

Employee Expenses, Operating Flexibility, and Expected Stock Returns

In memory of Simon Benninga
Roi D. Taussig*

ABSTRACT

This paper offers a new measure for operating flexibility based on firms' expenditures on their employees. Asset pricing literature has concentrated on labor unions that reduce firms' operating flexibility. However, even firms without major labor unions can be sensitive to human capital risks which affect operating flexibility. The contribution of this study is to show, in general, that expenditures on employees affect firms' operating flexibility and thus account for higher stock returns. This may well be the first paper to conduct time-series predictability tests of market returns for market operating leverage and to find a positive interaction in and out of sample.

Keywords: Asset Pricing; Investment; Capacity; Wages

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1. Introduction and Literature Review

Economics and finance literature discusses the impact of labor unions on the cost of equity. For example, there is a substantial mark-up in salaries of union workers in comparison to non-union workers. The fact that the workers of a firm are unionized affects the profitability, equity value and investment decisions of the firm (e.g. Lewis (1986), Connolly, Hirsch and Hirschey (1986)). A recent article by Chen, Kacperczyk and Ortiz-Molina (2011) discusses the impact of labor unions on the cost of equity. They suggest that the operational flexibility of a firm decreases when its workers are unionized. When a company wants to make changes in its operations, flexibility is very important. These changes can include: buying a new plant, selling or buying machines, hiring or firing employees, signing salary contracts with employees and more. Schmalz (2013) suggests that human capital risk can arise from inefficient layoffs of good employees in times of distress. When a firm fires good employees because of transitory financial distress the firing is inefficient because finding and retraining good employees again will entail costs. This paper suggests that total expenditures on employees can affect the firms' operational flexibility. The variable REEA, the ratio of employee expenses to total assets, is constructed in order to explain the cross-section of expected stock returns.

$$REEA_{it} = \text{Ln} \left(\frac{tee_{it}}{ta_{it}} \right) = \text{Ln}(tee_{it}) - \text{Ln}(ta_{it}) \quad (1)$$

Where **Ln** is the natural logarithm, **tee** is total expenditures on employees in time t for security i, and **ta** is total assets from the balance sheet in time t of security i.

A firm will find it difficult to fire employees because of firing costs and/or labor unions. Consequentially, high total expenditure on employees reduces the firm's operational flexibility. When a firm wishes to lower employees' wages or to fire employees, labor unions or the cost of firing can prevent it from doing so optimally. Substantial reduction in the terms or salaries of workers is considered by common law as firing. Thus REEA is associated with a systematic risk which cannot be dispersed. Recent asset pricing literature has focused only on labor unions. However, even firms without major labor

unions can be sensitive to human capital risks which affect operating flexibility. Only 0.4% of firms which operate for at least five years reduced their annual labor costs. That is, firms can increase their labor costs but can hardly reduce them. They can only shut down the firm. The main contribution is to show in general (not just for firms with labor unions) that expenditures on employees affect firms' operating flexibility and thus account for higher stock returns.

Recent articles, like Bazderesch, Belo and Lin (2014) (hereafter BBL14), and Kuehn, Petrosky-Nadeau and Zhang (2012), concentrate on labor frictions. This paper's rationale relies on operating leverage. These two subjects are connected. Employee expenses as fixed costs are considered which is true in the presence of labor market frictions. This research concentrates on the labor costs themselves while others concentrate on the frictions. BBL14 find a negative connection between hiring employees and stock returns. This result is consistent with their labor market frictions model. They concentrate on frictions in the labor market in the form of the rate of change in hiring employees, while this paper assumes frictions and therefore regards labor costs as relatively fixed. Interestingly, if a firm hires many employees then its labor costs should increase which contradicts our findings of a positive connection between REEA and excess returns. However, BBL14 mention in the third paragraph of their data section that using EMP (the data item for number of employees) is conservative. Firstly, new workers can be only part-time or seasonal workers. There is no adjustment for hours worked. A part-time worker does not cost as much as a full-time worker *ceteris paribus*. Secondly, there is heterogeneity among employees. While usually employees' expenses are substantially higher when there is an additional engineer in the firm relative to a clerk, the number of employees does not address this difference. These issues explain the alleged contradiction.

Another explanation for REEA to affect the cross-section of stock returns is that it is a proxy for capital intensity. However, it is not clear how capital intensity is associated with risk. Moreover, if one considers a productivity explanation, Jorgenson and Griliches (1967) showed that most of Solow residual is explained by the quantity of inputs. According to

them the observed growth in total factor productivity is negligible. Nevertheless, in this paper capital intensity is also controlled.

Novy-Marx (2011) suggests a similar proxy for operating leverage which is based on total operating costs to assets. Our measure is related only to labor costs while Novy-Marx's operating leverage (OL) relates to all operating costs. The REEA measure contributes to the literature by adding another economic explanation for OL. Moreover, when subtracting the expenditures on employees from total operating costs in Novy-Marx's OL, its effect becomes insignificant. This suggests that expenditures on employees are an important factor in Novy-Marx's total operating costs.

Some variables, like book-to-market, were found in the financial literature not only to have significant explanatory power in the cross-section of stock returns but also to have predictive power in the time-series of aggregate market returns (e.g. Pontiff and Schall (1998)). This may well be the first paper to examine the predictive power of market returns for aggregate operating leverage. It was found that aggregate operating leverage has significant predictive power of consecutive year market returns in and out of sample.

Section 2 discusses the cross-section analysis of REEA and stock returns. Section 3 follows with a time-series analysis and predictability tests. Section 4 concludes.

2. Cross-Section analysis of REEA and stock returns

It will be shown that REEA is a firm characteristic which is associated with firm risk. As such, it should have explanatory power of cross-section stock returns. The hypothesis is that a higher REEA for an individual firm reduces the firm's operational flexibility, exposes the firm to greater operational risk, and thus accounts for a higher expected stock return. Employee expenses are more fixed than usually thought of and thus account for operating leverage. As mentioned in the introduction, this paper finds that only about 0.4% of firms which survived for at least five years ever reduced their employee expenses. Firms are more reluctant or unable to reduce labor expenses than usually assumed. This can stem from labor unions and/or human capital risks.

Higher REEA explains higher cross-section stock returns because the exposure for operational risk on these firms is greater as well. The reason, as mentioned in the

introduction, is that higher REEA means more human capital risks. Layoffs of good employees in times of transitory distress are inefficient (Schmalz, 2013). Employee expenses are mostly rigid downward. The positive interaction among operating inflexibility, operating leverage and stock returns is well documented in the literature (Chen, Kacperczyk, and Ortiz-Molina (2011) and Novy-Marx (2011)). Higher operating leverage means a higher dispersion of profits with respect to aggregate conditions and hence higher firm's risk. Therefore, investors require higher average stock returns

Adding the REEA firm characteristic to the Fama-French (1992) parsimonious model (hereafter FF92) adds explanatory power, which is not captured by size, book-to-market and past performance effects.

2.1. Data

This paper follows the methodology and data items which were used in FF1992. The sample includes all the firms in the intersection of the NYSE, AMEX, and NASDAQ return files from the Center for Research in Securities Prices (CRSP) and the CRSP-COMPUSTAT Merged (CCM) database which includes the firms' financial statements.¹ The data is extracted using Wharton Research Data Services (WRDS). The sample period is 1963-2013. The net return of each firm is used as the dependent variable in a cross-section regression. The return is given in the CRSP database and the 1-month t-bill return is taken from Kenneth French's website. The net return equals the stock's return in time t minus the 1-month t-bill return. The stock returns are from July 1963 to December 2013. In each year the dependent variable is the monthly net return from July of year t to June of year $t+1$. The market equity (price of a share multiplied by the number of outstanding shares) is calculated in month June of year t . ME in month June of year t will be an explanatory variable for the monthly returns from July of year t to June of year $t+1$. ME in month June of year $t+1$ will be the explanatory variable for the monthly returns from July of year $t+1$ to June of year $t+2$, and so on. Book equity is the common ordinary equity from CCM of each stock in the end of fiscal year $t-1$. ME for the book-to-market ratio is the market equity in December of year $t-1$. BE/ME from year $t-1$ explains the monthly returns from July of year t

¹ Excluding financial firms from the sample (SIC codes 6000-6999) results in similar findings.

to June of year $t+1$. BE/ME from year t explains the monthly returns from July of year $t+1$ to June of year $t+2$, and so on. This means that the returns are from July of year 1963 to December 2013, ME is only for months of June from 1963 to 2013, and BE/ME is from January 1962 to December 2012. REEA is the natural logarithm of total employee expenses (XLR) divided by total assets (AT), which is also the log of total employee expenses minus the log of total assets. Total employee expenses and total assets are taken from the financial reports in the CCM database. The data from the end of year $t-1$ is used. REEA from year $t-1$ explains the monthly returns from July of year t to June of year $t+1$, and so on.

Data item XLR (employee expenses) availability is limited which reduces the sample size. However, the mean and standard deviation of size and book-to-market do not change much in the sample. Moreover, the Fama-Macbeth estimates for size and book-to-market (which are presented in table 3) are conventional.

Past performance was measured by the return on a stock in the last month ($R(0,1)$), and the return on a stock from 12 months ago to two months ago ($R(2,12)$). Capital Intensity (CI) is measured as in Stickney and McGee (1983). Plant and equipment (PPEGT) are divided by total assets (AT). Table 1 reports descriptive statistics of the annual variables.

[Insert table 1 here]

REEA is directly connected to human capital risks, operating inflexibility, and operating leverage. The common size and Book-to-Market effects do not seem to capture human capital risks. As in Artikis and Nifora (2011), who found the relation among financial leverage, industries, and stock returns, our analysis is performed on REEA and the cross-section of stock returns. Table 2 reports the Pearson correlation coefficients of the variables. The correlations of REEA with size, Book-to-Market, and capital intensity are very low. The correlation with Book-to-Market is almost zero, and the correlation with size is just -0.14. It should be noted that employee expenses in REEA are scaled by the assets of the firm. That is, we capture in REEA the firm's relative employee expenses. Larger firms usually have on average higher labor costs. Therefore, it was important to employ a relative measure.

[Insert table 2 here]

2.2. The model and Fama-Macbeth regressions

The following model was tested which stems from the hypothesis that REEA has explanatory power for cross-sectional stock returns:

$$R_{it} = a + b_{1t} \ln(ME_{i,t-1}) + b_{2t} \ln(BE/ME_{i,t-1}) + b_{3t} \ln(REEA_{i,t-1}) + b_{4t} R(0,1) + b_{5t} R(2,12) + b_{6t} \ln(CI_{i,t-1}) + e_{it} \quad (2)$$

The slopes from each cross-section regression are averaged and a t-statistic is computed. The procedure follows the second stage of Fama-Macbeth (1973).

2.3. Results of the cross-section analysis

The empirical results of the cross-section FM regressions are presented in Table 3. The Ratio of Employee Expenses to Total Assets is significant when it is used as a single independent variable with a t-statistic of 2.59 (P-value of 0.009). When adding the FF1992 parsimonious model factors, size and book-to-market, REEA stays significant with a t-statistic of 3.69. Controls for past performances and capital intensity do not change the results. When controlling for total assets, REEA stays significant at the 5% level. This confirms that the effect of REEA is not just through the channel of total assets.

[Insert table 3 here]

The effect of REEA on stock returns is not only significant statistically but also significant economically. A one STD deviation increase in REEA accounts for an average increase of 2.13% in annual returns. This economic significance means that investing in firms with relatively high REEA (*ceteris paribus*) frequently results in higher average stock returns.

Human-capital risks can be more prominent in certain industries than in others. Armour and Cumming (2006) show the importance of the stock market and legal environment for the high-tech industry in the Silicon Valley. In the high-tech industry it can be more costly to fire engineers and programmers in times of transitory distress than to fire sellers in the retail industry. Cirillo (2014) finds a positive relation between product innovation and wages. Piva and Vivarelli (2005) find a positive relationship between innovation and employment. It should be mentioned that most of the high-tech and consumer industries have low labor union coverage. However, there are still human-capital

risks which are expected to be higher in the high-tech industry. When comparing the impact of REEA on the cross-section of expected stock returns (Table 4) it is clear that the impact is much stronger in the high-tech industry.

[Insert table 4 here]

3. Time-series analysis and REEA/OL predictability

The article proceeds with a time-series analysis. Total expenditures on employees for all firms is aggregated and divided by the sum of total assets of the firms. Because aggregate REEA actual level is not stationary we use the continuous rate of change in aggregate REEA (AREEA). The analyses include Granger causality tests and vector auto regressions.

$$AREEA_t = \text{LN} \left(\frac{\sum_i^n tee_{i,t}}{\sum_i^n ta_{i,t}} \right) - \text{LN} \left(\frac{\sum_i^n tee_{i,t-1}}{\sum_i^n ta_{i,t-1}} \right) \quad (3)$$

Studies show that there is a risk-return trade-off in inter-temporal market returns (e.g. Ghysles, Santa-Clara, and Valkanov (2005)). An aggregate measure of market operating leverage is related to market risk. AREEA interacts positively with market returns volatility. Therefore, it is hypothesized that positive changes in aggregate REEA, AREEA, will result in higher value-weighted market portfolio returns in the consecutive period. Predictability tests are then conducted.

3.1. Data

Annual data from 1962 to 2011 is used. The value-weighted market portfolio return from CRSP index annual data was obtained. Employee expenses and total assets of firms were acquired from CRSP-Compustat-Merged Database. Employee expenses and total assets were aggregated with respect to the data date. Variables known in the literature to have predictive power on market returns were controlled: the dividend yield which is defined as the difference between the log of dividends and the log of lagged prices; the term spread which is defined as the yield on 10-year government bonds minus the yield on

three-month T-bills; the default spread which is the difference between the yield on BAA corporate bonds and the yield on AAA corporate bonds; the change in the risk-free rate where the risk-free rate is the one-month T-bill.

Unit-root tests were conducted and it was concluded that the variables are stationary. Figure 1 shows the graphs of AREEA and consecutive year market returns.

[Insert figure 1 here]

3.2. Results of time-series regression (predictability tests)

Now that it has been established that AREEA is stationary, predictability tests can be performed by running a time-series regression of one year ahead portfolio returns on AREEA. Because of the relatively small sample a bootstrapping regression is also performed (e.g. Kothari and Shanken (1997)). AREEA is not autoregressive and residuals from an autoregressive regression of AREEA do not correlate with residuals of regression (4) (Amihud and Hurvich (2004)).

$$R^e(\text{Market})_t = a + b * \text{AREEA}_{t-1} + e_t \quad (4)$$

[Insert table 5 here]

As shown in table 5 AREEA predicts consecutive year market return. Whether implementing OLS with Newey-West STD or a bootstrapping regression, AREEA predicts next year annual return and the relation is positive. Adding known controls to the regression does not change the significance of the results. Table 6 reports the predictability tests with known predictors which are used in the literature (for example, Cooper and Priestley (2009)). As shown in table 6, AREEA predicts positively next year's market return (CRSP-portfolio). The effect is much stronger and more significant for the EW (equal-weighted) market return than for the VW (value weighted) market return. This finding probably exists because the market aggregate operational leverage affects smaller firms stronger than it affects larger firms.

$$R^e(\text{Market})_t = a + b * \text{AREEA}_{t-1} + \text{Controls} + e_t \quad (5)$$

[Insert table 6 here]

3.3. VAR and Granger causality tests

The hypothesis of the article and the above results suggest that market-portfolio returns are affected by the previous AREEA. However, this assumption is not taken for granted and a Granger Causality Test was performed. A recent study by Inci (2011) tested the pairwise granger causality between earnings, cash flow, and capital investment as well as on subsequent annual stock returns in China. Capital investment was found to cause positive subsequent stock returns.

We conduct a granger causality test in the time-series framework on the aggregate measures of REEA and the market. Wald test was performed in order to determine the optimal number of employed lags. The test showed, that among all lags of AREEA and market stock returns, one lag of AREEA is optimal. As can be seen in Table 7, AREEA causes VW-returns significantly, but not vice-versa. A VAR analysis is also conducted with impulse-response process in the spirit of SIMS (1980). Table 8 presents the results.

[Insert table 7 here]

The vector-auto-regression system is:

$$\begin{aligned} r(\text{vw-market})_t &= c1 + b1 * r(\text{vw})_{t-1} + b2 * r(\text{vw})_{t-2} + b3 * \text{AREEA}_{t-1} + b4 * \text{AREEA}_{t-2} + e_t \\ \text{AREEA}_t &= c2 + b5 * r(\text{vw})_{t-1} + b6 * r(\text{vw})_{t-2} + b7 * \text{AREEA}_{t-1} + b8 * \text{AREEA}_{t-2} + e_t \end{aligned} \quad (6)$$

[Insert table 8 here]

As can be seen in table 8, the only significant result is the predictability of one period ahead portfolio returns by the AREEA. The results support the hypothesis. The impulse response is illustrated in figure 2. As can be seen, the variables are stationary so the graphs are stabilizing to zero with time. AREEA predicts one period ahead of market portfolio return in a positive interaction with system stabilization after about 8 periods

3.4. Out-of-sample tests of AREEA

The predictive power of AREEA is examined in out-of-sample tests. It is important to examine the ability of an investor to predict next year's actual returns with past information which is available at a given time during our 1963-2011 sample's period. The AREEA model (proxy for aggregate market operating leverage) is compared to a restricted model based on a constant, i.e., the return is predicted according to its historical mean. Equation (7) is the restricted model and equation (8) is the unrestricted time-varying expected return which is based on a constant and the aggregate measure for operating leverage (AREEA).

$$R^e(\text{Market})_t = a + e_t \quad (7)$$

$$R^e(\text{Market})_t = a + b * AREEA_{t-1} + e_t \quad (8)$$

The results are shown for two out-of-sample tests. The first one is the ENC-NEW of Clark and McCracken (2001). It tests whether the forecast from the restricted constant model encompass the forecast from the unrestricted model which includes a constant and operating leverage. The second test, MSE-F, examines whether the mean squared forecasting error of the constant model is lower than that of the operating leverage model (McCracken (2007)). Bootstrapped probability values are calculated according to Clark and McCracken (2005). Firstly, the out-of-sample tests are examined for past data from 1963 to 1971. This past period is used for calculating the estimated models and forecasts begin in 1972. Secondly, the procedure is duplicated using past data from 1963 to 1991 and forecasts begin 1992. The results are presented in table 9. As shown, in the forecasting periods that start in 1972 and 1992 both ENC-NEW and MSE-F are significant at the 5% level. Evidently, the aggregate measure of operating leverage (AREEA) is significant also out-of-sample.

[Insert table 9 here]

4. Conclusions

This paper introduces an addition to the literature on the cross-section of expected stock returns. It is found that the ratio of total employee expenses divided by total assets

(REEA) is a significant and positive factor in explaining cross-sectional stock returns. This suggests that higher REEA is associated with more financial risk, which is suggested due to decreased operational flexibility. While former literature concentrated on labor unions extended results were shown for a random sample of firms which do not necessarily have a unionized labor force.

Predictability tests were conducted in a time-series frame-work. It was hypothesized that positive (negative) changes in aggregate market REEA decrease (increase) aggregate market operational flexibility, and thus account for one-period ahead higher (lower) market returns. The findings support the hypothesis in and out of sample. The REEA effect seems to be sustainable and requires future research to develop it.

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FIGURES and TABLES

Figure1: Aggregate Ratio of Expenditures on Employees to Assets and CRSP value-weighted index

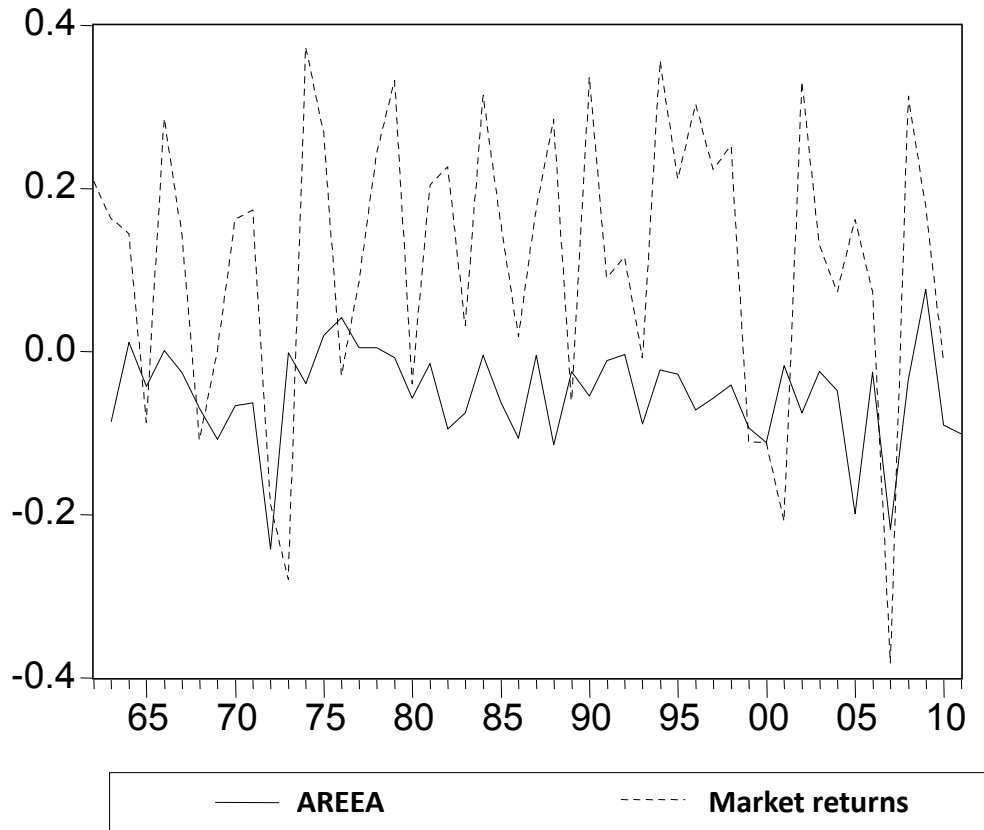


Figure2: Impulse response graphs of VAR system in equation set 6

Response to One S.D. Innovations \pm 2 S.E.

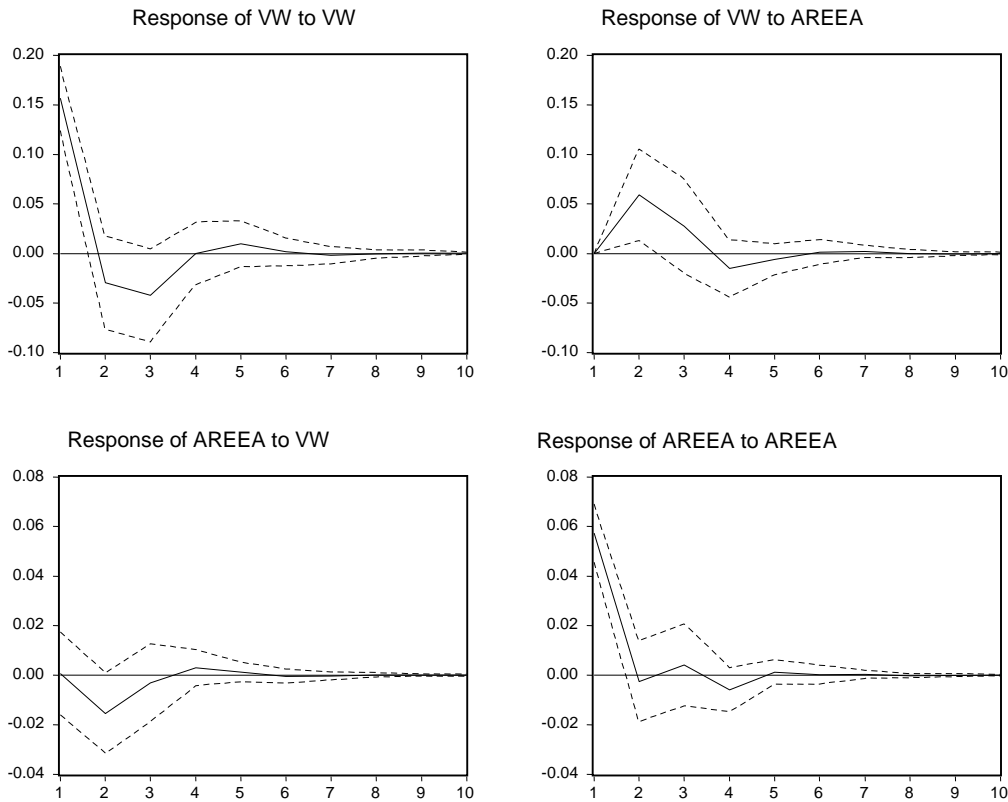


Table 1
Descriptive statistics of REEA
Jan 1963 to December 2013

Table 1 reports annual descriptive statistics of REEA=LN(XLR/AT), defined as the natural logarithm of firm's expenditure on employees divided by total assets (from Compustat). Size is the LN of the price of a share at the end of June multiplied by shares outstanding. Book-to-market is the LN of (CEQ) the book value at the end of a fiscal year divided by market value at the end of December. CI is capital intensity measured as the natural logarithm of plant and equipment divided by total assets PPEGT/AT. The sample is Jan1963 to Dec2013.

| | <u>Mean</u> | <u>STD</u> | <u>MAX</u> | <u>MIN</u> | <u>N</u> |
|--------------------|-------------|------------|------------|------------|----------|
| LN(tee/ta)=REEA | -1.77 | 1.11 | 1.55 | -6.25 | 27,083 |
| LN(Book-to-Market) | -0.43 | 0.76 | 1.95 | -4.03 | 27,083 |
| LN(Size) | 19.23 | 2.08 | 24.75 | 13.30 | 27,083 |

| | | | | | |
|----|-------|------|------|-------|--------|
| CI | -0.74 | 1.09 | 0.72 | -6.27 | 27,083 |
|----|-------|------|------|-------|--------|

Table 2
Pearson correlation coefficients
Jan 1963 to December 2013

Table 2 reports Pearson correlation coefficients of REEA=LN(XLR/AT), defined as the natural logarithm of firm's expenditure on employees divided by total assets (from Compustat). Size is the LN of the price of a share at the end of June multiplied by shares outstanding. Book-to-market is the LN of (CEQ) the book value at the end of a fiscal year divided by market value at the end of December. CI is capital intensity measured as the natural logarithm of plant and equipment divided by total assets PPEGT/AT. The sample is Jan1963 to Dec2013. All Pearson correlation coefficients are different from zero at the 1% significance level.

| | <u>REEA</u> | <u>LN(BM)</u> | <u>LN(Size)</u> | <u>CI</u> |
|--------------------|-------------|---------------|-----------------|-----------|
| LN(tee/ta)=REEA | 1.00 | -- | -- | -- |
| LN(Book-to-Market) | -0.02 | 1.00 | -- | -- |
| LN(Size) | -0.14 | -0.21 | 1.00 | -- |
| CI | 0.21 | 0.15 | 0.06 | 1.00 |

Table 3
Average Slopes (t-statistics) from month by month regressions of stock returns on Size,
Book-to-market, REEA, and past performance
July 1963 to December 2013

Table 2 reports average slopes (t-statistics) from month by month regressions of size, book-to-market, REEA, past performance, and capital intensity. The sample is from July 1963 to December 2013. Size is the price of a share at the end of June multiplied by shares outstanding. Book-to-market is (CEQ) the book value at the end of a fiscal year divided by market value at the end of December. REEA is XLR/AT, firm's expenditure on employees divided by total assets. Past performance is measured for the last month and for past 12 months to past 1 month. CI is capital intensity measured as plant and equipment divided by total assets PPEGT/AT. *, **, *** represent significance at the 10%, 5%, and 1%, respectively.

| <u>LN(tee/ta)=REEA</u> | <u>LN(ME)</u> | <u>LN(BE/ME)</u> | <u>R(0,1)</u> | <u>R(2,12)</u> | <u>CI</u> |
|------------------------|---------------------|-------------------|----------------------|-------------------|-------------------|
| 0.11*** (2.59) | | | | | |
| 0.10** (2.35) | -0.10*** (-3.31) | | | | |
| 0.17*** (3.69) | -0.09*** (-2.74) | 0.33*** (4.96) | | | |
| 0.16*** (3.61) | -0.09*** (-3.00) | 0.35*** (5.46) | -4.77*** (-10.73) | 0.58*** (3.26) | |
| 0.16*** (3.20) | -0.08*** (-2.54) | 0.37*** (5.98) | -4.87*** (-10.83) | 0.53*** (2.93) | -0.08* (-1.78) |

Table 4
Average Slopes (t-statistics) from month by month regressions of stock returns on REEA
July 1963 to December 2013

Table 3 reports average slopes (t-statistics) from month by month regressions of stock returns on REEA. The sample is from July 1963 to December 2013. REEA is XLR/AT, firm's expenditure on employees divided by total assets. There are two regressions: one only on the high-tech industry and the other only on the consumer industry. The high-tech industry, having more qualified employees (e.g. engineers, computer programmers), has higher human capital risks. *, **, *** represent significance at the 10%, 5%, and 1%, respectively.

| <u>Hi-tech industry</u> | | <u>Consumer industry</u> | |
|-------------------------|--|--------------------------|--|
| <u>REEA</u> | | <u>REEA</u> | |
| 0.59** | | 0.04 | |
| (2.34) | | (0.31) | |

Table 5
Time-series regression results of CRSP portfolio returns for AREEA

Table 6 reports estimates from OLS regressions of CRSP portfolio annual returns on lagged AREEA using Newey-West STD errors and bootstrapping regression for a relatively small sample. The sample is annual observations from 1963 to 2011. *, **, *** represent significance at the 10%, 5%, and 1%, respectively.

| | <u>OLS with Newey-West STD errors</u> | | | <u>Bootstrapping Regression</u> | | |
|-----|---------------------------------------|--------------|----------------------|---------------------------------|--------------|----------------------|
| | <u>Constant</u> | <u>AREEA</u> | <u>R²</u> | <u>Constant</u> | <u>AREEA</u> | <u>R²</u> |
| VW | 0.16*** | 1.05*** | 0.11 | 0.16*** | 1.05** | 0.05 |
| (t) | (6.93) | (2.99) | | (5.04) | (2.17) | |

Table 6
Time-series regression results of CRSP portfolio returns for AREEA

Table 7 reports estimates from OLS regressions of CRSP portfolio annual returns on lagged AREEA and a set of control variables: the dividend yield, *dy*, which is defined as the difference between the log of dividends and the log of lagged prices; the term spread, *term*, which is defined as the yield on 10-year government bonds minus the yield on three-month T-bills; the default spread, *def*, which is the difference between the yield on BAA corporate bonds and the yield on AAA corporate bonds; the change in the risk-free rate, *drf*, where the risk-free rate is the one-month T-bill; The sample is annual observation from 1963 to 2011. *R*² is the adjusted *R*². The Newey-West-corrected *t*-statistics are reported in parentheses. *, **, *** represent significance at the 10%, 5%, and 1%, respectively.

| | <u>Constant</u> | <u>AREEA</u> | <u>dy</u> | <u>term</u> | <u>def</u> | <u>drf</u> | <u>R²</u> |
|-----|-----------------|--------------|-----------|-------------|------------|------------|----------------------|
| VW | 0.05 | 0.91** | 1.34 | 2.14 | 3.19 | 0.43 | 0.07 |
| (t) | (0.52) | (2.44) | (0.89) | (0.83) | (0.66) | (0.20) | |
| EW | 0.28*** | 2.14*** | -0.74 | -2.35 | 4.84 | -3.38 | 0.16 |
| (t) | (2.64) | (4.03) | (-0.3) | (-0.70) | (0.64) | (-1.20) | |

Table 7
Granger causality test for AREEA and value-weighted-market returns
Pairwise Granger Causality Tests Sample: 1962 2011 Lags: 1

| <u>Null Hypothesis:</u> | <u>Obs</u> | <u>F-Statistic</u> | <u>Probability</u> |
|---------------------------------|------------|--------------------|--------------------|
| AREEA does not Granger Cause VW | 48 | 6.79 | 0.01 |
| VW does not Granger Cause AREEA | | 2.01 | 0.16 |

| | <u>VW</u> | <u>AREEA</u> |
|-----------|----------------------------|-----------------------------|
| VW(-1) | -0.19 (0.14) (-1.31) | -0.09 (0.05) (-1.83) |
| VW(-2) | -0.20 (0.13) (-1.49) | -0.04 (0.05) (-0.85) |
| AREEA(-1) | 1.03 (0.41) (2.51) | -0.04 (0.15) (-0.29) |
| AREEA(-2) | 0.72 (0.43) (1.67) | 0.17 (0.15) (1.08) |
| C | 0.24 (0.04) (5.00) | -0.03 (0.017) (-1.71) |

Table 9
Out-of-sample results for AREEA

Table 12 reports out-of-sample estimates for the significance of AREEA in forecasting annual CRSP returns. The sample is 1963 to 2011. The comparisons are of forecasts of returns based on a constant (the restricted model) and forecasts based on a constant and OL (unrestricted model). The row labeled ENC-NEW provides the Clark and McCracken (2001) encompassing test statistic. The row labeled MSE-F gives the *F*-test of McCracken (2007), which tests the null hypothesis of equal MSEs against the alternative that the MSE from the unrestricted model is smaller. The row labeled Boot p.v. provides the bootstrapped probability value using the methodology in Clark and McCracken (2005). *R2* OOS is the out-of-sample *R2*. *, **, *** represent significance at the 10%, 5%, and 1%, respectively.

| | <u>Forecasting from 1972</u> | <u>Forecasting from 1992</u> |
|---------|------------------------------|------------------------------|
| ENC-NEW | 4.36** | 2.49** |

| | | |
|--------------------|--------|--------|
| (Boot p.v.) | (5%) | (5%) |
| MSE-F | 2.94** | 2.99** |
| (Boot p.v.) | (5%) | (5%) |
| R ² OOS | 0.07 | 0.13 |
