Dissertation

Master in Corporate Finance

Do "The Best Companies to Work" have Higher Stock Returns?

Mariana Pereira Roque

Leiria, *September 2016*

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Dissertation developed under the supervision of Doctor Maria João da Silva Jorge, professor at the School of Technology and Management of the Polytechnic Institute of Leiria and co-supervision of Doctor Célia Patrício Valente Oliveira, professor at the School of Technology and Management of the Polytechnic Institute of Leiria.

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Dedication

"Everything's in the mind. That's where it all starts. Knowing what you want is the first step toward getting it."

Mae West

To my family, mom, dad and sisters.

Dedicated to the memory of my grandma, Maria Inácia.

Acknowledgements

First of all, I would like to thank my family.

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Abstract

Do “The Best Companies to Work” have Higher Stock Returns? The main purpose of this work is to prove the link between job satisfaction and the firm’s value. The «Best Companies to Work» list give us our measure for job satisfaction. The sample of this work is composed by firms listed in STOXX Europe 600 Index. We compared the monthly returns of a portfolio composed by firms present in the «Best Companies to Work» list with two other benchmark portfolios, using the four-factor model proposed by Carhart (1997), from January 2010 to December 2014. Our results show that the BCWE600 portfolio outperforms both benchmark portfolios. In other words, companies classified as Best Companies to Work generated 0.40%/month and 4.94%/year higher stock returns than their peers over the 2010-2014 period. Also, the market risk in portfolio BCWE600 is inferior compared to other portfolios. This work shows that firms with the most satisfied workers get better results, resulting in higher returns for it’s shareholders.

Keywords: Firm Value, Job Satisfaction, Best Companies To Work, Carhart Model, Four-Factor Model.

Resumo

Será que as "Melhores Empresas para Trabalhar" têm maiores rendibilidades? O principal objetivo deste trabalho é provar a ligação entre satisfação no trabalho e o valor da empresa. A nossa forma de medir a satisfação no trabalho utiliza as listas «Melhores Empresas para Trabalhar». A nossa amostra é constituída por empresas cotadas no índice STOXX Europa 600. Foram comparadas as rendibilidades mensais, de Janeiro de 2010 a Dezembro de 2014, de um *portfolio* constituído por empresas presentes nas listas «Melhores Empresas para Trabalhar» com dois *portfolios benchmark* utilizando o modelo dos quatro-fatores proposto por Carhart (1997). Os resultados obtidos mostram que o *portfolio* BCWE600 supera ambos os *portfolios benchmark.* Ou seja, empresas classificadas como melhores para trabalhar, no período 2010-2014, originaram maiores rendibilidades, ascendendo esta diferença a 0.40%/mês e 4.94%/ano, face às restantes empresas no mercado. Para além de rendibilidades superiores o *portfolio* BCWE600 apresenta menor risco de mercado face aos *portfolios benchmark*. Este trabalho corrobora que empresas com colaboradores mais satisfeitos alcançam melhores resultados, proporcionando rendibilidades mais elevadas aos seus acionistas.

Palavras-chave: Valor da Empresa, Satisfação no Trabalho, Melhores Empresas para Trabalhar, Carhart, Modelo Quatro-Fatores.

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List of acronyms

OCB – Organisational Citizenship Behaviour

E/P – Earnings-Price Ratio

ICB – Industry Classification Benchmark

FM – Full Market

RM - Reduced Market

BCWE 600 - Best Companies To Work in Europe 600

LRG – Large Company

MID – Medium company

SML – Small company

B/M – Book-To-Market

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1 Introduction

Landy, (1989, as cited in Edmans, 2012) described the relationship between job satisfaction and firm value as the "holy grail" of organisational behaviour. It is one of the most venerable research traditions in industrial-organisational psychology (Judge, Bono, Thoresen, & Patton, 2001).

The causes and implications of job satisfaction have been debatable issues for many years. It is believed that the interest in the relationship between job satisfaction and performance first emerged in studies of Hawthorne in 1933.

Theoretically, higher job satisfaction levels imply higher productivity. However, it is a very complex relationship. Empirically, it has been difficult to find the relationship between job satisfaction and performance indicators.

In the 50's, various meta-analysis about job satisfaction began to emerge. The investigations that have taken place until the 1990's have shown weak relationships between job satisfaction and performance variables (Brayfield & Crockett, 1955; Chapman & Chapman, 1969; Iaffaldano & Muchinsky, 1985). This meta-analysis had great influence in the management by the end of the millennium since its conclusions used to deny any relationship between satisfaction and performance (Jones, 2006; Edmans, 2012).

More positive results have recently appeared (Fulmer, Gerhart, & Scott, 2003; Harrison, Newman, & Roth, 2006; Talachi, Gorji, & Boerhannoeddin, 2014). Fulmer, Gerhart and Scott (2003, p.965) conclude that companies on the list «100 Best Companies to work in America» have more "stable and highly positive workforce attitudes". Harrison, Newman, & Roth (2006) found a strong correlation ($r = 0.59$) between general job attitude and individual effectiveness.

The main purpose of this work is to confirm human resource management (HRM) theories, proving a link between satisfaction and the firm's value through a financial methodology. For this, we will compare the monthly returns of a portfolio composed by firms listed in «Best Companies to Work» with other two benchmark portfolios.

It is expected that distinct policies of human resources result in different levels of satisfaction and value created. In other words: firms with higher job satisfaction levels are more valuable.

The sample used allows us to understand the link between job satisfaction and the firm's value in firms listed, specifically, in the STOXX Europe 600 Index between 2010 and 2014.

Most investigations address job satisfaction with an individual perspective, linking it to individual performance of the employee (Brayfield & Crockett, 1955; Iaffaldano & Muchinsky, 1985; Harrison, Newman, & Roth, 2006). We will understand the impact of job satisfaction in organisational performance, specifically, in firm value. This variable will be measured by future stock returns.

Generally, the variable job satisfaction is measured by surveys (Ostroff, 1992; Talachi, Gorji, & Boerhannoeddin, 2014). This paradigm has been change by A. Edmans (2012). Following its contribution, we will measure job satisfaction by using the lists of "Best Companies to Work" published by Great Place to Work® Institute.

In this work, we will use the 4-factor model. This model was constructed by Carhart (1997) using Fama and French (1993) 3-factor model.

Finally, using 4-factor model and variables described before, this work has some advantages over the others. Firstly, we leave the individual approach because "the market value takes into account all of the channels through which job satisfaction affects firm value" (Edmans, 2012, p. 5). It's not only money, only holidays or only a good boss. Secondly, using future stock returns we allow the market to take time to recognize the benefits of job satisfaction and we avoid reverse causality. If we use current stock returns, a high market value could actually lead to high satisfaction. However, if satisfaction in December was caused by strong performance during that year, the market value would already be high in December and so we should not expect high returns in the following year.

After the brief introductory chapter, the remainder of this dissertation consists of four more chapters. Chapter 2 provides the literature review of job satisfaction concept and their evolution in the last years. Additionally, we summarize the evolution of models of

performance measurement and we refer the work model (4-factor model). In Chapter 3 we present the main objective and hypothesis of this work, sample and methodology. We will thoroughly explain the construction of the variables used in the Carhart model. Chapter 4 is dedicated to the presentation of the empirical results and in Chapter 5 we conclude about main achievements of this work.

2 Literature Review

2.1 Introduction to job satisfaction

The concept of job satisfaction has been defined in many ways (Judge & Klinger, 2007). Under previous authors, the most widely used definition is the Locke's, who described job satisfaction as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976, p. 1304).

"Given that a job is a significant part of one's life, the correlation between job and life satisfaction makes sense ..." (Judge & Klinger, 2007, p. 404). In other words, the work experiences have always influenced the non-working life.

The impact of job satisfaction in general life satisfaction seems to be unquestionable, but what about the impact in performance of the employer?

Judge, Bono, Thoresen and Patton (2001) consider that a relationship between job satisfaction and job performance is one of the most venerable research traditions in industrial-organisational psychology.

2.2 Evolution of job satisfaction concept

Judge, Bono, Thoresen and Patton (2001) believed that the interest in the link between attitudes and productivity in the workplace goes back at least as far as the Hawthorne studies. The Hawthorne effect is even a reference in management and psychology schools. By 1920, in Hawthorne Works, electrical equipment producer, few studies have been conducted to systematically explore the impact of environmental factors on the productivity of the workforce. The workers were divided into groups in different workrooms and they executed various tasks. The light levels varied from room to room and the productivity of workers was monitored. "To the surprise of the researchers, even when lighting levels were decreased, productivity continued to increase" (Macefield, 2007, p. 2).

Elton Mayo was a key member of the research team in Hawthorne. According to him, the increase in performance is explained by the motivation of workers that resulted from the

attention given by their leaders during testing. However, we must take into consideration that this is “Mayo’s interpretation of the Hawthorne effect” (Draper, 2000).

Nowadays, workers tasks are harder to quantify because times are no longer industrial. Frederick Winslow Taylor’s system, dated back to 1911, the "incentive-initiative system", is no longer acceptable: If you give a (financial) incentive to workmen you can expect “initiative” from him (Blunden, s.d.). Therefore, Kohn (1993) alert to the inefficiency of incentive’s systems based on outputs.

Job satisfaction began to emerge when extrinsic motivators such as payments and working conditions became less effective.

In the 50’s some studies and meta-analyses found that there was “surprisingly little association between individual-level job satisfaction and job or task performance” (Fulmer, Gerhart, & Scott, 2003, p. 967).

Brayfield and Crockett (1955) reviewed existing literature about job satisfaction to job performance and to a number of other behavioural outcomes – accidents, absence, and turnover. Additionally, they concluded that there was little or a non-existent relationship between job satisfaction and performance, only a correlation of 0.15.

This study is considered “the most influential narrative review of the job satisfaction job performance relationship” (Judge, Bono, Thoresen, & Patton, 2001, p. 376). However, their review was limited by the small number of published studies in that time.

Iaffaldano and Muchinsky (1985) meta-analysed 217 correlations from 74 studies and found a mean correlation of only 0.17 between satisfaction and performance at the individual level. However, the 0.17 correlation between satisfaction and performance reported by Iaffaldano and Muchinsky is a correlation between pay, co-worker or promotion satisfaction and job performance. This approach is not an appropriate estimate of the relationship between overall job satisfaction and job performance because it violates the independence assumption (Judge, Bono, Thoresen, & Patton, 2001).

Ostroff (1992) tried to understand if overall level of satisfaction or the attitudes of employees within organisations was related to organisational performance. This study was part of a project for the NASSP - National Association of Secondary School Principals. The

sample comprised 298 schools from 36 states in the United States of America and Canada. The authors sent, by email, three types of surveys to each school for principals, teachers and students. In the end, the usable data was taken from 352 principal's questionnaires, 13,808 teachers and 24,874 students. In 12 organisational performance indexes, they found "magnitudes of the zero-order correlations between satisfaction and organisational performance ranged from $0.11\ to\ 0.54$" (Ostroff, 1992, p. 968).

Fulmer, Gerhart and Scott (2003) compare the companies on the list «100 Best Companies to Work in America» with two sets of other companies, a matched group and the broad market. The authors concluded that companies on the list have more "stable and highly positive workforce attitudes" (Fulmer, Gerhart, & Scott, 2003, p. 965). In addition, these enterprises have performance advantages over the broad market, for example, ratios like ROA and market-to-book were better for companies in the list.

Gorton and Schmid (2004, as cited in Addison & Schnabel, 2009) analysed the effect of codetermination on the economic performance of the firm using financial indicators (market-to-book ratio of equity and Tobin's q). But they also examined the effects of codetermination on company leverage, the wage bill-to-employees ratio, the employee-to-sales ratio, and the compensation of the management board and the supervisory board. They concluded that greater employee involvement reduced firm value.

Harrison, Newman and Roth (2006) found a strong correlation ($r = 0.59$) between general job attitude (comprised of job satisfaction and organisational commitment) and individual effectiveness (a structure based on a broad set of workplace behaviours, including focal performance, contextual performance, lateness, absenteeism and turnover).

Jones (2006) reinforced the belief there was until the 90's. The relationship between job satisfaction and performance is an "illusory correlation" (Chapman & Chapman, 1969). In other words, there is a perceived relationship between satisfaction and performance, "We logically or intuitively think should interrelate, but, in fact, do not". (Jones, 2006, p. 21)

Talachi, Gorji and Boerhannoeddin (2014) investigated the relationship between job satisfaction and Organisational Citizenship Behaviour (OCB). The data was gathered from 154 employees working in industry, mine and trade organisation of Golestan province in Iran. They found a significant relation between job satisfaction with OCB and its

components. Spearman and Pearson's correlation coefficients were of 0.644 and 0.622, respectively.

Edmans (2012) points out several difficulties in identifying the relationship between job satisfaction and firm value variables. According to him, most publications may not show the true impact of job satisfaction. On the one hand, studies are cross-sectional and positive correlation could result from reverse causality. For example, an increase in productivity may not be related to job satisfaction but by other external factors, like payments and work conditions. On the other hand, studies above use job performance as a dependent variable. Three problems may result from this. Firstly, they measure job performance at the individual level and its implications at the firm level are unclear. Secondly, considering organisational performance, there are many possible dimensions which may influence it and it is difficult to assign a weight to each one. Thirdly, some performance measures do not take into account the costs of achieving higher job satisfaction.

Edmans (2012) raised a question of management and human resources with many years of discussion and tried to relate it, through a financial methodology, with a financial factor (firm value). This author compared the firm value of «100 Best Companies to Work for in America» and other companies using the 4-factor model proposed by Carhart (1997)[1]. Firm value is obtained by market value (future stock returns) and «Best Companies to Work» is a proxy for job satisfaction. On the one hand, "the market value takes into account all of the channels through which job satisfaction affects firm value" (Edmans, 2012, p. 5). It's not only money, only holidays or only a good boss. On the other hand, it avoids reverse causality. If it uses current stock returns, a high market value could actually lead to high satisfaction. However, if satisfaction in December was caused by strong performance during the year, the market value would already be high in December and so we should not expect high returns in the following year. Additionally, by using future stock returns, it gives the market time to recognize the benefits of job satisfaction.

[1] See model description in the 2.3 Section: Models of Performance Measurement

In their study, Edmans (2012) concluded that companies listed in the «100 Best Companies to Work For in America» generated 2.3-3.8%/year higher stock returns than their peers from 1984-2011.

There aren't many additional studies of job satisfaction related with financial metrics of firms using financial methodologies. In this way, we will follow Edmans (2012) contribution and try to understand the phenomenon of job satisfaction in European firms.

The next section, 2.3, discusses the evolution of asset or companies valuation methodologies.

2.3 Models of performance measurement

The model developed by William Sharpe in 1964 and John Lintner in 1965 – Capital Asset Pricing Model (CAPM) – was a mark in the history of Models of Performance Measurement.

The model is defined by:

$$E(R_i) = R_f + \beta_i * [(R_M) - R_f] \quad (1)$$

Where,

$E(R_i)$ is the expected return of portfolio /stock *i*;

R_f is the risk free rate;

β_i is the systematic risk of portfolio *i*;

(R_M) is the market return.

Decades later, CAPM is still used to evaluate the performance of managed portfolio. However, CAPM presents some problems resulting "of many simplifying assumptions" (Fama & French, 2004, p. 25) and "has never been an empirical success" (Fama & French, 2004, p. 43).

Banz (1981) examined the relationship between the market value of a firm and its return. The «size effect» arises for the first time with this study. He found that the common stock of small firms had higher risk-adjusted returns than the common stock of large firms. This study has demonstrated that firm-size data can be used to create portfolios that earn abnormal returns, in particular, the smaller a firm's capitalization, the greater the apparent abnormal returns. These results appear to be inconsistent with the traditional single-period Sharpe-Lintner capital asset pricing model (CAPM), which posits a specific relationship between systematic risk (beta) and required asset returns.

Basu (1983) shows CAPM empirical failures by showing the presence of a significant earnings' yield effect on the NYSE during the period April 1963-March 1980. He confirmed that the common stock of high E/P (Earnings-Price Ratio) firms earns, on average, higher returns than the common stock of low E/P and that this effect is clearly significant even if experimental control is exercised over differences in firm size.

Rosenberg, Reid and Lanstein (1985) detected a market inefficiency in a universe of 1400 stocks of the largest companies priced in NYSE and NASDAQ. They found a positive relationship between the average return and the ratio of a firm's book value to market equity. This relationship could not be explained by the CAPM.

Concluding, Banz (1981), Basu (1983) and Rosenberg *et al.* (1985) found some variables with high power to explain cross-section like size, leverage, earnings/price or book-to-market equity. These variables don't have a "special standing" in CAPM (Fama & French, 1993).

According to these contributions, Fama and French (1993) developed a three-factor model to estimate expected stock returns. The three risk factors are size, book-to-market ratio and market of firms. The model is defined by:

$$R_{it} - RF_t = \propto_{it} + \beta_i * (RM_t - RF_t) + \beta_{iHML} HML_t + \beta_{iSMB} SMB_t + \varepsilon_{it} \quad (2)$$

Where,

$R_{it} - RF_t$ is the excess return on asset *i* in month *t* compared to the risk-free interest rate;

$\propto_{it}$ is the intercept term;

$RM_t - RF_t$ is the excess return of the stock market in month *t*;

HML_t is the book-to-market risk factor in month *t* and is calculated as the difference between the returns in diversified portfolios of high book-to-market (value) stocks and low book-to-market (growth) stocks (Fama & French, 2012, p. 2);

SMB_t is the size risk factor in month *t* and is calculated as the difference between the returns on diversified portfolios of small stocks and big stocks (Fama & R.French, 2012, p. 2).

Several years later, Carhart (1997) constructed a four-factor model using Fama and French (1993) three-factor model plus an additional factor: momentum. This is motivated by the three-factor models inability to explain cross-sectional variation in momentum-sorted portfolio returns (Carhart, 1997). This factor was captured by Jegadeesh and Titman (1993) who examined a variety of momentum strategies and documented a strategy: buy stocks with high returns over the previous 3 to 12 months and sell stocks with poor returns over the same time period and earn profits of about one percent per month. The Carhart model is defined by:

$$R_{it} - RF_t = \propto_{it} + \beta_{iM} * (RM_t - RF_t) + \beta_{iHML} HML_t + \beta_{iSMB} SMB_t + \beta_{iUMD} UMD_t + \varepsilon_{it} \quad (3)$$

Where,

UMD_t is the momentum risk factor in month *t*, composed as the difference between the month *t* returns on diversified portfolios of the winners and losers of the past year.

In the next chapter we will present the methodology used in this study, including the sample, time horizon, hypothesis and statistical model.

3 Methodology

The main purpose of this work is to prove the link between job satisfaction and the firm's value.

For this, we will compare the monthly returns of a portfolio composed by firms present in the «Best Companies to Work» list with two other benchmark portfolios using the four-factor model proposed by Carhart (1997).

Our hypothesis is «firms with higher job satisfaction levels are more valuable» and it takes into account companies listed in STOXX Europe 600 Index.

The period used to develop this work is from January 2010 to December 2014, five years, sixty months. Using a time series analysis, we have sixty observations for each firm.

3.1 Sample

The initial sample consists of all firms listed in the STOXX Europe 600 Index.

The index is derived by STOXX Europe Total Market Index (TMI) and part of STOXX Global 1800 Index. The STOXX Global 1800 derived benchmark indices are designed to provide a broad yet investable representation of the world's developed markets of Europe, North America and Asia/Pacific, represented by the STOXX Europe 600, the STOXX North America 600 and the STOXX Asia/Pacific 600 indices, respectively.

With a fixed number of 600 components, this index represents large, mid and small capitalization firms across 18 countries of the European region: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom (STOXX® Europe 600, s.d.).

However, several criterial must be considered to get a correct sample to apply the methodology:

1. Companies that have been listed in the STOXX Europe 600 Index over 5 years in analysis;

2. Companies that have all required data available in DataStream Database (database used for data collection);
    a. Monthly stock prices for the analysis period and for the previous twelve months;
    b. Market capitalization for the analysis period and for December of 2009;
    c. Book-to-Market for the analysis period and for December of 2009;
3. Companies with positive book-to-market.

In the next table, Table 1, we describe the sample selection procedure.

Table 1: **Sample selection**

Criterion	Sample (Firms)
Initial sample	**600**
Firms not listed in index over 5 years (2010-2014)	141
Firms without all require data available in DataStream Database	12
Firms with negative book-to-market	9
Final sample	**438**

Our sample includes companies with financial statements in several currencies. However, we collected from DataStream all financial data that was automatically converted into euros.

In our sample there are countries represented with a significant number of firms, such as the United Kingdom with 121 firms (27.63% of the sample) and France with 72 firms (16.44% of the sample). Table 2 details our sample by country.

Table 2: **Sample by country**

Country	Number of Companies	Weight in Sample
United Kingdom	121	27.63%
France	72	16.44%
Germany	44	10.05%
Switzerland	36	8.22%
Sweden	33	7.53%
Italy	24	5.48%
Netherlands	19	4.34%
Spain	19	4.34%
Finland	16	3.65%
Norway	14	3.20%
Belgium	11	2.51%
Denmark	10	2.28%
Austria	7	1.60%
Ireland	5	1.14%
Portugal	4	0.91%
Luxembourg	2	0.46%
Greece	1	0.23%
Total	**438**	

Our sample is composed by firms classified in different industries. The most represented industry is Industrial Goods & Services with 76 firms in the sample (17.4%) as shown in table 3.

Table 3: **Sample by activity sector (ICB)**[2]

Industry Classification Benchmark (ICB)		Number of Companies	Weight in Sample
2700	Industrial Goods & Services	76	17.40%
8300	Banks	35	8.00%
4500	Health Care	26	5.90%
8500	Insurance	25	5.70%
7500	Utilities	23	5.30%
8700	Financial Services	22	5.00%
3700	Personal & Household Goods	22	5.00%
3500	Food & Beverage	21	4.80%
500	Oil & Gas	21	4.80%
5300	Retail	21	4.80%
8600	Real Estate	20	4.60%
1700	Basic Resources	18	4.10%
5500	Media	18	4.10%
1300	Chemicals	17	3.90%
2300	Construction & Materials	17	3.90%
9500	Technology	15	3.40%
3300	Automobiles & Parts	14	3.20%
6500	Telecommunications	14	3.20%
5700	Travel & Leisure	13	3.00%
	Total	**438**	

[2] http://www.icbenchmark.com/: The Industry Classification Benchmark (ICB) is a definitive system categorizing over 70,000 companies and 75,000 securities worldwide, enabling the comparison of companies across four levels of classification and national boundaries. The ICB is an industry classification taxonomy launched by Dow Jones and FTSE in 2005 and now owned solely by FTSE International. It is used to segregate markets into sectors within the macroeconomics. The ICB uses a system of 10 industries, partitioned into 19 super sectors, which are further divided into 41 sectors, which then contain 114 subsectors.

3.2 Measure of job satisfaction

Following the contribution of Edmans (2012) we will measure job satisfaction using a list published by Great Place to Work ® Institute. This project emerges in 1981 with a challenge posed by a New York editor to two business journalists, Robert Levering and Milton Moskowitz. The first list, «100 Best Companies to Work in America» was published in 1984 by these journalists and since 1998 it has been published in the January issue of Fortune magazine each year. Later, in 1997, Fortune (in the United States) and Exame (in Brazil) partnered with the Institute's research and produced the world's first «100 Best Companies to Work». Great Place to Work ® Institute gradually emerged in 45 countries around the world with more growth slated in the coming years (Great Place To Work Institute, n.d. a).

In the institute's website it is possible to obtain many information about their approach of job satisfaction. Trust is the central issue. For them, "trust is the defining principle of great workplaces". On the one hand, the employee's perspective of the best place to work is a place where they TRUST the people they work for, where they have PRIDE in what they do and ENJOY the people they work with. On the other hand, the manager's perspective of the best place to work is where they achieve organisational OBJECTIVES with employees who give their personal BEST and work together as a TEAM / FAMILY in an environment of TRUST.

Great Place to Work ® Institute created a survey that measures the behaviours and the environment of companies. There are two points to take into account to measure the level of trust in the organisation: the culture of the organisation and the characteristics of the workplace.

The level of trust is measured by the Trust Index© survey and the characteristics of the company by the Culture Audit© (Great Place to Work Institute, n.d. c).

No one better to evaluate a workplace than their employees! In this way, two-thirds of the score are based on anonymous feedback of employees – Trust Index Employee Survey. This assessment is focused on measuring the behaviours that lead to a trusting workplace environment. The survey asks employees about behaviours that measure the way in which credibility, respect and fairness are expressed in the workplace. It also collects data about

the levels of pride and camaraderie in the organisational environment (Great Place To Work Institute, n.d. b).

Most of the questions follow the Likert scale using ratings of a 1-5 scale. In addition, employees answer two open-ended questions (Edmans, 2012).

Finally, one-third of total assessment is measured by the Culture Audit – Management Questionnaire, which is generally filled out by human resources department and top management. This tool provides insight into organisation's value system, programs and practices. It is divided into two parts. Part I includes employee and company demographics data, for example, number of employees, voluntary turnover, ethnic breakdowns, tenure, year of company foundation and financial revenues. Other questions include the benefits and perks that they offer to employees, for example, percentage of premium insurance paid by the company for the employee and holidays. Part 2 contains some open-ended questions, providing the company an opportunity to share their philosophy and practices in areas such as hiring, communication, employee development, and company celebrations.

The questionnaires are not published. However, the Institute kindly provided them for Edmans paper in 2012 and it presents examples of questions used by the survey. According to him, it includes questions such as: diversity (proportion of women and minorities in senior positions), turnover (voluntary, involuntary, and retirements), compensation (average cash compensation, retirement benefits, employee stock ownership plans, stock options, profit sharing), benefits (healthcare, training, on-site perks), time off (paid vacations, sabbaticals, community involvement) and work-family issues (parental leave, child care).

Are the «Best Companies to Work» lists the best way to measure job satisfaction? The Best Companies list has advantages as a measure of firm-level job satisfaction. First, it is available for many years which includes recessions and booms periods. In other words, this tool gives us longer time series than those used in most previous literature (generally one or two years). This factor helps to ensure that the results are not influenced by a specific period or market conditions. Second, most studies about job satisfaction have focused on individual dimensions, but using the Best Companies list we can measure overall job satisfaction, which involve surveying several dimensions.

However, the list has some limitations. The list results of two different assessments, by employee and by management. In the end, the score is not a pure measure of job satisfaction by employees because 1/3 comes from management questionnaire. If both responses are correlated it's not a problem. On the other hand, management responses can have advantages to the list (Blasi & Kruse, 2012): managers may be aware of workplace benefits that the employee is unaware of because they haven't benefited from them yet. Additionally, there are factors unknown to employees, like turnover, that provide a more accurate overall picture of the organisation. Another limitation is that the Great Place to Work Institute does not survey all companies. Firms must apply to be considered for the list.

Nevertheless, the lists published by Great Place to Work ® Institute have been used in previous years by many authors. Fulmer, Gerhart and Scott (2003) use the list «100 Best Companies to Work in America» to prove that positive employee relations serve as an intangible asset and a source of sustained competitive advantage. Filbeck and Preece (2003) examine the market reaction to the announcement by Fortune of the «Best 100 Companies to Work for in America». They found a statistically significant positive response to the announcement. In addition, they found that these firms generally outperform the matched sample of companies. Edmans (2011) and Edmans (2012) used the list «100 Best Companies to Work in America» to create portfolios (applied in the 4-factor model proposed by Carhart (1997)) and connect job satisfaction and firm stock returns.

Can a list divulgation influence the stock value? Can it influence a shareholder to buy assets of a company known as a best place to work?

According to Edmans (2012) it is arguably the most respected and prominent measure of job satisfaction available. As a result, it receives significant attention from shareholders, management, employees, and the media.

3.3 Proposed Model

The Fama and French-Carhart model is "the most commonly used asset pricing model in finance" (Edmans, 2012, p. 9) and is the model that we will use in our work to find future stock returns (firm value). It is given as follows:

$$R_{it} - RF_t = \propto_{it} + \beta_{iM} * (RM_t - RF_t) + \beta_{iHML}\, HML_t + \beta_{iSMB} SMB_t + \beta_{iUMD} UMD_t + \varepsilon_{it} \quad (4)$$

Where,

$R_{it} - RF_t$ is the excess return on portfolio *i* in month *t* compared to the risk-free interest rate;

$\propto$ is an intercept that captures the abnormal return that the Best Companies earn over and above their benchmark, after controlling for risk;

$RM_t - RF_t$ (Market factor) is the return on the market portfolio in excess of the risk-free rate. This represents a market factor. β_{MKT} represents the sensitivity of the Best Companies to market risk (See 3.5.4 section);

HML_t (Book-to-Market factor) is the return on a zero-investment portfolio which is long (short) high (low) book-to-market stocks. β_{HML} represents the sensitivity of the Best Companies to a value factor, and measures how much "value" risk the Best Companies bear (See 3.5.2 section);

SMB_t (Size factor) is the return on a zero-investment portfolio which is long (short) small (large) stocks. β_{SMB} represents the sensitivity of the Best Companies to a size factor, and measures how much "size" risk the Best Companies bear (See 3.5.2 section);

UMD_t (Momentum factor) is the return on a zero-investment portfolio which is long (short) stocks with high (low) past returns. β_{UMD} represents the sensitivity of the Best Companies to a momentum factor, and measures how much "momentum" risk the Best Companies bear (See 3.5.3 section).

ε_{it} is an error term which is uncorrelated with the independent variables.

3.4 Portfolios

As mentioned before, we will use the 4-factor model to compare the monthly returns of a portfolio composed by firms present in the «Best Companies to Work» list with two other benchmark portfolios. Therefore, we need to create three portfolio, as described below:

1. **Full market (FM)** portfolio is constituted by the whole sample: all firms listed in the STOXX Europe 600 Index between 2010 and 2015. This portfolio is composed by 438 firms (*see section 3.1*).
2. **Best Companies To Work in Europe 600 (BCWE600)** portfolio is constituted by firms in our sample that are classified as the best companies to work at least once in the period under review, as published by Great Place to Work® Institute (*see section 3.4.1*). Note that we only consider European lists. This portfolio is composed by 45 firms.
3. **Reduced market (RM)** portfolio is the whole sample except those firms included in the BCWE600 portfolio, so it includes 393 firms.

3.4.1 Best Companies to Work in Europe - Portfolio Composition

We use the «Best Companies to Work» lists to create one of three portfolios to prove that firms with higher levels of job satisfaction are more valuable. Through the site of Great Place to Work ® Institute we identified which firms in our sample were classified as the best companies to work. In Appendix 1 all companies that constitute the portfolio of best companies to work in Europe (BCWE600 are identified). Table 4 summarizes the composition of the portfolio by industry sector. Health Care, Industrial Goods & Services and Banks represent 42.2% of the BCTWE600 portfolio.

Table 4: **Composition of BCWE 600 portfolio by ICB**

Industry Classification Benchmark (ICB)	Number of Companies	Weight in Sample
Health Care	9	20.0%
Industrial Goods & Services	6	13.3%
Banks	4	8.9%
Food & Beverage	4	8.9%
Personal & Household Goods	4	8.9%
Insurance	3	6.7%
Telecommunications	3	6.7%
Automobiles & Parts	2	4.4%
Media	2	4.4%
Retail	2	4.4%
Technology	2	4.4%
Utilities	2	4.4%
Others	2	4.4%
Total	**45**	

The portfolio is also diversified by the level of geographic markets, as shown in table 5. France, Germany and United Kingdom represent 53.3% of the BCWE600 portfolio.

Table 5: **Composition of BCWE 600 portfolio by Country**

Country	Number of Companies	Weight in Sample
United Kingdom	9	20.0%
Germany	8	17.8%
France	7	15.6%
Netherlands	5	11.1%
Switzerland	4	8.9%
Denmark	3	6.7%
Spain	3	6.7%
Sweden	3	6.7%
Portugal	2	4.4%
Belgium	1	2.2%
Total	**45**	

3.5 Construction and Analysis of the Risk Factors

Fama and French (1993) offer an extensive database for different portfolio dimensions and characteristics, including all factors required to compute the multifactor model output[3].

However, there is no European database available on their website. In this sense, we manually compute all four factors for every month (t=60). We will following explain the procedure.

3.5.1 Excess Return Variable

Excess return variable ($R_{it} - RF_t$) is the excess return on portfolio *i* in month *t* compared to the risk-free rate.

This variable was calculated for the three portfolios, as we explained in section 3.4: Full Market (FM), Best Companies To Work in Europe 600 (BCWE600) and Reduced Market (RM).

For each portfolio, we calculated a value-weighted monthly return minus the risk-free rate. Following Carhart (1997) we choose the one month Euribor rate as the free rate proxy.

$$R_{it} - RF_t = \sum_{j=1}^{j=n} W_{j,t} \times R_{j,t} - Euribor\ 1M_t \quad (5)$$

- R *i,t* is the value-weighted monthly return of portfolio *i* in month *t*;
- R *j,t* is the monthly return of stock *j* in month *t*;
- W j,t: is the weight of each stock *j* belonging to the portfolio *i* in month *t*;
- n: is the number of stocks of portfolio *i*.

Following Fama and French (1993) explanations, all stock returns are not continuously compounded and they are calculated using the formula below:

$$R_{j,t} = \frac{P_{j,t} - P_{j,t-1}}{P_{j,t-1}} \quad (6)$$

[3] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

Where P is the stock price in euros and was obtained in DataStream Database.

The weight of each stock j in portfolio *i* in month *t* (W j,t) was determined by market capitalization. We compared the market value of stock j with the sum of total portfolio market value. The market value of firms in euros was obtained in DataStream Database.

The Euribor rate was obtained in DataStream. To compare the Euribor rate with the monthly weighted returns we calculated the monthly equivalent rate as follows:

$$(1 + annual\ rate) = (1 + monthly\ rate)^{12} \quad (7)$$

3.5.2 Size and Book to Market Factor

To calculate the book-to-market factor (HML_t) and the size factor (SMB_t) we ranked all stocks according to their size (market capitalization) and their book-to-market ratio.

The median market capitalization value was used to divide stocks into two groups: stocks with small (S) capitalization and stocks with big (B) capitalization.

Also, the book-to-market ratio was used to divide stocks into three groups: stocks with low (L) (bottom 30%), medium (M) (middle 40%) and high (H) (top 30%) book-to-market ratio (Fama & French, 2012).

After, we created six portfolios from the interception of these groups:

- S/L (Small and Low): Stocks with small market capitalization and low book-to-market (B/M) ratio;
- S/M (Small and Medium): Stocks with small market capitalization and medium B/M ratio;
- S/H (Small and High): Stocks with small market capitalization and high B/M ratio;
- B/L (Big and Low): Stocks with big market capitalization and low B/M ratio;
- B/M (Big and Medium): Stocks with big market capitalization and medium B/M ratio;
- B/H (Big and High): Stocks with big market capitalization and high B/M ratio

The following table describes the number of companies in portfolios formed on Size and B/M.

Table 6: **Number of firms in portfolios sorted on Size and B/M**

Year	SL	SM	SH	BL	BM	BH
2010	70	84	65	64	89	66
2011	70	87	62	61	92	66
2012	60	86	73	71	90	58
2013	66	87	66	65	89	65
2014	65	87	67	66	89	64
Avarage	**66.2**	**86.2**	**66.6**	**65.4**	**89.8**	**63.8**
Total			**1095**			**1095**

As we can see in table 6, small size firms and big size firms on average tend to have a larger number of firms with medium B/M. This is the result of model assumption that all firms are ranked according their B/M and classified as Medium 40% of the firms (versus 30% as low and high). In addition, the firms were divided into two group according to their size (50% small and 50% big), so the number of small stock portfolios is equal to the number of large stock portfolios (1095 stocks).

Fama and French (1993) calculated returns beginning in July of year t to be sure that book equity for year t-1 is known. However, we formed portfolios in December of year t-1 and which remain unchanged until December of year t. For each year we formed these groups/portfolios and calculated the value-weighted monthly returns.

The mean of excess returns of the six different portfolios and the corresponding standard deviations are presented in the next table.

Table 7: **Average of excess portfolio returns for all six portfolios, 2010-2014**

	Average of monthly excess returns (%)			**Standard Deviations (%)**		
	High (H)	Medium (M)	Low (L)	High (H)	Medium (M)	Low (L)
Small (S)	1.47%	1.55%	1.43%	4.88%	3.91%	3.07%
Big (B)	0.82%	0.66%	0.98%	5.11%	3.48%	2.51%
S-B	**0.65%**	**0.89%**	**0.45%**	**-0.23%**	**0.43%**	**0.56%**

Note that all portfolios have, in average, positive excess returns during the sample period. Additionally, small firms heavily outperform big firms during the sample period. These findings are consistent with Fama and French (1993). They argue that small firms are more risky thus yield higher expected returns. Furthermore, standard deviations are higher in small firms (except in high B/M firms). This implies that small firms offer a higher return but also higher volatility.

Finally, we obtained the value-weighted monthly returns for two portfolio, Small minus Big (SMB) and High minus Low (HML), which are the size and value factors, respectively:

$$SMB = \frac{\left(\frac{S}{L}+\frac{S}{M}+\frac{S}{H}\right)}{3} - \frac{\left(\frac{B}{L}+\frac{B}{M}+\frac{B}{H}\right)}{3} \quad (8)$$

$$HML = \frac{\left(\frac{S}{H}+\frac{B}{H}\right)}{2} - \frac{\left(\frac{S}{L}+\frac{B}{L}\right)}{2} \quad (9)$$

3.5.3 Momentum Factor

To calculate the momentum factor (UMD_t) we ranked all stocks according to their market capitalization and their prior return. Prior return of month t is the cumulative return from month t–11 to month t–1 of each stock, "skipping the sort month is standard in momentum tests" (Fama & French, 2012, p. 7).

The median market capitalization value was used to divide stocks into two groups: stocks with small (S) capitalizations and stocks with big (B) capitalizations.

Also, prior return was used to divide stocks into three groups: stocks with down (D) (bottom 30%), medium (M) (middle 40%) and up (U) (top 30%) prior returns.

The intersection of the independent 2x3 sorts on size and momentum produces six value-weighted portfolios:

- S/D (Small and Down): Stocks with small market capitalization and down prior returns;
- S/M (Small and Medium): Stocks with small market capitalization and medium prior returns;
- S/U (Small and Up): Stocks with small market capitalization and up prior returns;
- B/D (Big and Down): Stocks with big market capitalization and down prior returns;
- B/M (Big and Medium): Stocks with big market capitalization and medium prior returns;
- B/U (Big and Up): Stocks with big market capitalization and up prior returns.

The portfolios are formed every month t-1. For each month we formed these groups/portfolios and calculated the value-weighted monthly returns.

Finally, we obtained the value-weighted monthly returns for one portfolio, Up Minus Down (UMD):

$$UMD = \frac{\left(\frac{S}{U}+\frac{B}{U}\right)}{2} - \frac{\left(\frac{S}{D}+\frac{B}{D}\right)}{2} \qquad (10)$$

This computation can be interpreted as the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios (Lopez, 2014).

The mean of returns and excess returns of the portfolio UMD and the corresponding standard deviations are presented in the next table.

Table 8: **Average of monthly returns of momentum sorted portfolio**

Portfolios	Average Returns (%)	Std. Deviation (%)
UP	2.766%	7.501%
Down	1.913%	8.779%
UMD	0.427%	3.397%
Free Rate (Euribor 1m)	0.030%	0.023%
Excess Return	**0.396%**	**3.374%**

The portfolio up, which contains stocks with highest past returns, offered the highest mean return of 2.766% with total risk of 7.501%. The portfolio down offered 1.913% with standard deviation of 8.779%.

The UMD (Up minus Down) portfolio shows the gain offered by the momentum strategy over the sample period (Nwani, 2015, p. 99). Concluding, if investors implemented the momentum strategy in the sample period they obtained, in average, a return of 0.427% per month.

This conclusion corroborates the findings of Carhart (1997). He finds that the stocks which performed best last year (in the top decile) also had positive exposure to the momentum factor (UMD) while those which performed worst had negative exposure.

3.5.4 Market Factor

The market risk factor is the difference between the value weighted portfolio and the risk free rate for the full market (438 stocks) Like we referred before, risk free rate is represented by the one month Euribor rate.

In the next chapter we will discuss the evolution of profitability of portfolios and estimation results of Carhart regressions.

4 Results

4.1 Evolution of the yields of portfolios

Before moving on to the results of Carhart models regressions, we will explain the evolution of profitability of the created portfolios.

On the one hand, like the next figure shows, on average, in three of the five years analysed, the portfolio BCWE 600 exceed the benchmark portfolios in terms of profitability (2011, 2013 and 2014). Furthermore, in 2011, while the benchmark portfolios yield negative returns, the BCWE600 remained with positive, though reduced, returns (0.17%/month).

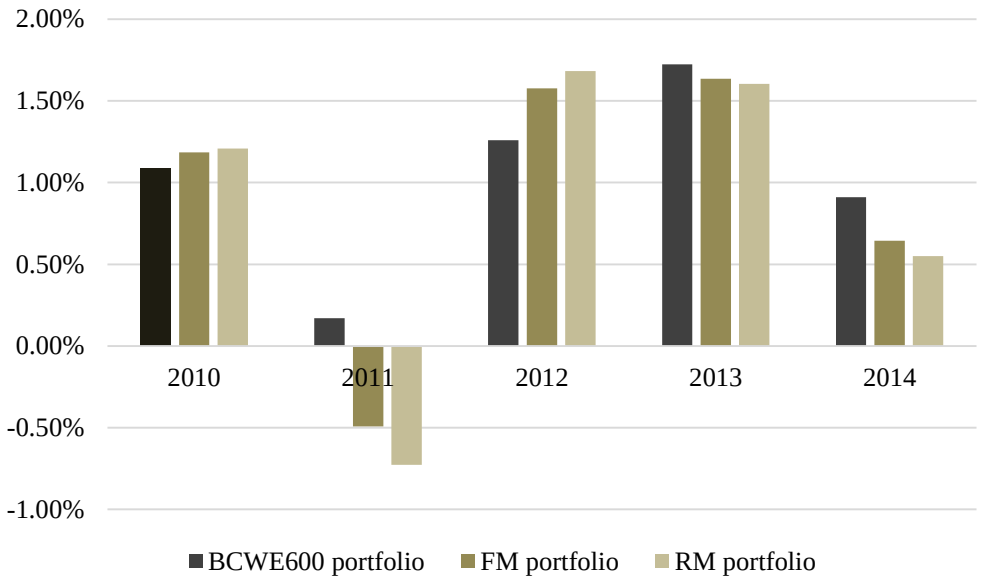

Figure 1: Average of Monthly Returns of Portfolios (2010-2014)

On the other hand, as table 9 shows, BCWE 600 portfolio presents, over the entire period, on average, an annual return of 13.08% against 11.48% of Market portfolio (FM) that is an addition of 1.60%/year. The results are even more positive when comparing the portfolio of the best companies to work (BCWE 600) with the reduced market (RM), an increase of 2.21%/year. The BCWE600 portfolio provides 2.21% more of yield per year than the RM portfolio and 1.60% more than the FM portfolio.

Table 9: **Monthly and annual returns for three portfolios, average of 2010-2014**

	Monthly Rate	Annual Rate
BCWE600	1.03%	13.08%
FM	0.91%	11.48%
RM	0.86%	10.87%
BCWE600 - FM	**0.12%**	**1.60%**
BCWE600 - RM	**0.17%**	**2.21%**

Therefore, according to the average monthly/annual returns, we can conclude that the BCWE600 portfolio outperforms both the RM and FM portfolios over 2010-2014 period. In other words, our hypothesis, «firms with higher job satisfaction levels are more valuable», is confirmed in this initial approach.

The next section shows the estimation results of the Carhart model.

4.2 Carhart regression

The previous results provided some evidence of a possible relationship between job satisfaction and stock returns. However, we will clarify the results of the Carhart regressions for the BCWE600 portfolio and the two benchmark portfolios (FM and RM).

The empirical analysis is based on a multivariate OLS regression of equation 4.

The parameters of the regression were estimated implementing a time series analysis, provided in the Gretl (Gnu Regression, Econometrics and Time-series Library) software.

The following table summarizes the Carhart regression results for the three portfolios (See the Gretl outputs in Appendix 2).

Table 10: **Results of Carhart regression**

	Portfolios			
Variables	**BCWE600**		**RM**	
α	0.0040	***	-0.0015	***
Market β	0.8986	***	1.0351	***
SMB β	-0.3079	***	0.1092	***
HML β	-0.2187	***	0.0756	**
UMD β	-0.0046		0.0004	
Adjusted R-squared	0.878173		0.991491	

Notes: The significance levels are indicated by *, **, and *** that represent 10%, 5%, and 1% level, respectively. BCWE600 is the portfolio of companies classified by Best Place to Work listed in STOXX Europe 600 Index. FM is the Full Market portfolio; RM is the Reduced Market portfolio. SMB is the difference in returns of small and big firms; HML is defined as the difference in the returns of high and low B/M firms; UMD is defined as the difference in the returns of up and down prior returns firms.

We used the return value of the FM portfolio as a proxy for market value and, therefore, market beta should be equal to 1 and the results of the intercept and the betas for the other risk factors should be equal to 0.

As we referred before, α is an intercept term that captures the excess return that the Best Companies earn over and above their benchmark, after controlling for risk. This alpha is the key variable of interest and it is the variable that will allow to confirm or not our hypothesis.

Our results reveal positive and statistically significant (0.0040/month) BCWE600 portfolio alpha. In other words, companies of this portfolio generated 0.40%/month and 4.94%/year higher stock returns than their peers over the 2010-2014 period. Also, market beta of the BCWE600 portfolio is statistically significant and equal to the 0.8986. Betas of the SMB and HML risk factors are statistically significant, which means the portfolio returns are sensible to size and value factors. Nonetheless, beta of momentum factor (UMD) is not statistically significant.

For the RM portfolio our results reveal a negative but statistically significant alpha (-0.0015/month). In other words, companies of this portfolio generated 0.15%/month and 1.73%/year below stock returns than their peers over the 2010-2014 period. Also, market beta of the RM portfolio is statistically significant and equal to the 1.0351. Betas of the SMB and HML risk factors are statistically significant, which means the portfolio returns are sensible to size and value factors. Nonetheless, beta of momentum factor (UMD) is not statistically significant.

In addition to the portfolio BCWE600 obtaining higher stock returns than benchmark portfolios, the market risk is also less. BCWE600 portfolio presents a lower market beta (0.8986) than FM portfolio (1.00) and RM portfolio (1.0351).

To complete the regression analysis we discuss the goodness of fit of the model. The adjusted R^2 for the four factor regressions (BCWE600 portfolio as dependent variable) is of 87.82%. This means that our four-factors (Size, B/M, Market and Momentum) explain 87.82% of variance of excess return of BCWE600 portfolio. On the other hand, the adjusted R^2 for the four factor regressions (RM portfolio as dependent variable) is of 99.15%.

5 Conclusions

Over the years, there has been a great evolution in human resource management in organizations, however, this management is not always done in the most efficient or morally correct way. While we believe that today there are organizations that believe that intellectual capital is critical to your success, there is too much evidence that this belief is not unanimous on the market. The reasons may be numerous, among other personal beliefs of managers and the pressure of shareholders and other stakeholders.

Believing that people are the most important asset of firms is generally accepted for us to see how we can make this asset in a competitive and sustainable resource. Many authors have raised the importance of keeping satisfied and motivated employees on staff in order to achieve these individual targets contributing to achieve the underlying objective of all for-profit organizations: making money.

The main purpose of this work was to prove the link between job satisfaction and the firm's value. We compared the monthly returns of a portfolio composed by firms present in the «Best Companies to Work» list with two other benchmark portfolios using the four-factor model proposed by Carhart (1997) from January 2010 to December 2014. Note that «Best Companies to Work» list originates our measure for job satisfaction on portfolio firms and our sample was firms listed in STOXX Europe 600 Index.

Our results show that the BCWE600 portfolio outperforms both benchmark portfolios (RM and FM). The four-factors model estimation reveal positive and statistically significant (0.0040/month) BCWE600 portfolio alpha. In other words, companies of this portfolio generated 0.40%/month and 4.94%/year higher stock returns than their peers over the 2010-2014 period. In addition, betas of the Market, SMB and HML risk factors are statistically significant, which means the portfolio returns are sensible to these factors. Nonetheless, beta of momentum factor (UMD) is not statistically significant. Also, the market risk in portfolio BCWE600 (Market β=0.8986) is inferior compared to other portfolios.

So we accomplished the objective and proved that there is a link between job satisfaction and the company's value. We confirm our hypothesis «firms with higher job

satisfaction levels are more valuable». This work shows that the firms with the most satisfied workers get better results, resulting in higher returns for its shareholders.

Like any other research, our study has its own limitations that could be overcome by further research. Measuring job satisfaction is the main challenge detected in the existing literature on the subject and our job satisfaction measure, «Best Companies to Work» list may have some limitations. The Great Place to Work Institute does not survey all firms. Firms must apply to be considered for the list. In addition, the score of firms is not a pure measure of job satisfaction by employees because 1/3 comes from management questionnaire.

We would like to make some suggestions to extend this theme to other studies. Job satisfaction is a subject of social science and a highly debated psychological topic. However, it will be interesting to combine these social issues to financial methodologies that give measurable and easy interpretation results. Thus a possible extension of this work is the combination of other measures of job satisfaction to create portfolios in the four-factor model. On the other hand, it is possible to use different models of performance assessment and keep this job satisfaction measure. A comparative analysis between different valuation models or different measures of job satisfaction would also be relevant.

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7 Appendices

7.1 Appendix 1 – Composition of the BCWE 600 portfolio

ISIN	Name	Country		ICB		Size
CH0038863350	NESTLE	CH	Switzerland	3500	Food & Beverage	LRG
CH0012005267	NOVARTIS	CH	Switzerland	4500	Health Care	LRG
CH0012032048	ROCHE HLDG P	CH	Switzerland	4500	Health Care	LRG
GB00B16GWD56	VODAFONE GRP	GB	United Kingdom	6500	Telecommunications	LRG
GB0009252882	GLAXOSMITHKLINE	GB	United Kingdom	4500	Health Care	LRG
FR0000120578	SANOFI	FR	France	4500	Health Care	LRG
DE0007236101	SIEMENS	DE	Germany	2700	Industrial Goods & Services	LRG
ES0113900J37	BCO SANTANDER	ES	Spain	8300	Banks	LRG
GB0002875804	BRITISH AMERICAN TOBACCO	GB	United Kingdom	3700	Personal & Household Goods	LRG
DE0007100000	DAIMLER	DE	Germany	3300	Automobiles & Parts	LRG
GB0002374006	DIAGEO	GB	United Kingdom	3500	Food & Beverage	LRG
DE0007164600	SAP	DE	Germany	9500	Technology	LRG
DK0060102614	NOVO NORDISK B	DK	Denmark	4500	Health Care	LRG
GB0009895292	ASTRAZENECA	GB	United Kingdom	4500	Health Care	LRG
GB0031348658	BARCLAYS	GB	United Kingdom	8300	Banks	LRG
ES0178430E18	TELEFONICA	ES	Spain	6500	Telecommunications	LRG
NL0000303600	ING GRP	NL	Netherlands	8500	Insurance	LRG
FR0000121972	SCHNEIDER ELECTRIC	FR	France	2700	Industrial Goods & Services	LRG
SE0000106270	HENNES & MAURITZ B	SE	Sweden	5300	Retail	LRG
FR0000120644	DANONE	FR	France	3500	Food & Beverage	LRG
DE0007664039	VOLKSWAGEN PREF	DE	Germany	3300	Automobiles & Parts	LRG
DE000ENAG999	E.ON	DE	Germany	7500	Utilities	LRG
NL0000009538	PHILIPS	NL	Netherlands	2700	Industrial Goods & Services	LRG
DE000A1EWWW0	ADIDAS	DE	Germany	3700	Personal & Household Goods	LRG
JE00B2QKY057	SHIRE	GB	United Kingdom	4500	Health Care	LRG

FR0000120693	PERNOD RICARD	FR	France	3500	Food & Beverage	LRG
DE0006048432	HENKEL PREF	DE	Germany	3700	Personal & Household Goods	LRG
FR0000130577	PUBLICIS GRP	FR	France	5500	Media	LRG
BE0003565737	KBC GRP	BE	Belgium	8300	Banks	LRG
DE0006599905	MERCK	DE	Germany	4500	Health Care	LRG
CH0012138605	ADECCO	CH	Switzerland	2700	Industrial Goods & Services	LRG
NL0000009082	KPN	NL	Netherlands	6500	Telecommunications	LRG
PTEDP0AM0009	EDP ENERGIAS DE PORTUGAL	PT	Portugal	7500	Utilities	MID
NL0000395903	WOLTERS KLUWER	NL	Netherlands	5500	Media	MID
FR0000120404	ACCOR	FR	France	5700	Travel & Leisure	MID
SE0000103814	ELECTROLUX B	SE	Sweden	3700	Personal & Household Goods	MID
DK0060079531	DSV B	DK	Denmark	2700	Industrial Goods & Services	MID
PTJMT0AE0001	JERONIMO MARTINS	PT	Portugal	5300	Retail	MID
GB00B02J6398	ADMIRAL GRP	GB	United Kingdom	8500	Insurance	MID
FR0004035913	ILIAD	FR	France	9500	Technology	MID
ES0124244E34	MAPFRE	ES	Spain	8500	Insurance	SML
SE0000221723	MEDA A	SE	Sweden	4500	Health Care	SML
NL0000288967	CORIO	NL	Netherlands	8600	Real Estate	SML
GB0004161021	HAYS	GB	United Kingdom	2700	Industrial Goods & Services	SML
DK0010311471	SYDBANK	DK	Denmark	8300	Banks	SML

7.2 Appendix 2 – Output Gretl Software

7.2.1 Dependent variable: EXCESSBCWE600

Model 1: OLS, using observations 2010:01-2014:12 (T = 60)

Dependent variable: EXCESSBCWE600

HAC standard errors, bandwidth 2 (Bartlett kernel)

	coefficient	std. error	t-ratio	p-value	
const	0.00403005	0.00109036	3.696	0.0005	***
MKT	0.898599	0.0678546	13.24	9.54E-19	***
SMB	-0.307867	0.0766261	-4.018	0.0002	***
HML	-0.218745	0.0772848	-2.83	0.0065	***
UMD	-0.00462114	0.0453618	-0.1019	0.9192	

Mean dependent var	0.009997	**S.D. dependent var**	0.028226
Sum squared resid	0.005338	**S.E. of regression**	0.009852
R-squared	0.886433	**Adjusted R-squared**	0.878173
F(4, 55)	101.1608	**P-value(F)**	1.11E-24
Log-likelihood	194.6794	**Akaike criterion**	-379.3588
Schwarz criterion	-368.8871	**Hannan-Quinn**	-375.2627
rho	-0.356119	**Durbin-Watson**	2.654027

Excluding the constant, p-value was highest for variable 7 (MOM)

7.2.2 Dependent variable: EXCESSFM

Model 2: OLS, using observations 2010:01-2014:12 (T = 60)

Dependent variable: EXCESSFM

HAC standard errors, bandwidth 2 (Bartlett kernel)

	coefficient	std. error	t-ratio	p-value	
const	0.00	0.00	-1.701	0.0946	*
MKT	1.00	0.00	6.12E+15	0	***
SMB	0.00	0.00	0.4498	0.6546	
HML	0.00	0.00	0.1385	0.8903	
UMD	0.00	0.00	0.1809	0.8571	

Mean dependent var	0.008799	**S.D. dependent var**	0.034057
Sum squared resid	0	**S.E. of regression**	0
R-squared	1	**Adjusted R-squared**	1
F(4, 55)	1.43E+31	**P-value(F)**	0

Excluding the constant, p-value was highest for variable 6 (HML)

7.2.3 Dependent variable: EXCESSRM

Model 3: OLS, using observations 2010:01-2014:12 (T = 60)

Dependent variable: EXCESSRM

HAC standard errors, bandwidth 2 (Bartlett kernel)

	coefficient	std. error	t-ratio	p-value	
const	-0.00145197	0.000387598	-3.746	0.0004	***
MKT	1.03513	0.0241689	42.83	6.27E-44	***
SMB	0.109169	0.0269696	4.048	0.0002	***
HML	0.0756463	0.0270484	2.797	0.0071	***
UMD	0.000421882	0.0155709	0.02709	0.9785	

Mean dependent var	0.00834	**S.D. dependent var**	0.037252
Sum squared resid	0.000649	**S.E. of regression**	0.003436
R-squared	0.992068	**Adjusted R-squared**	0.991491
F(4, 55)	2171.779	**P-value(F)**	8.27E-60
Log-likelihood	257.876	**Akaike criterion**	-505.7521
Schwarz criterion	-495.2803	**Hannan-Quinn**	-501.656
rho	-0.358743	**Durbin-Watson**	2.657461

Excluding the constant, p-value was highest for variable 7 (MOM)