of the participants returning surveys were larger than the SBA small firm definition of 500 employees, and these were deleted from the data base. Also, some of the surveys were incorrectly filled out and showed obvious signs of misunderstandings.

However, those firms *not* interested in participating were asked (on the telephone) for their age, size, and category in order to check for possible sample selection bias. The non-respondent data were *further* checked by a followup survey sample wherein firms that had initially expressed disinterest and firms that had expressed interest, but had not completed a survey, were recontacted by phone and subsequently by mail.⁵ These firms were sent another survey to complete, and their results were combined⁶ with those of the original respondents.

Table 1
Combined Respondent Data
By Size of Firm (# of Employees)

<i>Group</i>	<i>N*</i>	<i>Percent of All Groups</i>	<i>Median No. of Employees</i>	<i>Mean No. of Employees</i>	<i>Standard Deviation of No. of Employees</i>	<i>Minimum No. of Employees</i>	<i>Maximum No. of Employees</i>
NN	89	42.4	18.0	31.7	50.3	1	380
YN	78	37.1	30.0	69.2	98.2	2	500
YY	43	20.5	70.0	138.9	147.9	3	500
ALL	210	100.0	27.0	67.6	103.0	1	500

* based on number answering question (actual data with followup sample has 89 NN's, 81 YN's, and 43 YY's)

T-tests⁷ on these combined respondent samples (including survey followups) showed no statistically significant differences in the YY, YN, or NN age means. (*Note: all significance reports in this study are based on $\alpha = 5\%$ or lower. Furthermore, "significant" will henceforth mean statistically significant.*)

However, there *were* significant and substantial differences in sizes between all three categories shown in Table 1. In short, the extent of these firms' knowledge or use of DCF methods does differentiate them on a size basis.

However, the differences in size here are probably understated since the *percentage* of the NN group in the combined sample is significantly less than that in either of the two "control" samples (the non-responding telephone group and the followup mailing group) which were used to check for sample selection bias. Also, the YN and YY firms that initially returned surveys were significantly larger than their counterparts in their sample selection control groups (the YY respondents were even significantly older than the control YY group). In short, although the NN firms comprise a greater population proportion than shown above in Table 1, they are less likely to respond to a survey. Furthermore, smaller firms are less likely to know about DCF, much less use it.

The possibility of *within* group sample selection bias was investigated too. This was accomplished by running statistical tests of comparison *on every survey question* (except for the open-ended questions) on each of the three surveys between the original respondents and the survey mail followups. There were only three minor discrepancies (and then only in the smallest YY group). Thus, although more and bigger YN and YY firms returned surveys, there was no substantial evidence of sample selection bias within those groups as to *how* they answered the questions.⁸

One interesting aspect of the groups is that the coefficient of variation for the YY group (1.06) is much lower than that for the YN and NN groups (1.42 and 1.06, respectively) indicating that the YY group is much more cohesive. However, the three groups were further partitioned into “large” and “small”⁹ NN firms, large and small YN firms, and large and small YY firms to check for size effects on their responses to the survey questions. Overall, there was very little impact on survey responses within subgroups due to size; for example, a YN firm with 2 employees answered the survey nearly identically to a YN firm with 500 employees. What few differences were found will be mentioned in the body of the paper.

III: SURVEY RESULTS

For space purposes, this section of the paper will present survey results without commentary. All summaries, interpretations, and conclusions will be presented in Part IV.

The Brigham Hypotheses

The data for the first hypothesis (the ignorance hypothesis) were obtained from the answers to the initial telephone contacts wherein the respondents indicated their awareness or ignorance of DCF methods. The other nine hypotheses were asked on the YN *survey* in a true/false/not applicable (N/A) framework. The results are shown in Table 2.

The evidence is very supportive of the first (ignorance) hypothesis since, in the two control groups about 65% of all firms were simply *not* familiar with discounted cash flow methods. (This is in contrast to the downward biased estimate of 42.4% of NN firms not familiar with DCF as shown in Table 1.) Although this will be explained in more depth in the section on “Acquiring DCF Methods,” the primary reason for such ignorance of DCF appears to be a lack of education in business methods.

The primary focus, though, was on the application of Brigham’s other nine hypotheses to the unbiased estimate of 26% (vs. the biased 37.1% in Table 1) of firms who were familiar with DCF but didn’t use it for one or more reasons (the YN group). For these YN firms, the reason chosen most often for *not* using DCF was the emphasis on short-term cash recovery and payback (74%). The next most important factors for shunning DCF methods were the small project sizes (65%), the expected futility of formal analyses (62%), and the inability to measure the (resulting) value of the firm from such projects (61.8%). The least important factor in eschewing the use of DCF was the problem of estimating the cost of equity capital (34.2%), thus indicating some support for all 10 hypotheses.

Table 2
Brigham's 10 Hypotheses

<i>Hypotheses</i>	<i>True</i>	<i>False</i>	<i>N/A</i>
1. Small firms do not use DCF techniques because they are simply not familiar with DCF methods. (Determined by unbiased telephone and followup surveys.)	65.0%	35.0%	—
2. Although familiar with DCF, we do not use the techniques because we do not have a sufficient knowledge to apply them.	46.2%	48.7%	5.1%
3. We do not use DCF techniques because our management talent is spread too thin as it is, and we cannot take the time to use elaborate techniques to analyze a proposed project.	48.1%	46.8%	5.1%
4. We do not use DCF techniques because the comparatively small size of our project proposals does not justify the relatively large fixed cost associated with applying discounted cash flow analysis.	65.0%	28.8%	6.2%
5. We do not use DCF because as manager/owners of small firms we have a total knowledge of our operations and markets and find it both unnecessary and unfruitful to gather and formally analyze the details in a discounted cash flow model.	62.0%	36.7%	1.3%
6. We do not use DCF but instead rely on the payback period of our projects because we are most concerned with WHEN the cash committed to an investment will be recovered and thus available for new opportunities.	74.0%	20.8%	5.2%
7. We do not use DCF techniques because they require explicit estimates of cash flows through the life of a project, and we are uncomfortable making forecasts beyond a few years.	46.8%	40.5%	12.7%
8. Recognizing that the single most appealing argument for the use of net present value (NPV) in capital expenditure decisions is that the technique gives an explicit measure of the effect of the investment on the value of the firm, we do not use DCF (NPV) because our stock is not traded in public markets and the value of our firm is not easily determined or observed.	61.8%	22.4%	15.8%
9. We do not use DCF because as owner/managers of small business firms we are most concerned with quality and service and therefore may make an investment that would be rejected on purely economic grounds.	50.0%	43.6%	6.4%
10. We do not use DCF because we have no reliable basis for estimating our cost of equity capital.	34.2%	57.9%	7.9%

Two of these hypotheses were, however, affected by the size of the responding YN firms. Hypotheses four and nine were (significantly) more likely to be answered "true" by smaller YN firms.

However, the YN surveys went further than these 10 hypotheses in an effort to probe deeper into the fundamental problems underlying the use or non-use of DCF methods. The following sections provide a summary of the findings from the YN as well as the NN and YY respondents.

Non-DCF Methods

When asked to specify what capital budgeting methods they *did* use, 81.3% of the YN firms answered “payback,” alone and in combination¹⁰ with other methods. For the NN firms, a significantly lower 50.1% said payback.

Only 18.8% of the YN firms used “accounting rate of return.” In fact, the predominant permutation of answers for the YN firms was “payback” alone (65.3%), followed very distantly by “payback *and* accounting rate of return” (14.7%). A lesser 14.6% of the NN firms used *only* the accounting rate of return compared to the 18.8% of the YN’s who used it alone, but the difference was not significant.

Also, a meager 15.0% of the YN firms used “other” methods which included miscellaneous answers such as “the ability of the investment to make us more competitive” (n=4), “the sales/capacity ratio,” “the ability to pay from cash on hand,” “intuition,” “100 times gross sales over a 5-year period,” “appropriate need,” “required by contract,” “impact on quality,” “effect of reduced labor costs,” and “impact on productivity.”

A much larger 40.5% of the NN firms used “other” methods which represented an assortment of vague answers, mostly “need.” This was significantly higher than the 15.0% of YN’s who marked “other” methods.

Even 63.4% of the YY firms used *non-DCF* methods *in addition to* DCF methods, a result consistent with large firm capital budgeting surveys [6, 9, 13]. Payback was the most popular choice with 55.6%, followed by 11.1% who said “gut feeling,” followed by a negligible percentage of “miscellaneous” answers.

Why Those (Non-DCF) Methods?

To the open-ended question of “Why *those* other (non-DCF) methods?,” the predominant response (49%) of the 51 YN firms who answered “*payback*” was that it was “simple to use.” Only 9.8% said they used payback because they were familiar with it, and only 11.8% said they used it because it worked. Another 9.8% of the responses even *said* to refer to Hypothesis 6 on the survey (emphasizing the short-term cash orientation hypothesis). A larger 19.6% answered “other” and gave miscellaneous reasons such as the “cyclical nature of their business,” “their accountant’s recommendation,” and “only had small projects.” For the few NN firms (n=16) who answered “payback,” the

clearly dominant reason was the simplicity. Only six of the NN firms mentioned the accuracy. Another four NN firms reported it was the only method they knew. The rest of the NN responses were a miscellaneous collection of "it's more appropriate for rapidly developing technology," "better for firms with high sales variability," "more appropriate for short-term projects," and "flexibility."

For the three YN firms that used the accounting rate of return and answered this question, the only reasons given for its use were that it was either "habit" or due to their "accountant's recommendation." For those NN firms who used the accounting rate of return, one mentioned that it was "traditional," another noted that "90% of their investment was for inventory," another said it was "more practical" for depreciation accounting, and one said it was "recommended by their CPA."

For the YN respondents who indicated that they used some "other" capital budgeting technique besides payback or ARR, the reasons given were of a miscellaneous nature such as "convenience," "the uncertainty or the cyclical nature of their business," and "the absence of staff knowledge of other methods." For the "other" category of methods, there was no dominant response among the NN firms, only an assortment of answers from those who said that they used other methods because they were "required by contract" (1), that they were "proven" (1), that "there were too many unknowns to use the standard procedures" (1), and that other methods were "easier."

The YY firms were not asked "why those other methods" since the focus of their survey was on DCF methods.

Perceived Success Rates of Capital Budgeting Methods

The firms in the three samples were not asked for more objective measures of their capital budgeting success such as ROA, ROE, or profits for two primary reasons—the concern with the accuracy of such information coming from small businesses, and the concern with lower response rates by firms very reluctant to participate even without being asked such proprietary information. Instead, they were simply asked what their estimated (subjective) success rate (in percent) was using their capital budgeting methods. The YN firms' perceived success rates ranged from 50% to 100% with a mean of 84.1%. The NN firms' perceived success rates ranged from 25% to 100% with a mean of 87.1%, but it was not significantly different from that of the YN firms. However, the 68.9% perceived success rate of the YY firms was significantly lower than that of the YN and NN firms.

Chi-square tests were also run to see if there was any relation between methods and perceived accuracy. Only for the NN firms were significantly

higher than expected success rates found for the use of “other” methods (other than payback or ARR). For the YN and YY groups, there were no statistically significant relationships between *any* of the methods and perceived accuracy.

Problems with DCF and non-DCF Methods

When asked about problems with their non-DCF methods, 12.5% of the YN respondents and 10.1% of the NN firms noted the time it took to do an analysis, not a significant difference. However, the percentage of YY firms citing time as a problem (34.9%) with their DCF methods was significantly higher than the YN and NN firms.

Only 8.8% of the YN firms and 4.5% of the NN firms mentioned the cost of doing a formal analysis with their non-DCF methods, not significantly different. However, 0.0% of the YY firms mentioned cost as a problem for DCF methods, significantly lower than the YN and NN firms.

However, 56.3% of the YN firms and 49.4% of the NN firms mentioned the difficulty in *forecasting* such items as revenues and costs. An even larger 65.1% of the YY firms said forecasting was a problem with their DCF methods. However, there was no significant difference between the three groups on this issue.

A meager 7.5% of the YN firms and 9.0% of the NN firms mentioned “other” problems which were largely unspecified. An even lesser 2.4% of the YY firms mentioned “other” problems with their DCF methods. There was no significant difference in the three groups.

As for problems particular to the YY firms actually using DCF methods, the YY firms’ problem of estimating the cost of capital received considerable mention (37.2%). To compare, recall that 34.2% of the YN respondents said that they did not use DCF because they had no reliable basis for estimating their equity cost of capital.

Income Measures

Most of the YN firms used two or more income measures. A substantial 46.3% of the YN firms, 31.5% of the NN firms, and 50.0% of the YY firms answered “net cash flow.” A comparable 35.0% of YN firms, 48.3% of the NN firms, and 20.0% of the YY firms answered “net income.” Furthermore, 33.8% of the YN firms, 13.5% of the NN firms, and 35% of the YY firms answered “operating income.” A lesser 3.8% of the YN firms, 12.4% of the NN firms, and 10.0% of the YY firms answered “other income measures.” There were no significant differences between the three subgroups with respect to “operating income” or “other,” but the NN firms did rely on “net income” significantly more than the other two groups. Furthermore, the YN

firms rely more on net cash flow than the other two groups. Finally, the only significant size effect found within a subgroup was that "larger" NN firms relied more on operating income.

Forecast Ranges

The firms were then asked *how far* into the future they felt comfortable forecasting their cash flows (or whatever measure of income they used in that regard). The mean response for the YN firms was an average of 2.9 years with a range of 0.0 to 10 years.¹¹ The NN firms only felt comfortable forecasting income a mean of 2.7 years with a range of 0 to 10 years, not significantly different from the YN firms. However, the YY group had a range from 0.5 to 30 years with an average 4.6 year horizon, significantly different from both YN and YY. In short, the YY firms have a planning horizon roughly 50% longer than the YN and NN firms.

Forecast Confidence

Although the future income forecasts were seen as the chief difficulty with capital budgeting, 5.4% of the YN firms, 15.9% of the NN firms, and 2.3% of the YY firms felt "very confident" of their estimates. A substantial 64.9% of the YN firms, 54.9% of the NN firms, and 72.1% of the YY firms felt "confident." A much lesser 29.7% of the YN firms, 28.0% of the NN firms, and 25.6% of the YY firms felt "uncertain." None of the YN firms, 1.2% of the NN firms, and none of the YY firms felt "very uncertain."

There is no significant difference between the three groups' levels of confidence in their income or cash flow estimates. Nor were the levels of confidence found to have any significant relationship to the choices of capital budgeting methods, DCF or non-DCF.

Risk, Inflation, and Working Capital

But how *comprehensive* were the firms in handling the effects of risk, inflation, and working capital on their capital budgeting? Some 40.0% of the YN firms assessed the impact of different degrees of risk on their capital budgeting decisions, but only five gave intelligible responses indicating how they did this. Another three said they did a form of sensitivity analysis, one adjusted revenues and costs, and one required a faster payback for more risk. A comparable 38.2% of the NN firms took risk into account, but even fewer of them were able to give cogent reports as to *how* risk impacted their capital budgeting. Another two preferred more "universal" equipment to lower risk. Only one used sensitivity analysis. Another said risk affected his markup on

receivables. Yet another reported that if risk could lead to bankruptcy in a worst case scenario, then the project was rejected. A substantial 53.5% of the YY firms took risk into account. For the 13 YY firms that answered *how* they handled risk in their analyses, five adjusted the discount rate, five used sensitivity analysis, two adjusted the cash flow estimates, and one altered the payback period. There was no significant difference between the three groups on this issue.

Some 28.8% of the YN firms, 22.5% of the NN firms, and 37.2% of the YY firms made an effort to assess the impact of the expected rate of inflation on their capital budgeting, none of which were significantly different from each other. However, within the YN group, the larger YN's were significantly more likely to account for inflation than the small YN firms. In answer to *how* they handled inflation, three of the YN firms adjusted their cash flows, one adjusted the discount rate, and one used intuition. Another six NN firms said they "adjusted their cash flows," and one used sensitivity analysis. For the YY firms, three adjusted their cash flows, three adjusted their discount rate, and five used sensitivity analysis.

A much larger 70.0% of the YN firms, 53.9% of the NN firms, and 65.1% of the YY firms made an effort to assess the impact of working capital in their capital budgeting. Again, there were no significant differences between the three groups. Out of the 10 YN responses to *how* they took working capital into account in their capital budgeting analyses, half mentioned that internal financing was preferred over borrowing, and so financing was desired out of working capital. Other miscellaneous responses indicated using "sensitivity analysis," "inventory requirements," and "intuition."

The NN firms were largely concerned about drawing down working capital too far to finance capital budget projects. One firm said that "if he had to borrow, then he would invest less." Another said he would "take on more projects with more working capital." One used a sensitivity analysis. One said that he "adjusted the cash flow."

The major *way* ($n=6$) that the YY firms took working capital into effect was to downgrade the project the more working capital it required. Other answers included sensitivity analysis (1) and inventory requirements (1).

Seminar Interest

Only 25.6% of the YN firms, 21.6% of the NN firms, and 23.3% of the YY firms expressed interest in learning more about the application of DCF methods if seminars were offered under the auspices of the SBA¹² on that topic. There was no significant difference in those rates among the three groups.

DCF Users (YY Firms)

The YY firms used a *variety* of DCF methods. NPV and IRR were the dominant choices, with discounted payback a distant third. The profitability index and "other" responses were virtually insignificant. Seldom was any *one* method used alone. The highest plurality (20.9%) permutation of the rankings¹³ in this question was to have NPV ranked 1 and nothing else ranked at all. The next highest plurality (11.6%) was to have NPV ranked first, IRR ranked second, and nothing else ranked. Discounted payback makes a strong appearance but is still ranked much lower. However, the larger YY firms were significantly more likely to use discounted payback than the smaller YY firms.

Acquiring DCF Methods

In an effort to learn more about the *acquisition* of DCF methods, the YY survey asked *how* the respondents learned of whatever DCF methodology they were familiar with and using. Of the 51 answers to this open-ended question, "college experience" was clearly dominant (26 responses). Including "graduate school" increased the responses to 31. "Prior management experience" was noted by 6 respondents, and the rest cited miscellaneous means of acquiring DCF experience such as "study" (1), "research" (1), "professional literature" (1), "working on acquisitions" (1), "corporate requirements" (2), "used by company for many years" (2), "CPA on staff" (2), etc. One respondent could not recall how he learned of DCF.

When is DCF Used?

In order to see how extensively DCF analysis was applied in the YY firms, the owners/managers were asked if there was a cutoff size on their capital projects; 76.7% said "yes." The cutoff size averaged about \$30,000 with a range from \$1,000 to \$100,000 and a standard deviation of about \$36,000.

IV: SUMMARY AND CONCLUSIONS

Why do small firms shun DCF? First of all, about two-thirds (66%) of them are simply unaware of DCF methods. In fact, about half of them are unaware of *any* formal methods; and the other half mainly use payback. Thus, Brigham's first hypothesis is given updated and solid support by the results of this survey. As to the why of such ignorance, evidence from this study would seem to indicate that DCF knowledge is almost exclusively obtained

from formal education, viz., college experience. Our explanation, therefore, would be that most small manufacturers do not have college-level business training.

What makes the present study unique, however, is its focus on the 26% of the small firms which know what DCF methods are but still don't use them (recall, only about 9% of small firms actually *use* DCF methods). With this focus, we gain insight into the barriers that *knowledgeable* firms face in becoming DCF users. The reasons of this YN group for not using DCF are confirmed in different degrees by the hypotheses mentioned herein—the focus on a short time horizon and short term cash flows is cited most often (74.0%), followed by the small project sizes which don't justify the costs of a formal DCF methodology (65.0%). In fact, the smaller YN firms mention the small size of their projects significantly more than the larger YN firms as a reason for not using DCF methods. Next in that percentage range are the reasons of simply not needing DCF methods because of the total knowledge the owners/managers have of their company (62.0%) and the superfluous nature of DCF methods in the face of an unobservable company value (61.8%). The next reasons in order of importance for not using DCF are the focus on non-economic considerations (50.0%), the lack of time and talent to implement DCF methods (46.2%), the greater uncertainty in estimating small firm cash flows (46.8%), and the problems of estimating the equity cost of capital (34.2%). In this regard, the smaller YN firms mention the concern with quality and service significantly more than the larger YN firms.

Looking more closely, however, uncovers other reasons which seem to be correlated with DCF use or non-use. First of all, *larger* small firms use DCF methods significantly more than smaller firms do. This is why we would surmise that even if the NN firms learn about DCF, they would *still* shun DCF because of their small size. Perhaps, with increasing size, most of the firms that survive are firms that go on to use the more formal DCF methods. Furthermore, the employee size definition that seems to produce a significant Chi-square value in such a test occurs between 20 and 25 employees. What this may mean is that near some critical size, firms are simply forced by the complexity of their operations to acquire more sophisticated financial personnel or knowledge. In short, at some size, DCF analysis may become a monitoring device to lower agency costs. Still, DCF users retain payback (for a backup or maybe to check on a project's liquidity or to use on a small project) and even allow for "gut feeling." On the other hand, *within* subgroups (NN, YN, YY), there was no significant overall difference in how the firms responded—it made no difference if the firms in a subgroup had as little as 1 or as many as 500 employees.

Furthermore, DCF methods (and NPV in particular) seem to offer the most convenient settings for refinements in capital budgeting theory. For example, in the latest edition of a popular finance textbook [11] there is mention of strategic NPV, but no mention of strategic IRR or strategic payback.

Age has no correlation with the progression from NN to YN to YY. The implication here is that the financial knowledge level of firms is more accurately proxied by size, not by age. More evidence of this is that larger firms tend to use the more comprehensive measures of income such as net cash flow, while smaller firms rely more on net operating income and "other" (ad hoc?) measures. On the other hand, there was no difference in how much the three groups accounted for risk, inflation, or working capital in their capital budgeting analyses.

Furthermore, DCF knowledge is overwhelmingly gained in college courses. What this would seem to confirm is the slow filtering down of financial knowledge as a larger percent of the population becomes college-educated.

The *non*-users of DCF rely primarily on the payback method, although they also use the accounting rate of return method and "other" miscellaneous methods. The chief reason seems to be payback's simplicity—its ease of calculation (low time requirement) and understanding. By implication then, the relative complexity of DCF methods would be barriers to using them. But, according to Blatt [3], another incentive for using payback could stem from the firms having very short time horizons beyond which 'uncertainty closes in'; that is, beyond a few years it becomes pointless to estimate probabilities. Furthermore, firms want to protect themselves against the possibility of post-disaster losses.

Indeed, the short time horizons (less than three years, on average) of the non-DCF users would be another barrier to DCF acquisition since they would most likely reduce the *relative* inaccuracy of non-DCF capital budgeting methods. But Blatt [3] would not be surprised at these severely low numbers in the face of uncertainty, and would probably cite them as support for his derivation of a modified payback criterion.

It is also interesting to conjecture the direction of causality here—does the longer time horizon lead to an interest in DCF, or does the use of DCF lead to a willingness to stick one's neck out further into the financial future? Or is it simply just the larger *size* of a firm that affects both of these?

Non-DCF methods are not without their problems, though, particularly with respect to estimating future cash flows (however measured). But DCF methods in and of themselves apparently offer no improvement in this most important regard; in fact, the three groups of firms rated this problem similarly. They all rated the cost problem similarly. However, the time

involved in doing analyses was a significantly more important problem for the DCF-users because they *took* the time to do the analysis.

Furthermore, the *perceived* success rates of their capital budgeting techniques are fairly high for all three groups. In fact, the perceived success rate of DCF users is lower than that of DCF non-users. However, that may be misleading since the smallest firms may not be as sophisticated datawise. “Success” to them may just mean continuing in business. Regardless of the accuracy or meaning of “success,” the important point is that the *perceptions* of relatively high success rates (however unrealistic) would seem to be the greatest barrier of all to acquiring DCF methods—why incur the costs of learning and applying DCF analyses when the improvement would be marginal at best?

This would also explain the low interest in learning more about DCF in seminars, in an SBA context at least. Referring to Hypothesis 5, 62% of the YN firms found DCF analysis to be “... unnecessary and unfruitful...” On the other hand, many of the respondents volunteered very negative comments about the effect of government policies—they may have been wary of another government agency.

In any case, there was no significant difference in the confidence level of the forecasts of the three groups; nor was there any relationship between the techniques and forecast confidence levels between or within the three groups. In short, the fundamental problem small firms face is forecasting, regardless of the technique.

The shortcomings of the survey technique are well-known and documented, and this survey is no exception. Still, the imperfect revelations are always interesting, and, if nothing else, serve as a source of ideas and hypotheses for further research.

The virtue of this study is that it takes a deeper and more recent look into issues that traditional surveys of this kind have totally ignored—in particular, the *rationale* for DCF use or non-use and also the problems of *both* DCF and non-DCF capital budgeting methods. As such, it may help to provide insights for small businesses (and especially growing ones) that seek to improve their capital budgeting decision-making methods.

Suggestions for further research¹⁴ would be to explain why small-firm managers have such short time horizons, how small firms establish thresholds for payback tests, how capital budgeting criteria vary by *type* of project, and how small firms develop their forecasts for risky projects. Furthermore, do small firms shun DCF because it is conceptually deficient? How do small firms *really* use DCF as well as other decision criteria? Equally important would be obtaining an objective measure of technique efficiency to look deeper into the issue of what methods work and how well. (The authors’ personal conjecture is that the YY firms are found to be more

objectively successful with their techniques.) And finally, more research needs to be addressed in terms of non-manufacturing firms.

Acknowledgments

The authors wish to thank: UAB colleague Ted Bos, Professor Ricardo Leal of the Pontifical University of Rio de Janeiro, James Read of Incentives Research (Boston, Massachusetts), and the anonymous referees. All those who assisted in this project are also greatly appreciated.

NOTES

1. It was decided to survey manufacturers because of the homogeneous nature of the group and also because of precedent in the literature [e.g., see, 12, 13, 15].
2. This is the Small Business Administration definition of a "small" firm in the manufacturing sector [see, 6]. Its chief advantage over a measure such as sales or assets is its insensitivity to inflation rates. In addition, in the authors' previous research with small firms [see, 5], total assets, total sales, and number of employees were all highly correlated and made no difference in the analyses' results.
3. The mailing list was obtained from Zeller & Letica, Inc., 15 East 26th Street, New York, New York 10010.
4. The questions were asked in a conversational style, and responses were substantiated with back-up questions to discover possible miscommunications, ambiguities, or just plain "bluffing."
5. It cannot be emphasized too strongly how difficult the process of obtaining followup replies was. *Every single one* of the YY and YN owner/managers who did not fill out a survey was recontacted; and still the response rate was dismal. On average, the recontacted firms were extremely reluctant to participate in the survey. In any case, more details are available from the authors upon request.
6. With caveats, there is precedence in the marketing research literature [see, 2] for combining the original respondents and the followups in such circumstances.
7. There were no differences in significance levels (i.e., at 5% level or less) in t-test statistics based on assumptions about equal or unequal variances.
8. All such surveys are inherently biased anyhow since only the surviving firms' responses are being recorded.
9. The three subgroups were first split into halves at the median employee size, and then all tests were rerun between the "larger" and "smaller" firms within subgroups to see if there were size effects. In addition, the three subgroups were split into thirds by employee size, and again size effects were tested for comparing the top and bottom thirds.
10. Many of the questions on the three surveys give the respondents several possible combinations of answers. The numbers reported in this study give the percentage of total responses that all combinations represent. For example, for answer (a), the number reported will have the percent of responses of the total with an (a) alone or in combination with (b) or (c). Therefore, percentages reported for the various answers can total to *over* 100% due to overlapping categories.
11. When *ranges* instead of point data were given on the survey, we used the maximum number of the range.

12. There were a lot of unsolicited negative comments concerning the role of government, and the mention of such seminars in an SBA context may also explain the low interest.
13. The composite average is merely a weighted average of rankings (weighted by the percent of respondents). Unfortunately, this measure implies cardinal measurability which is inappropriate in this context. It serves merely as a "ballpark" number in this case.
14. Our thanks to James Read of Incentives Research (Boston, Massachusetts) for valuable comments in this regard.

REFERENCES

- [1] Ang, James S. 1991. Small Business Uniqueness and the Theory of Financial Management. *Journal of Small Business Finance* 1 (Spring): 1-13.
- [2] Berdie, Douglas R. 1989. Reassessing the Value of High Response Rates to Mail Surveys. *Marketing Research* 18 (September): 52-64.
- [3] Blatt, John M. 1979. Investment Evaluation under Uncertainty. *Financial Management* 8 (Summer): 66-81.
- [4] Brigham, Eugene. 1992. *Fundamentals of Financial Management*. 6th ed. Chicago, IL: Dryden Press.
- [5] Burns, Richard M. and Joe Walker. 1991. A Survey of Working Capital Policy Among Small Manufacturing Firms. *The Journal of Small Business Finance* 1: 61-74.
- [6] Federal Register. 1989. *Rules and Regulations* 54(244): December 21. Author.
- [7] Gitman, Lawrence, J. and John R. Forrester, Jr. 1977. A Survey of Capital Budgeting Techniques Used by Major U.S. Firms. *Financial Management* 6 (Fall): 66-71.
- [8] McMahon, R.G.P. and S. Holmes. 1989. Small Business Financial Management: A Review of Practice. *Accounting and Finance Research Paper 89/4*, The Flinders University of South Australia.
- [9] Mukherjee, Tarun K. 1987. Capital-Budgeting Surveys: The Past and the Future. *Review of Business and Economic Research* 22 (Spring): 37-56.
- [10] Petty, J. William, David F. Scott, Jr. and Monroe M. Bird. 1975. The Capital Expenditure Decision Making Process of Large Corporations. *Engineering Economist* 20 (Spring): 159-172.
- [11] Pinches, George E. 1992. *Essentials of Financial Management*. 4th ed. New York: Harper Collins.
- [12] Runyon, L.R. 1983. Capital Expenditure Decision Making in Small Firms. *Journal of Business Research* 11 (September): 389-397.
- [13] Scott, David F., Jr., Otha P. Gray and Monroe M. Bird. 1972. Investing and Financing Behavior of Small Manufacturing Firms. *MSU Business Topics* 20 (Summer): 29-38.
- [14] Scott, David F., Jr. and J. William Petty, III. 1984. Capital Budgeting Practices in Large American Firms: A Retrospective Analysis and Synthesis. *The Financial Review* 19 (March): 111-123.
- [15] Soldofsky, Robert M. 1966. The What, Why, and How of Capital Budgeting for Small Businesses. *Iowa Business Digest* 37 (January): 3-17.