Management Practices as a Proxy for Firm Quality

Petar Dobrev
Stockton University

This paper uses firm-level data on management practices to proxy for firm quality. To that end, we create portfolios comprised of well-managed and poorly-managed firms with the management practice score (a number between one and five) as our sole selection criteria. We find that: (1) Between 1999 and 2019, the well-managed portfolio consistently outperformed the poorly-managed portfolio with respect to profitability, investment, default risk, financial strength, and market capitalization; (2) In the period from 1999 to 2008, a portfolio that took a long position in stocks of well-managed firms and a short position in stocks of poorly-managed firms earned a monthly three-factor alpha of 0.89% (t=2.16) and a five-factor alpha of 1.14% (t=2.75).

Keywords: excess returns, firm quality, financial performance, management practices, world management survey

INTRODUCTION

The emphasis on firm quality has become a hallmark of investing. Successful investors like Warren Buffet have long insisted on the importance of investing in high-quality firms. Nevertheless, there is no agreed-upon definition of firm quality. Jagannathan and Zhang (2020) propose to measure firm quality based on firms' stock performance relative to peers during stressful times (defined as the month with the worst return over a given year). Others (Chen and Zhang 2010; Fama and French 2015; Asness et al. 2019) construct quality-related factors based on firm profitability and asset growth. Altman (1968) built a credit strength test (subsequently updated in 2012) known as the Altman Z-score used to assess a firm's risk of bankruptcy. Piotroski (2000) built a quality measure, referred to as the Piotroski F-score, used to assess the strength of a firm's financial position. The lack of consensus in the literature on what criteria to use to identify high-quality firms suggests that firm quality remains a vaguely defined concept.

Nevertheless, despite disagreement on how best to measure firm quality, it has become generally accepted that quality should, at the very least, be correlated with some objective fundamental measure of firm performance, such as earnings, profitability, or expected growth rate, among others. Although it has long been conjectured that differences in financial performance must at least partly reflect differences in management practices (or management quality), over the past two decades, a growing body of work has confirmed that premise. Bertrand and Schoer (2003) find that a significant extent of the heterogeneity between firms concerning investment, financial, and organizational practices can be explained by manager fixed effects. Bloom and Van Reenen (2007) use a novel survey methodology to collect data on management practices from small and medium-sized manufacturing firms in the U.S. and several other countries. The authors find that firms with higher management practice scores are also more profitable and

productive, with a higher Tobin's Q and a higher survival rate. Giorcelli (2019) estimates the long-run effect of adopting management practices and new technologies on Italian manufacturing firms using evidence from the Marshall Plan Productivity Program. The author finds that Italian firms that sent their managers on U.S. study trips to improve their management practices had higher sales, employment, and productivity for at least 15 years after the end of the program.

Since better management practices have been shown to be positively associated with specific firm characteristics indicative of superior performance, it is natural to investigate whether management practices can proxy for firm quality. Therefore, we aim to investigate whether better management practices are associated with superior financial performance and higher risk-adjusted excess returns (high-quality firms should outperform peers in both metrics). To that end, we use the firm-level survey data on management practices for publicly-traded U.S. manufacturing firms collected by Bloom and Van Reenen (2007) to create portfolios comprised of what we refer to as poorly-managed (PM) and well-managed (WM) firms. To test the robustness of the management practice variable in its ability to proxy for firm quality, we use three different selection strategies. We assign a firm to the WM (PM) portfolio if that firm's management practice score is: (1) One standard deviation above (below) the mean; (2) Half a standard deviation above (below) the mean; (3) Above (below) the median management practice score. To simplify notation, we refer to these strategies as 1 SD, 0.5 SD, and median, respectively. Note that the management practice score is our sole selection criteria. We use no financial statement or stock return data when assigning firms to either portfolio.

For our sample period from 1999 to 2019, we find that the WM portfolio is more profitable, has a higher rate of investment, is characterized by a higher degree of financial strength, exhibits a lower risk of bankruptcy, and has a higher market capitalization. In addition, we compare the efficacy of our three selection strategies in identifying consistent differences in financial performance between firms and find that the 1 SD selection strategy performs best. Stated otherwise, we find that the larger the difference in management practice scores between the firms in the two portfolios, the more substantial the difference in financial performance between the two portfolios. This result confirms that the management practice score positively correlates with financial performance.

Next, we compare the returns of the WM and PM portfolios across all three selection strategies. Since there are many delisted firms in our sample (partly as a result of the 08-09 financial crisis), we primarily concentrate our stock returns analysis on the subsample period from 1999 to 2008 to avoid delisting bias in our results. As with our findings on financial performance, we find that the 1 SD selection strategy best identifies differences in stock performance between firms. Specifically, under 1 SD selection, the average excess return of the WM portfolio is 78 basis points higher compared to the PM portfolio. In addition, the WM portfolio has a Sharpe ratio of 0.18 compared with 0.08 for the PM portfolio. Further, we estimate the risk-adjusted excess returns for each portfolio using six different factor models. We use the CAPM, the Fama-French 3-factor model based on the work of Fama and French (1993), the Carhart 4-factor model following Carhart (1997), the Fama-French 5-factor based on the recent work of Fama and French (2015), the q-factor model by Hue et a. (2015), and the QMJ model by Asness et al. (2019). We estimate each factor model on the excess returns of the PM, the WM, and the long-short (WM minus PM) portfolio to test whether the difference in risk-adjusted excess returns between the PM and the WM portfolio is statistically significant. We find that the alpha on the long-short portfolio is significant in 4 of the 6 factor models, with the factor model alpha ranging from 89 and 114 basis points. In contrast, if the firms in each portfolio are assigned according to the other two portfolio selection strategies, the mean excess return and Sharpe ratio between the WM and PM portfolios is only half as large (although still positive and statistically significant) compared to 1 SD. In addition, the alpha on the long-short portfolio is insignificant across all factor models, except the Fama-French 5-factor model, where the alpha is significant but only half as large in magnitude. These findings suggest a positive and statistically significant relationship between management practices and stock returns if there is a substantial difference in the management practice scores of the firms that comprise each portfolio.

Our contribution is twofold. First, to the best of our knowledge, this is the first paper that links better firm management with superior long-term risk-adjusted stock returns relative to peers. Note that we cannot (nor attempt to) claim any causal relationship between management practices and long-term stock returns.

However, we believe this result to be an eseential first step that future research can build upon in establishing whether a causal relationship between management practices and stock performance does exist. Attempts to establish a link between a firm's management and stock price are not new. However, most of the research on the topic has employed event studies to estimate the impact of a change in management (either a change in leadership or CEO deaths) on a firm's stock price (Warner et al. 1988; Combs et al. 2007; Salas 2010). Second, we expand on Bloom and Van Reenen's (2007) results. They find that the management score is positively associated with several measures of firm performance, such as return on capital employed (their measure of firm profitability), Tobin's Q, productivity, and others. We find that the management practice score is also positively associated with other quality indicators such as operating profitability, return on book equity, investment (measured as growth in total assets), the Altman Z-Score, and the Piotroski F-score.

The rest of the paper is organized as follows. In section 2, we describe the data and our methodology. In section 3, we compare the financial performance of the WM and the PM portfolios using various indicators widely considered as useful markers of firm quality in the finance literature. In section 4, we evaluate the stock returns of our portfolios. Finally, section 5 concludes.

DATA AND METHODOLOGY

Data

Data on management practices for U.S. manufacturing firms is obtained from the World Management Survey (WMS). Firms in the WMS database are surveyed and assigned scores from one (worst practice) to five (best practice) across eighteen key management practices. These management practices are grouped into four categories: operations, monitoring, targets, and incentives. The average score across these categories is the variable we use to categorize firms as either well managed or poorly managed and assign them to either the WM or the PM portfolio. Table 1 provides a sample list of the questions asked in the survey across each category. The complete list of all questions asked, as well as the design and methodology of the survey, are described in detail in Bloom and Van Reenen (2007).

TABLE 1
SAMPLE LIST OF QUESTIONS ASKED BY PRACTICE TYPE

Practice (Practice type0	Examples of questions asked
Modern manufacturing (Operations)	Can you describe the production process for me? What kind of lean (modern) manufacturing processes have you introduced?
Performance Tracking (Monitoring)	Tell me how you track production performance? What kind of key performance indicators (KPIs) would you use for performance tracking?
Target Breadth (Targets)	What types of targets are set for the company? What are the goals for your plant?
Promoting high performance (Incentives)	Can you rise up the company rapidly if you are really good? Can you give any examples you can think of?

We obtain monthly stock return data from the Center for Research in Security Prices (CRSP) for all publicly traded U.S. manufacturing firms in the WMS database. We use CRSP's RET variable as our measure for the monthly return. Firm-level financial statement data is obtained from Compustat. Market-wide factor data comes from several different sources. The one-month risk-free rate, the Fama-French 3 factors, the two additional factors in the Fama-French 5 factor model, and the Carhart's momentum factor are obtained from the French Data Library available on Kenneth French's website. Data on the quality-

minus-junk factor by Asness et al. (2019) is obtained from the AQR website. Data on the q-factor model by Hou et al. (2015) is obtained from the global-q website.

Methodology

Of the more than 900 U.S. firms in the WMS database, the majority of which are manufacturing firms, only 229 are publicly traded. Further, we exclude 9 of the 229 publicly traded firms since they were not classified as manufacturing firms. Thus, the final number of firms in our dataset is 220. However, between 1999 and 2019, our sample period, a significant number of these firms were delisted (and, in some cases, relisted), which presents an additional problem we must address before conducting our analysis. Only 86 of the 220 firms in our sample have publicly available financial statements and stock return data for at least 20 of the 21 years in the sample period. Thus, excluding all delisted firms significantly reduces our firm sample. Yet, if we keep all firms irrespective of delisting status, we risk introducing too much noise in our results since too many delisted firms in our portfolios would bias the portfolio returns. To resolve these problems, most of our portfolio returns analysis will focus on the subsample period from 1999 to 2008. Between 1999 and 2008, 143 firms have publicly available financial statements and stock returns data for the entire ten-year period. Further, almost all 220 firms were publicly traded for at least five of the ten years.

We use the average management score (a number between 1 and 5) from the WMS database to form portfolios comprised of well-managed (WM) and poorly-managed (PM) firms. This management score is our sole selection criteria. We do not use financial statement information, default probability measures, stock returns data, or any other measure of firm performance when selecting firms for either of the two portfolios. Of the 220 firms, 129 have been surveyed twice or more between 1999 and 2019 (or before their delisting), while the remaining 91 have been surveyed only once. We take the average management practice score across all surveys for firms surveyed more than once to derive a unique management score for each firm. We assume that the quality of each firm's management practices, measured by its management score, has not changed throughout the sample period. Thus, each firm's management score is fixed for the sample period. Note that even though there are differences in management scores over time for companies surveyed more than once, these scores are a product of a survey of managers within each company. Therefore, they are not necessarily an objective indication that specific management processes or practices have changed. We interpret the average management score for each company across multiple surveys as a more accurate measure of the management practices at each company rather than as an indication of a significant change in the management practices of a company. Although this assumption may appear strong on the surface, there is evidence to suggest that, given our relatively short sample period, it is not unreasonable. Giorcelli (2019) estimates the long-run effect of adopting new management practices and new technologies on Italian manufacturing firms using evidence from the Marshall Plan Productivity Program. The author finds that Italian firms that sent their managers on U.S. study trips (to improve their management practices) had higher sales, employment, and productivity for at least 15 years after the program ended, with some evidence that the effects for some firms lasted for more than 50 years. These findings suggest that management practices have a significant long-term impact on firm performance. Our identifying assumption would present an issue if, during our sample period, there was an unobserved management practice shock that directly impacted the performance of a sizeable number of the firms in our sample. However, we have not found any evidence for such a shock.

We use three different selection strategies to assign firms to either the WM or the PM portfolio: (1) We convert the average management score to a z-score and define a well-managed (poorly-managed) firm as a firm with a z-score one standard deviation above (below) the mean; (2) As in (1), we convert the average management score to a z-score and define a well-managed (poorly-managed) firm as a firm with a z-score half a standard deviation above (below) the mean; (3) We use the median management practice score to divide firms in two halves. Firms with a management practice score above the median are assigned to the WM portfolio, and firms with a score below the median are assigned to the PM portfolio. The number of firms in each portfolio according to each sorting strategy is shown in Table 2 below.

TABLE 2
NUMBER OF FIRMS IN EACH PORTFOLIO BY SELECTION STRATEGY

Time Period	1999–2019				1999–2008			
	PM		WM		PM		WM	
Selection Strategy	min	max	min	max	min	max	min	max
1 SD	14	35	17	37	22	35	26	37
0.5 SD	29	74	27	65	52	74	51	65
Median	43	110	43	110	72	110	71	110

As previously mentioned, we will conduct our analysis on the entire sample period from 1999 to 2019 and the subsample from 1999 to 2008 due to the larger number of firms that have publicly available information throughout this smaller ten-year period. Note that the number of firms in each portfolio varies over time since some of the firms in the sample were delisted. Further, the minimum number of firms in each portfolio indicates the number of firms that were not delisted for that period and have publicly available financial statement and stock return data continuously throughout the entire sample period. Lastly, note that although the number of stocks in our portfolios is relatively small, the Dow Jones Industrial Average, an index that is still of relevance to financial markets, contains only 30 stocks.

CHARACTERISTICS OF WELL-MANAGED AND POORLY-MANAGED FIRMS

In this section, we compare the WM and PM portfolios across various measures indicative of quality. As in Novy-Marx (2013), Fama and French (2015), Hou et al. (2015), and Jagannathan and Zhang (2021), our profitability measures are: gross profits over assets, operating profitability, and return on book equity. We also measure investment as the total asset growth over the previous year. We will use the Altman Z-score to measure a company's financial stability and risk of bankruptcy. The Altman Z-score, developed by Altman (1968), is a formula comprised of five financial ratios (profitability, leverage, liquidity, solvency, and activity) designed to assess the likelihood that a company in the manufacturing industry may be close to bankruptcy. An Altman score below 1.8 typically indicates that a company is at risk of default, while scores above 3 suggest that the company is in good financial health. We will also compare the two portfolios according to their Piotroski F-score. The F-score, created by Piotroski (2000), ranges from 0 and 9 and ranks a company according to its score on nine key financial indicators. The F-score is a binary measure. For each of the nine indicators, a firm receives a score of 1 if the standard is met, and a score of 0 if the standard is not met. The F-score is a measure of fundamental strength, with higher scores identifying companies in a stronger financial position relative to companies with a lower F-score. In addition, the F-score is used to identify value stocks. Lastly, we will compare the two portfolios according to the average market capitalization of the firms comprising each portfolio. All indicators are defined in the appendix.

In Figure 1, we compare the WM and PM portfolios' average profitability and investment ratios according to our least restrictive sorting strategy (median) and our most restrictive strategy (1 SD). The portfolios are formed from the pool of all 220 firms, and delisted firms reduce the number of firms in each portfolio (at a relatively uniform rate) over time. Recall that sorting firms in each portfolio using the median score preserves all firms in the dataset, whereas sorting the firms using the management score one standard deviation above and below the mean as the cutoff selects only the firms with scores above and below this threshold in the two portfolios. Note that due to extreme outliers in the data, we winsorize the data at the 5th and 95th percentile.

FIGURE 1
PROFITABILITY AND INVESTMENT COMPARISON BETWEEN PORTFOLIO SELECTION STRATEGIES

For both selection strategies, the WM portfolio exhibits higher gross profitability when compared to the PM portfolio. This difference is consistent and pronounced between 1999 and 2011. After 2011, there appears to be a convergence in gross profitability between the two portfolios. However, there isn't any notable qualitative difference in gross profitability between the two selection strategies. On the other hand, the differences in the efficacy of both strategies in identifying more profitable from less profitable firms become evident when we compare the WM and PM portfolios according to their operating profitability, return on book equity, and investment. Constructing portfolios according to our 1 SD strategy produces non-trivial and lasting differences in performance between the WM and the PM portfolios. Specifically, throughout the whole sample period, the WM portfolio exhibits higher operating profit than the PM portfolio. A similar pattern is observed when we compare the two portfolios according to their return on book equity and investment. However, in both cases, as with gross profitability, the differences between the two portfolios disappear after 2011. In contrast, constructing portfolios using the median selection strategy does not yield significant differences in profitability and investment between the two portfolios.

Figure 2 compares the WM and PM portfolios according to their Altman Z-score, Piotroski F-score, and market capitalization. The WM portfolio has a noticeably higher Altman Z-score throughout the sample period under both selection strategies. As expected, the difference is more substantial for the 1 SD selection strategy. There is also a notable difference in F-scores between the WM and the PM portfolios when portfolio selection is conducted according to 1 SD. In contrast, there isn't any notable difference in F-scores between the two portfolios when using the median management practice score as portfolio selection criteria. Lastly, the WM portfolio also has a higher market capitalization (the scale on the y-axis is expressed in

millions). This result is not surprising since Bloom and Van Reenen (2010) have already documented that firms with a sizeable number of employees have a higher management score. In addition, as the authors state, firms with more resources can attract better management. In Figure 4 and Figure 5 in the appendix, we also compare the financial performance of the WM and the PM portfolios created from the pool of all companies present throughout the entire sample period (that is, we exclude all delisted companies). As these figures show, qualitatively, the results remain the same, suggesting that delisted firms are not driving these differences.

FIGURE 2
QUALITY MEASURES AND MARKET CAPITALIZATION COMPARISON BETWEEN PORTFOLIOS SELECTION STRATEGIES

In Figure 3, we compare the performance of each of the three portfolio selection strategies in our analysis. Specifically, for each quality indicator, we plot the average differences between the WM and PM portfolios for each selection strategy. Except for gross profits, the 1 SD selection strategy is superior in identifying differences in financial performance between firms. Nevertheless, note that there appears to be a convergence in financial performance between the two portfolios across all three selection strategies during the last couple of years in our sample period. Lastly, there is no noticeable difference in financial performance between the WM and PM portfolios if we use the median or 0.5 SD as our portfolio selection strategies.

FIGURE 3
COMPARISON OF SELECTION STRATEGIES BASED ON THE DIFFERENCE IN PERFORMANCE BETWEEN THE WM AND PM PORTFOLIOS

Notes: Each line represents the difference between the WM and PM portfolios for each selection strategy

To summarize, according to our results in this section, the larger the difference in management practice scores between firms, the larger the disparity in their financial performance. These results suggest that the management practice score correlates with several different metrics of firm quality and fulfills one of our two criteria necessary to be considered a good proxy of firm quality.

MANAGEMENT PRACTICES AND STOCK PERFORMANCE

In the previous section, we showed that a portfolio comprised of well-managed firms is on average more profitable, has a higher rate of investment, exhibits a lower risk of default, greater financial strength, and has a higher market capitalization compared to a portfolio comprised of poorly-managed firms. Further, we showed that the larger the difference in the management practice score between firms, the bigger the difference in their financial performance. It is, therefore, natural to ask whether the WM portfolios we constructed can earn superior risk-adjusted returns above the risk-free rate relative to the PM portfolios.

We begin by comparing the average excess return (mean), the standard deviation (SD), and the Sharpe ratio (SR) for the WM and PM portfolios across all three selection strategies. The excess return is defined as the return in excess of the risk-free rate. We use R_f from the French Data Library as our measure of the monthly risk-free rate. Table 3 displays the summary statistics for the entire sample period and the subsample period from 1999 to 2008. Because the large number of delisted firms in our sample could bias

the portfolio comparison, we also display the results for each portfolio by excluding all delisted firms. We refer to these portfolios as poorly-managed excluding delisted (PMED) and well-managed excluding delisted (WMED).

TABLE 3
SUMMARY STATISTICS

Selection Strategy		1 SD			0.5 SD			Median	
Monthly Excess Return %	Mean	SD	SR	Mean	SD	SR	Mean	SD	SR
PM (1999-2019)	1.00	6.48	0.15	1.21	6.07	0.20	1.25	5.91	0.21
WM (1999-2019)	1.27	7.06	0.18	1.21	6.57	0.18	1.23	6.30	0.20
PMED (1999-2019)	1.06	6.98	0.15	1.15	6.10	0.19	1.21	5.97	0.20
WMED (1999-2019)	1.13	6.24	0.18	1.25	6.37	0.20	1.20	6.01	0.20
Monthly Excess Return %	Mean	SD	SR	Mean	SD	SR	Mean	SD	SR
PM (1999-2008)	0.46	6.61	0.07	0.75	6.2	0.12	0.77	6.05	0.13
WM (1999-2008	1.19	7.58	0.16	0.95	6.89	0.14	0.99	6.60	0.15
PMED (1999-2008)	0.52	6.43	0.08	0.75	5.95	0.13	0.73	5.64	0.13
WMED (1999-2008)	1.30	7.21	0.18	1.13	6.77	0.17	1.10	6.74	0.16

For the whole sample period from 1999 to 2019, the difference in means across all three selection strategies (and both portfolio definitions) is statistically insignificant (based on the results from a t test on the difference in means between portfolios). In contrast, for the period from 2008 to 2019, the difference in the mean excess return across all three selection strategies and both portfolio types is statistically significant. In addition, there is also a substantial difference in the Sharpe ratios between the two portfolios for the same period. As one might expect based on our results from the previous section, the 1 SD selection strategy produces the most substantial difference in mean excess return between the PM and WM portfolios. Moreover, as we can see from the comparison between the PMED and WMED portfolios, this difference is not driven by the large number of delisted firms in the sample. Note, however, that despite the higher excess return, the WM portfolios are also characterized by a higher standard deviation. Nevertheless, despite the higher standard deviation, the WM portfolio has a noticeably higher Sharpe ratio (SR) when portfolios are formed using 1 SD.

Next, we compare the risk-adjusted excess returns of the portfolios using several different factor models. Note that due to the relatively small firm sample size and the presence of several firms with a large market capitalization in our sample, all portfolios in the analysis are equal-weighted rather than value-weighted. We will use the standard CAPM model with market factor (MKT) and the Fama-French 3-factor (FF3) model with size factor (SMB) and value factor (HML) based on the work of Fama and French (1993). In addition, we will also employ the Carhart 4-factor (MOM) model developed by Carhart (1997), which uses a momentum factor alongside the value and size factor in FF3. We will also use three other factor models that incorporate quality-specific factors. The first of these models is the Fama-French 5-factor (FF5) model based on the recent work of Fama and French, who extend their 3-factor model by adding a profitability factor (RMW) and an investment factor (CMA). The second model is the q-factor (QF) model developed by Hou et al. (2015), which includes a size factor (ME), an investment factor (IA), and a profitability factor (ROE). The last model in our list is the quality-minus-junk factor (QMJF) model by Asness et al. (2019), which adds a quality-minus-junk factor (QMJ) to the original FF3 factor model. We run a time series regression of the monthly excess return on each portfolio (for a given selection strategy) on each of the six models we described.

In Table 4, we compare the performance of the median selection strategy when the WM and PM portfolios are formed from the pool of all firms that were never delisted (86 firms in total) across the entire sample period and the two other subsample periods. The table displays each factor model's estimated alpha

for the PM, WM, and the WM minus PM (long-short) portfolio. The numbers in parenthesis are the associated t-statistics, while the numbers in bold denote 5% significance. Note that each portfolio contains 43 firms. The two portfolios have roughly the same alpha over the whole sample period, and as shown by the long-short (WM-PM) portfolio, the difference is insignificant. However, the difference in excess returns between the WM and PM portfolios is larger in the first half of our sample and becomes negative in the second half. These results are consistent with our observation of convergence in performance between the PM and WM firms, as seen in the graphs in the previous section. Nonetheless the long-short portfolio is insignificant, and we cannot reject the null hypothesis that there is no significant difference in alpha between the two portfolios.

TABLE 4
PORTFOLIO ALPHA BY SAMPLE PERIOD USING MEDIAN SELECTION STRATEGY AND EXCLUDING ALL DELISTED FIRMS

Model	1999-2019			1999-2008			2009-2019		
	PM	WM	WM-PM	PM	WM	WM-PM	PM	WM	WM-PM
CAPM	**0.61**	**0.58**	-0.03	**0.95**	**1.19**	0.24	**0.14**	-0.04	-0.18
	(18.87)	(18.33)	(-0.18)	(18.70)	(22.68)	(0.97)	(3.45)	(-1.27)	(-0.95)
FF3	**0.45**	**0.42**	-0.03	**0.44**	**0.68**	0.24	**0.46**	**0.23**	-0.23
	(19.30)	(19.30)	(-0.13)	(7.54)	(13.73)	(1.05)	(16.09)	(30.30)	(-1.13)
MOM	**0.55**	**0.50**	-0.05	**0.59**	**0.79**	0.20	**0.45**	**0.23**	-0.22
	(26.32)	(23.37)	(-0.38)	(11.34)	(15.49)	(0.81)	(17.44)	(10.48)	(-1.12)
FF5	**0.32**	**0.34**	0.02	**0.32**	**0.60**	0.28	**0.40**	**0.21**	-0.19
	(13.42)	(14.79)	(0.13)	(8.37)	(14.62)	(1.03)	(14.15)	(8.98)	(-0.96)
QF	**0.45**	**0.44**	-0.01	**0.54**	**0.78**	0.24	**0.49**	**0.25**	-0.24
	(18.58)	(18.92)	(-0.03)	(12.96)	(18.41)	(0.92)	(18.06)	(11.25)	(-1.19)
QMJ	**0.53**	**0.40**	-0.13	**0.53**	**0.67**	0.13	**0.53**	**0.18**	-0.35
	(21.61)	(16.93)	(-0.80)	(13.08)	(16.04)	(0.52)	(18.02)	(7.70)	(-1.72)

The remainder of our analysis will focus on the subsample period from 1999 to 2008, which, as previously discussed, results in a trade-off by expanding the firm sample size (which also reduces the volatility of excess returns) at the expense of a smaller sample period. Table 5 displays each portfolio's alpha and the associated t-statistic across all three selection strategies. The portfolios in the table are constructed from the pool of all firms in our data (220) and thus also include all delisted firms. Consistent with our previous findings, the 1 SD selection strategy performs best. A portfolio that takes a long position in WM firms and a short position in PM firms earns a monthly alpha greater than 90 basis points in five of the six factor models. The alpha on CAPM is the only exception, with the result marginally insignificant at the 5% level. In contrast, even though the WM portfolio outperforms the PM portfolio across the other two selection strategies, the difference, as shown by the long-short portfolio, is insignificant. Therefore, we cannot reject the hypothesis that there is no statistically significant difference between these portfolios when we compare portfolios comprised of firms with smaller average differences in management scores between them.

TABLE 5
PORTFOLIO ALPHA FOR EACH SELECTION STRATEGY: 1999-2008

Model	1 SD			0.5 SD			Median		
	PM	WM	WM-PM	PM	WM	WM-PM	PM	WM	WM-PM
CAPM	**0.70**	**1.50**	0.80	**0.99**	**1.22**	**0.23**	**1.00**	**1.24**	0.24
	(10.46)	(23.62)	(1.93)	(25.04)	(27.78)	(0.86)	(32.59)	(38.36)	(1.19)
FF3	0.08	**1.00**	**0.92**	**0.47**	**0.76**	0.29	**0.48**	**0.74**	0.26
	(1.59)	(23.01)	(2.32)	(16.08)	(24.17)	(1.07)	(21.93)	(34.08)	(1.33)
MOM	**0.19**	**1.08**	**0.90**	**0.58**	**0.88**	0.30	**0.58**	**0.87**	0.29
	(3.68)	(25.29)	(2.24)	(21.00)	(29.62)	(1.09)	(27.66)	(42.67)	(1.43)
FF5	-0.07	**1.14**	**1.21**	**0.36**	**0.85**	0.49	**0.37**	**0.77**	0.40
	(-1.24)	(26.21)	(3.08)	(12.21)	(26.50)	(1.78)	(16.33)	(33.25)	(1.94)
QF	**0.17**	**1.12**	**0.95**	**0.62**	**0.97**	0.35	**0.61**	**0.91**	0.30
	(3.08)	(25.4)	(2.26)	(20.37)	(30.54)	(1.21)	(25.66)	(39.44)	(1.46)
QMJ	**0.26**	**1.20**	**0.94**	**0.64**	**0.99**	0.35	**0.62**	**0.91**	0.29
	(4.80)	(26.82)	(2.26)	(21.36)	(30.86)	(1.21)	(27.20)	(40.56)	(1.40)

In Table 6, we repeat the analysis but exclude firms that were delisted to account for potential delisting bias in our results. Compared to the results from Table 5, the alpha on the 1 SD long-short portfolio remains significant in all models except the q-factor model, where it becomes marginally insignificant at the 5% level. In addition, the alpha on the long-short portfolio drops by several basis points across all models but remains roughly similar in magnitude. Furthermore, the long-short portfolio alpha is significant across all three selection strategies when estimating the excess portfolio returns using the FF5 model, suggesting that the Fama-French five-factor model is particularly robust at capturing differences in portfolio returns even when comparing firms with smaller differences in management scores. In Figure 6 and Figure 7 in the appendix, we show that the gap in financial performance between the PMED and WMED portfolios (the portfolios whose returns are displayed in Table 6) is larger when using 1 SD as opposed to median selection. Therefore, the observed larger (and statistically significant) difference in alpha in favor of the 1 SD selection strategy relative to the median selection strategy is also supported by objective measures of financial performance and is unlikely to be a statistical coincidence.

TABLE 6
PORTFOLIO ALPHA (EXCLUDING DELISTED FIRMS) BASED ONE EACH SELECTION STATEGY: 1999-2008

Model	1 SD			0.5 SD			Median		
	PM	WM	WM-PM	PM	WM	WM-PM	PM	WM	WM-PM
CAPM	**0.74**	**1.58**	0.84	**0.97**	**1.40**	0.43	0.95	1.37	0.42
	(8.62)	(20.47)	(1.93)	(20.56)	(25.31)	(1.40)	(25.36)	(32.26)	(1.54)
FF3	**0.17**	**1.06**	**0.89**	**0.47**	**0.93**	0.46	**0.46**	**0.84**	0.38
	(2.39)	(19.36)	(2.16)	(12.63)	(23.05)	(1.54)	(15.69)	(34.47)	(1.51)
MOM	**0.33**	**1.16**	**0.83**	**0.60**	**1.04**	0.44	**0.57**	**0.94**	0.37
	(4.76)	(21.73)	(2.01)	(16.74)	(26.60)	(1.44)	(20.57)	(34.47)	(1.46)
FF5	-0.01	**1.13**	**1.14**	**0.31**	**0.94**	**0.63**	**0.27**	**0.84**	0.57
	(-0.15)	(20.23)	(2.75)	(8.14)	(22.55)	(2.10)	(9.16)	(28.04)	(2.27)
QF	**0.27**	**1.12**	0.85	**0.61**	**1.03**	0.42	**0.56**	**0.93**	0.37
	(3.50)	(20.27)	(1.96)	(15.16)	(24.67)	(1.36)	(17.37)	(31.06)	(1.40)
QMJ	**0.27**	**1.19**	**0.92**	**0.55**	**1.06**	0.51	**0.48**	**0.96**	0.48
	(3.58)	(20.79)	(2.11)	(13.85)	(25.08)	(1.63)	(15.71)	(32.01)	(1.65)

Notes: The portfolios in this table are formed by first excluding all firms that are delisted during the period from 1999 to 2008. Thus, these portfolios are respectively PMED, WMED, and WMED-PMED. In the table, we use PM, WM, and WM-PM instead for legibility.

Table 7 reports the complete time series regression results associated with the 1 SD selection strategy for the WM portfolio from Table 5. Note that the WM portfolio's monthly market beta (MKT) is greater than one across all specifications. In addition, as expected, the WM portfolio loads positively on the size (SMB) and value (HML) factors of the FF3 and FF5 models. Further, the WM portfolio loads positively on the investment factor (CMA)in the FF5 model, while the coefficient on the investment factor (IA) in the QF model is insignificant. Surprisingly, the portfolio loads negatively on the RMW and ROE profitability factors and the QMJ quality factor in the QMJF model.

TABLE 7
REGRESSION RESULTS FOR THE 1 SD WM PORTFOLIO: 1999-2008

	CAPM	FF3	FFC4	FF5	QF	QMJF
α	1.58	1.06	1.16	1.13	1.12	1.19
	(20.47)	(19.36)	(21.73)	(20.23)	(20.27)	(20.79)
MKT	1.28	1.16	1.08	1.10	1.07	1.06
	(74.21)	(91.37)	(80.70)	(69.65)	(68.39)	(58.16)
SMB / ME		0.84	0.88	0.72	0.74	0.78
		(57.32)	(60.99)	(41.60)	(50.44)	(48.18)
HML		0.22	0.18	0.07		0.23
MOM		(12.71)	(10.43)	(3.00)		(13.21)
			(-14.59)			
CMA / IA				0.16	0.03	
				(5.52)	(1.52)	
RMW / ROE				-0.26	-0.23	
				(-10.71)	(-10.88)	
QMJ						-0.20
						(-7.18)

Notes: FFC4 refers to the Carhart four-factor model

In Table 8, we show the regression results for the PM portfolio. In terms of factor loadings, the results are similar to those of the WM portfolio, with the notable exception that the portfolio loads positively on the RMW profitability factor. Intuitively, we would expect the opposite sign on the profitability factor or, at the very least, a positive and significant coefficient for both the WM and PM portfolios. However, these results could be a function of our limited sample period and the small firm sample size. In addition, all firms in our data are from a single industry which could also play a role. We display the results for the long-short portfolio in Table 9 in the appendix.

In this section, we showed the presence of a notable and significant difference in mean and risk-adjusted excess returns for the period between 1999 to 2008 for firms with management practice scores one standard deviation above the mean (from the pool of all firms in our sample) relative to firms with management practice scores one standard deviation below the mean. These results, coupled with our findings on firms' financial performance, support our argument that the management practice score can proxy for firm quality. In addition, these results provide additional evidence for the validity and quality of the management survey methodology employed by Bloom and Van Reenen (2007). Nevertheless, our findings are subject to several caveats due to the limitations associated with our data. First, some of our results are conditional on our most restrictive selection strategy (1 SD), which reduced the number of firms in each portfolio to less than 40. Second, all firms in our data are small to medium-sized manufacturing firms, many of whom were delisted and no longer exist as individual publicly-traded companies (the vast majority of the companies in our sample were delisted due to a merger or acquisition). Thus, our findings only apply to a narrow segment of firms in the economy, and further research is necessary to assess the impact of management practices on U.S. firms in the broader economy. Third, our stock performance results are based on a relatively small sample of just ten years. However, despite these limitations, our results are too robust to be merely attributed to statistical coincidence. Specifically, we showed that for our most restrictive portfolio selection strategy (in terms of both firm size and management scores), the 1 SD, the differences in risk-adjusted excess returns between the WM and PM portfolios were substantial and statistically significant in four of the six factor models. Yet, the statistical power of our factor model regressions is smallest when selecting portfolios using 1 SD since the standard errors of the regression are larger (relative to the other two selection strategies) due to the smaller number of firms in each portfolio. Our results were statistically significant despite the larger standard errors since the difference in returns between the PM and WM portfolios when using 1 SD as our selection strategy were substantial. Further, in the previous section we also showed that the difference in financial performance between the WM and the PM portfolios is also larger when using 1 SD as selection criteria. Overall, we believe that we have presented sufficient evidence, despite the limitations of our data, in support of our argument that the management practice score is positively associated with firm and stock performance and can therefore serve as a proxy for firm quality.

TABLE 8
REGRESSION RESULTS FOR THE 1 SD PM PORTFOLIO: 1999-2008

	CAPM	FF3	FFC4	FF5	QF	QMJF
α	0.74	0.17	0.33	-0.01	0.27	0.27
	(8.62)	(2.39)	(4.76)	(-0.15)	(3.50)	(3.58)
MKT	1.03	1.07	0.95	1.19	1.01	1.00
	(54.10)	(64.24)	(55.29)	(57.30)	(45.90)	(41.42)
SMB / ME		0.64	0.71	0.74	0.51	0.60
		(33.50)	(38.31)	(32.57)	(24.82)	(28.05)
HML		0.63	0.57	0.26		0.64
		(28.05)	(26.17)	(7.99)		(28.32)
MOM			0.21			
			(-17.43)			
CMA / IA				0.19	0.45	
				(4.89)	(13.53)	
RMW / ROE				0.28	-0.11	
				(8.90)	(-3.84)	
QMJ						-0.15
						(-4.10)

Notes: FFC4 refers to the Carhart's four-factor model

CONCLUSION

This paper uses the management practice score developed by Bloom and Van Reenen (2007) to proxy for firm quality. We assign firms to what we refer to as well-managed (WM) and poorly-managed (PM) portfolios with the management practice score (a number between 1 and 5) as our only selection criteria. To test the robustness of this measure in proxying for firm quality, we use three selection strategies to assign firms to either the PM or the WM portfolio. We assign firms to the WM (PM) portfolio if the management practice score is: (1) One standard deviation above (below) the mean; (2) Half a standard deviation above (below) the mean; (3) Above (below) the median management practice score.

We find substantial differences in financial performance and risk-adjusted excess returns between the two portfolios if we use a management score of one standard deviation above and below the mean as our selection criteria. In this case, relative to the PM portfolio, the WM portfolio is more profitable, has a higher rate of investment, is characterized by a higher degree of financial strength, exhibits a lower risk of bankruptcy, and firms in the portfolio have a larger market capitalization. In addition, between 1999 and 2008, the WM portfolio had a larger mean excess return (78 basis points higher) and a larger Sharpe ratio than the PM portfolio. In addition, we estimated the alpha of a portfolio that took a long position in WM firms and a short position in PM firms and found that for the period from 1999 to 2008, the alpha of the portfolio was significant across four of the six factor models we considered and ranged from 89 to 114 basis points. To the best of our knowledge, this paper is one of the first to document a statistically significant quantitative relationship between the quality of firm's management with their stock returns in the long term.

In contrast, the differences in financial performance and stock returns, were neither qualitatively (when comparing financial performance) nor quantitatively (when estimating excess returns) significant, if we assigned firms to the WM and PM portfolio according to the criteria in the other two selection strategies. This result suggests that large differences in the quality of firms' management practices do translate in significant observed differences in both financial performance and stock returns. The management practice score, therefore, appears to serve as a good proxy for firm quality. Nevertheless, a more definitive answer

to that question and a broader examination on the long-term relationship between a firm's management and its stock price would require a significant expansion in the number of publicly traded firms surveyed according to the methodology developed by Bloom and Van Reenen (2007).

REFERENCES

Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, *23*(4), 589–609.

Asness, C.S., Frazzini, A., & Pederson, L.H. (2019). Quality Minus Junk. *Review of Accounting Studies*, *24*(1), 34–112.

Asness, C.S., Frazzini, A., & Pederson, L.H. (2022). *Quality Minus Junk: 10 Quality-Sorted Portfolios, Monthly*. Retrieved from https://www.aqr.com/Insights/Datasets/Quality-Minus-Junk-10-QualitySorted-Portfolios-Monthly

Bertrand, M., & Schoer, A. (2003). Managing with Style: The Effect of Managers on Firm Policies. *The Quarterly Journal of Economics*, *118*(4), 1169–1208.

Bloom, N. & Van Reenan, J. (2010). Why Do Management Practices Differ Across Firms and Countries? *Journal of Economic Perspectives*, *24*(1), 203–224.

Bloom, N., & Van Reenan, J. (2007). Measuring and Explaining Management Practices Across Firms and Countries. *The Quarterly Journal of Economics*, *122*(4), 1341–1408.

Bloom, N., Lemos, R., Sadun, R., Scur, D., & Van Reenen, J. (2021). *World Management Survey Manufacturing*. https://doi.org/10.7910/DVN/OY6CBK, Harvard Dataverse, V1, UNF:6:k5xYE9W6U534XDiWu3RjrA== [fileUNF]

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance*, *52*(1), 57–82.

Combs, J., Ketchen, Jr, D., Perryman, A., & Donahue, M. (2007). The Moderating Effect of CEO Power on the Board Composition–Firm Performance Relationship. *Journal of Management Studies*, *44*(8), 1299–1323.

Fama, E.F., & French, K.R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, *33*(1), 3–56.

Fama, E.F., & French, K.R. (2015). A Five-Factor Asset Pricing Model. *Journal of Financial Economics*, *116*(1), 1–22.

French, K. (n.d.). *French Data Library*. Retrieved from *https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html*

Giorcelli, M. (2019). The Long-Term Effects of Management and Technology Transfers. *The American Economic Review*, *109*(1), 121–152.

Hou, K., Xue, C., & Zhang, L. (2015). Digesting Anomalies: An Investment Approach. *The Review of Financial Studies*, *28*(3), 650–705.

Hou, K., Xue, C., & Zhang, L. (n.d.). *Global-q*. Retrieved from https://global-q.org/index.html

Jagannathan, R., & Zhang, Y. (2020). *A Return-Based Measure of Firm Quality* (NBER Working Paper No. 27859). National Bureau of Economic Research. Retrieved from https://www.nber.org/papers/w27859

Novy-Marx, R. (2013). The Other Side of Value: The Gross Profitability Premium. *Journal of Financial Economics*, *108*(1), 1–28

Piotroski, J.D. (2000). Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research*, *38*(1), 1–41.

Salas, J.M. (2010). Entrenchment, Governance, and the Stock Price Reaction to Sudden Executive Deaths. *Journal of Management Studies*, *34*(3), 656–666.

Warner, J., Watts, R., & Wruck, K. (1988). Stock Prices and Top Management Changes. *Journal of Financial Economics*, *20*, 461–492.

APPENDIX

Definition of Firm Quality Measures

In this section, we provide a definition for all financial indicators that were used to compare the poorly-managed and well-managed portfolios. We use * to denote any variables defined by the author. All variable definitions without a * are defined as such in the Compustat database. We begin by defined the set of profitability measures as well as investment displayed in Figure 1.

1. Gross profits over total assets (GPOA):

$$GPOA^* = \frac{REVT-COGS}{AT} \tag{1}$$

where REVT=total revenue, COGS=cost of goods sold, and AT=total assets

2. Operating profitability to equity (OP):

$$OP^* = \frac{REVT-COGS-XSGA-XINT}{BE} \tag{2}$$

where XSGA=selling, general, and administrative expenses, XINT=total interest and related expenses, and BE=book equity which is defined as:

$$BE^* = SEQ + TXDB + ITCB - PS \tag{3}$$

where SEQ=total stockholders' equity, TXDB=deferred taxes, ITCB=investment tax credit, and PS=preferred stock. As in Novy-Marx (2013), preferred stock is defined as redemption value (PSTKR) if available, or else liquidating value (PSTKRL) if available, or else carrying value (PSTK).

3. Return on book equity (ROE):

$$ROE = \frac{IB}{BE} \tag{4}$$

where IB=income before extraordinary items.

4. Investment (IV):

$$IV = \frac{AT-AT_{-1}}{AT_{-1}} \tag{5}$$

Next, we define the Altman Z-score and the Piotroski F-score shown in Figure 2.

5. Altman Z-score:

$$Z = 1.2\left(\frac{WCAP}{AT}\right) + 1.4\left(\frac{RE}{AT}\right) + 3.3\left(\frac{EBIT}{AT}\right) + 0.6\left(\frac{MKTCAP}{LT}\right) + 1\left(\frac{SALE}{AT}\right) \tag{6}$$

where WCAP=working capital, RE=retained earnings, EBIT=earnings before interest and taxes, MKTCAP=market capitalization (yearly number which represents the average the monthly market capitalization for each company), and SALE=sales/turnover.

6. Piotroski F-score:

The Piotroski F-score sums across 9 binary indicators. The 9 binary indicators can be grouped into three distinct categories: (1) Profitability; (2) Leverage, liquidity, and sources of funds; (3) Operating efficiency. The F-score is defined as:

$$F - score = 1(if\ ROA > 0) + 1(if\ CFOA > 0) + 1(if\ \Delta\, ROA > 0) + 1\ (if\ ACC < 0) + 1(if\ \Delta\, LVR < 0) + 1(if\ \Delta LR > 0) + 1(if\ CSO < 0) + 1(if\ \Delta\, GM > 0) + 1(if\ \Delta\, ATURN > 0) \quad (7)$$

where the variables above are defined as:

P.1. Return on Assets (ROA*):

$$ROA = \frac{IB}{AT} \quad (8)$$

P.2. Cash Flow from Operating Activities (CFOA*):

$$CFOA^* = \frac{OANCF}{AT} \quad (9)$$

where OANCF=operating activities/net cash flow

P.3. Accruals (ACC*):

$$ACC = ROA^* - CFOA^* \quad (10)$$

P.4 Gross Margin (GM*):

$$GM^* = \frac{REVT - COGS}{SALE} \quad (11)$$

P.5. Asset Turnover (ATURN*):

$$ATURN^* = \frac{SALE}{AT} \quad (12)$$

where DLTT=long-term debt

P.6. Leverage (LVR*):

$$LVR = \frac{DLTT}{AT} \quad (13)$$

P.7. Current Ratio (CR*):

$$CR^* = \frac{ACT}{LCT} \quad (14)$$

where ACT=current assets and LCT=current liabilities

P.8. Changes in common shares outstanding (CSO*):

$$CSO^* = CSHO - CSHO_{-1} \quad (15)$$

7. Market Capitalization:

$$MKTCAP = \frac{MKTCAP(monthly)}{12} \quad (16)$$

where MKTCAP (monthly)=the market capitalization of each company at the end of each month

List of Additional Tables and Figures

TABLE 9
REGRESSION RESULTS FOR THE WM-PM (LONG-SHORT) PORTFOLIO

	CAPM	FF3	FFC4	FF5	QF	QMJF
α	0.84	0.89	0.83	1.14	0.85	0.92
	(1.93)	(2.16)	(2.01)	(2.75)	(1.96)	(2.11)
MKT	0.25	0.09	0.13	-0.09	0.06	0.06
	(2.59)	(0.92)	(1.25)	(-0.75)	(0.50)	(0.46)
SMB / ME		0.20	0.17	-0.02	0.23	18.00
		(1.77)	(1.51)	(-0.15)	(1.98)	(1.47)
HML		-0.41	-0.39	-0.19		-0.41
		(-3.20)	(-2.98)	(-1.01)		(-3.17)
MOM			0.07			
			(1.00)			
CMA / IA				-0.03	-0.42	
				(-0.12)	(-2.25)	
RMW/ROE				-0.54	-0.12	
				(-3.02)	(-0.70)	
QMJ						-0.05
						(-0.23)

FIGURE 4
PROFITABILITY AND INVESTMENT COMPARISON BETWEEN PORTFOLIO SELECTION STRATEGIES AFTER EXCLUDING ALL DELISTED FIRMS

Notes: There are 43 firms each in the portfolio when using the median selection strategy. In the portfolio using 1 SD selection, there are 14 firms in the PM and 17 firms in the WM portfolio.

FIGURE 5
QUALITY MEASURES AND MARKET CAPITALIZATION COMPARISON BETWEEN PORTFOLIO SELECTION STRATEGIES AFTER EXCLUDING ALL DELISTED FIRMS

Notes: There are 43 firms each in the portfolio when using the median selection strategy. In the portfolio using 1 SD selection, there are 14 firms in the PM and 17 firms in the WM portfolio.

FIGURE 6
PROFITABILITY AND INVESTMENT COMPARISON BETWEEN PORTFOLIO SELECTION STRATEGIES FOR THE PERIOD FROM 1999 TO 2008 AFTER EXCLUDING ALL DELISTED FIRMS

Notes: There are 72 and 71 firms in the PM and the WM portfolios respectively when using the median selection strategy. In the portfolio using 1 SD, there are 22 firms in the PM portfolio and 26 firms in the WM portfolio.

FIGURE 7
QUALITY MEASURES AND MARKET CAPITALIZATION COMPARISON BETWEEN PORTFOLIO SELECTION STRATEGIES FOR THE PERIOD FROM 1999 TO 2008 AFTER EXCLUDING ALL DELISTED FIRMS

Notes: There are 72 and 71 firms in the PM and the WM portfolios respectively when using the median selection strategy. In the portfolio using 1 SD, there are 22 firms in the PM portfolio and 26 firms in the WM portfolio.