

Equity home bias in Dutch industry-wide pension funds

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ABSTRACT

Integration of financial markets allows investing abroad. International diversification provides with higher returns and reduces portfolio risk. However, despite the well-documented benefits of diversification many investors still hold larger proportion of domestic equity in their international portfolio, phenomenon known as home bias. This paper investigates to which extent Dutch industry-wide pension funds are exposed to equity home biased during years 2011 and 2012 by examining their individual characteristics: size, maturity and funding status. It is demonstrated that Dutch industry-wide pension funds are not exposed to home bias and therefore they pursue rational equity diversification and take advantage of the benefits of international diversification.

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Keywords

Home bias, pension funds, diversification, CAMP, optimal portfolio, equity, explicit and implicit barriers, Europe

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1. INTRODUCTION

“Do not pull all your eggs in one basket” – this maxim perfectly reflects investment diversification. Diversification consists of including in the investment portfolio different types of assets such as equity, fixed-income securities or real estate which come from different companies, industries and countries (Hotvedt & Tedder, 1978). The benefits of diversification include higher returns and risk reduction. As a consequence of global integration of financial markets investors have the opportunity to invest in foreign assets and benefit from international portfolio diversification.

However, despite the well documented benefits and gradually disappearing political restrictions and barriers to international capital flow the proportion of foreign assets in investors’ portfolios is still limited. Investors do not take the full advantage of international diversification (Li, Gao, Du & Huang, 2007).

The presence of higher proportion of domestic or near the investors’ domicile holdings in the international portfolio than the optimal predicted by portfolio theory for the observed set of risk and return on available assets is named home bias (Rubbiani, Lelyveld & Verschoor, 2010; Babilis & Fitzgerald, 2005). Home bias is an intriguing and yet unsolved puzzle in financial economics.

Investing heavily in domestic securities is particularly surprising when it comes to institutional investors such as pension funds. Institutional investors are more informative and possess the required resources to follow and understand financial markets. There is evidence that institutional investors have better means to overcome the barriers to international investments (Lewis, 1999; Chan, Corving & Ng, 2009).

The issue of diversification turns to be key in the Netherlands, where pension funds hold a significant amount of money and the value of their assets exceed the Dutch GDP (125%)(Rubbiani et al., 2010). Most of the pension assets pertain to industry-wide pension funds. Industry-wide pension funds provide pension plans to employees of companies affiliated to a specific industry. Participation in these pension schemes is compulsory for most employees (Kakes, 2006).

Dutch pension funds are dominant investors in local financial markets and prominent investors in European financial markets. Research shows, however, that Dutch pension funds do not profit from international portfolio diversification. Runnaniy et al. (2010) who study Dutch pension funds in the period of 1992-2006 report existing but decreasing home bias from 37% to 13%. Dreu & Bikker (2012) who also examine home bias of Dutch pension funds during 1999-2006 also find preference for regional investments.

Therefore, in order to give an impression of how Dutch pension funds invest it is investigated *To what extent are Dutch industry-wide pension funds exposed to equity home bias during the years 2011-2012?* In this paper industry wide-pension funds are analyzed and the focus is put on one important asset category: equity.

This paper adds to existing scarce literature on home bias of pension funds in the Netherlands. Studies which research to which extent are industry-wide pension funds exposed to home bias during these years do not exist yet. Previous studies of Runnaniy et al. (2010) and Dreu & Bikker (2012) examined the investment behavior of pension funds before year 2007. In 2007 the actual financial crisis started. As a consequence, pension funds experienced investment losses (Dreu & Bikker, 2010). As

a companion, during 2007 change in regulation took place which caused many pension funds to shift their investment plans. Furthermore, existing research uses an aggregated approach (all types) to study pension funds, here disaggregated approach is used.

This paper is structured as follows. The second section introduces to portfolio theory. The third chapter presents the reasons to home bias. In chapter number four the evidence to home bias is given. Subsequently, Dutch pension system is explained. The sixth section contains methodology. In chapter seven results are presented. After that discussion is given. Chapter nine concludes.

2. PORTFOLIO THEORY

2.1 Total risk is separated into systematic and unsystematic risk

Risk is defined as volatility in stock and other assets’ rates of return. Risk reflects the variance of historical rates of return about the average rate of return. Total risk is separated into systematic and unsystematic risk. Systematic risk refers to the portion of an asset’s price movements caused by changes in the market as a whole. Systematic risk is non-diversifiable. Unsystematic risk reflects the portion of an asset’s price movements caused by factors unique to the company or industry. Unsystematic risk is diversifiable (Hotvedt & Tedder, 1978).

2.2 Fund performance is measured by return and risk

Modern portfolio theory refers to the theory of portfolio selection developed by Markowitz. This theory provides with the answer to the following question: How should an investor allocate funds among the possible investment choices? Markowitz suggests that investors should consider return and risk together and determine the allocation of funds among investment alternatives on the basis of the trade-off between return and risk. It assumes that mean and standard deviation provide with sufficient information about the return distribution of a portfolio (Markowitz, 1952). The risk of portfolio depends on the share of individual stock holding and the variance-covariance matrix among its holdings (Statman, 1987).

2.3 World market portfolio is the optimal portfolio

Capital Asset Pricing Model (CAPM) is built basing on the Mean-Variance theory of Markowitz. CAPM holds that the world market portfolio is the optimal portfolio in a fully efficient and integrated capital market. This model holds when in fully integrated markets investors have the same consumption opportunity sets (Stehle, 1977). However, when consumption opportunity sets differ or when purchasing power parity is violated foreign exchange rate risk is priced (Solnik, 1974). The resulting international capital asset pricing model (ICAMP) includes the world portfolio and a number of foreign currency deposits (Eiling et al., 2012). Under the “ideal” conditions, the ICAMP model predicts that individuals hold equities from around the world in proportion to each equity market’s capitalization (Salehizadeh, 2003). The portfolio investment abroad is allocated to less correlated securities and markets so that the overall risk of the investment portfolio is reduced (Fedenia, Shafer & Skiba, 2013).

2.4 Benefits of diversification

2.4.1 Reduction in un-systematic risk

Diversification refers to the purchase of different types of assets such as stocks, bonds, securities or real states from more than one company, industry or country in order to reduce total risk (Hotvedt & Tedder, 1978). International diversification can lower risk by eliminating non-systematic volatility without sacrificing expected return. Global diversification will raise the expected return for a given level of risk. The diversification benefits consists of reduced risk, usually measured by annualized standard deviation of monthly returns, by investing in markets which are relatively uncorrelated or even negatively correlated with the investor domestic market. International diversification reduces risk faster than domestic diversification because domestic securities exhibit stronger correlation as a result of their joint exposure to country-specific shocks (Solnik, 1988; Reisen, 1997). By raising the number of stocks diversifiable risk is minimized and the fund performance increases (Statman, 1987). According to Dou, Gallagher, Schneider & Walter (2013) investors would be better off in terms of risk reduction if they pursued a geographical diversification strategy rather than an industry-based one.

2.4.2 Reduced cost of capital and higher valuation

Market segmentation hypothesis states that firms in segmented capital markets have a higher cost of capital because local investors bear the major part of the total risk due to little international risk sharing. Diversification shifts the source of systematic risk for stock pricing from the domestic stock market portfolio to a world stock market portfolio. When risk is shared among investors worldwide firm experiences a lower cost of capital and higher valuation (Brealey, Cooper & Kaplanis, 1999; Chan, Covring & Ng, 2005; Chan, Covring & Ng, 2009).

3. REASONS TO HOME BIAS

3.1 Definition of home bias

Home bias is defined as the presence of higher proportion of domestic or near the investor's domicile holdings in the international equity portfolio of investors (Rubbianiy, Lelyveld & Verschoor, 2010). The phenomenon of home bias is a deviation from the CAMP setting. "Home bias occurs when the observed asset holdings of an investor (pension fund) contain a smaller proportion of foreign assets than the optimal predicted by portfolio theory for the observed set of risks and returns on available assets on the one hand and the risk appetite of the investor on the other hand" (Babilis & Fitzgerald, 2005).

CAUSES OF HOME BIAS
Explicit barriers - directly observable and quantifiable
Cross-border investing costs
Hedging with home equity against home risk
Corporate governance
Government quality
Implicit barriers - not directly observable and quantifiable
Information asymmetries
Rational factors
<i>Trade link between countries</i>
<i>Familiarity and geographical proximity</i>
<i>Investors' experience, sophistication and competence</i>
Behavioral factors

Figure 1. Reasons to home bias

3.2 Explicit barriers – directly observable and quantifiable

3.2.1 Cross-border investing costs

Costs associated with cross-border investing include transaction costs, international taxes and restrictions. If the costs of holding foreign stocks do not overweight the benefits of diversification investors prefer to invest in domestic markets (Lewis, 1999). Transaction costs are fees, commission and market impact costs. Investors prefer to invest in countries where the costs are minimized (Daly & Xuan, 2013). Tax differences refer to withholding taxes on dividends or management fees imposed on foreign investors. Theoretical relationship between taxes and returns appear: the higher the increase in taxes the lower the domestic holdings of foreign stocks (Lewis, 1999). Tax-exempt investors such as pension funds suffer reduction in the return on foreign investment compared to domestic investment as a result of foreign withholding taxes (Tesar & Werner, 1995). Restrictions reflect differences in access to markets by distinct investors, capital controls and contingency rules. Evidence exists that taxes and restriction result in market segmentation and that cross-border investing costs generate net return on equities which is more beneficial for domestic investors than for foreign ones (Cooper & Kaplanis, 1994 b.; Lewis, 1999).

3.2.2 Hedging with home equity against home risk

Domestic equities provide with a better hedges against home country-specific risks. Three types of hedging is distinguished: hedges against domestic inflation, hedges against wealth non-traded in capital markets and hedges with foreign returns implicit in equities of domestic firms that have overseas operations (Lewis, 1999).

Firstly, domestic equities provide a hedge against inflation risk for investors with very low level of risk aversion and when equity returns are negatively correlated with domestic inflation (Adler & Dumas, 1983; Cooper & Kaplanis, 1994 b). Due to the fact that investors worldwide do not perceive the same real returns since currency-adjusted inflation rates are not equalized through purchasing power parity inflation rates and goods' prices differ among countries (Lewis, 1999). As a consequence of this inflation risk and deviations from purchasing power parity investors in different countries hold portfolios which help them to hedge against domestic inflation risk (Adler & Dumas, 1983).

Secondly, non-tradable assets refer to securities which may not be sold or bought or restrictions are imposed on trading these assets. Investors try to hedge against the price uncertainty of these goods (Cooper & Kaplanis, 1994 b). Non-tradable assets are not included in the CAMP model which assumes that all wealth is liquid and tradable and thus these assets are omitted from the analysis (Lewis, 1999).

Thirdly, due to the fact that many firms operate internationally investors do not need to hold foreign stocks because these firms provide the equity holders with returns that come from foreign operations. Therefore, diversification potential from foreign securities are already included in domestic equities (Lewis, 1999).

3.2.3 Corporate governance

Differences in corporate governance across countries explain home bias through their impact on share ownership. If investors are mean-variance optimizers in a world of perfect financial markets they should hold the world market portfolio of common stocks. When companies are controlled by large investors, portfolio investors are limited in the fraction of a firm they can hold (Dahlquist et al., 2003). Furthermore, according to

corporate insider theory which states that it is optimal for insiders to have large ownership stakes in corporation, the ownership of foreign investors is limited as long as they are not insiders (Stulz, 2005). Portfolio investors cannot hold the world market portfolio in a world with controlling shareholders and insider investors (Dahlquist et al., 2003).

3.2.4 Government quality

Under the umbrella of government quality fall aspects as voice and accountability, political stability and absence of violence, government and effectiveness, regulatory quality, rule of law and control of corruption (Daly & Xuan, 2013).

3.3 Implicit barriers – not directly observable and quantifiable

3.3.1 Information asymmetries

Information asymmetries arise from differences in accounting standards, disclosure requirements and regulatory environments. Equity investments in foreign companies which are not cross-listed in domestic markets require understanding of these foreign standards (Lewis, 1999). If investors do not have a good understanding of the available information it affects their portfolio choice and influences their decisions of investment time and drives to bad investment performance (Li et al., 2007). Therefore, investors invest in firms about which they can most easily find information (Fedenia et al., 2013).

3.3.2 Rational factors

3.3.2.1 Trade link between countries

Bilateral trade flows can be seen as reduction in the information cost, due to the fact that investors can obtain the information cheaply. Increased trade openness is a major factor which influences globalization and international diversification (Daly & Xuan, 2013).

3.3.2.2 Familiarity and geographical proximity

Familiarity refers to cultural closeness, common language, industrial development and existence of tax treaties (Fedenia et al., 2013). Investors appear to hold stocks of foreign companies which products they are familiar with (Daly & Xuan, 2013). Geographically proximate markets are often followed more by the media, home country's relationship might be more special with nearby countries because of common border, trade union, or monetary union, and trade flows between these countries are higher (Fedenia et al., 2013). Investors focus on few large, safe and internationally visible firms and prefer familiar markets than unfamiliar ones (Kang & Stulz, 1997).

3.3.2.3 Investors' experience, sophistication and competence

Li et al. (2007) in their study found that investment experience and sophistication have a strong impact on the investment portfolio. A rich investment experience helps investors to digest and expand the information in security market and helps to distinguish the information. Graham, Harvey & Huang (2009) found that a one standard deviation increase in competence increases by one-third the probability that an investor will invest in foreign assets. An investor who feels to be competent about understanding the benefits and risks involved in investing in foreign assets is more willing to invest in foreign securities and perceive less uncertainty about his subjective distribution of future asset returns (Graham et al., 2009).

3.3.3 Behavioral factors

French & Poterba (1991) found that investors are more optimistic about their domestic market. Kilka & Werber (2000) state that investors believe that the stocks in their countries have more competitive power. Strong and Xu (2003) report a strong tendency for managers to be more optimistic about market in their home country than about the rest of the world. Investors tend to invest more in securities which they know about. Similarly they tend to invest in securities which are known to them abroad (Merton, 1987).

4. EVIDENCE OF HOME BIAS

The current empirical literature gives contradictory opinions regarding the existence of home bias.

On the one hand, the potential existence of the phenomenon of home bias is questioned. International tax accords and removal of foreign exchange controls have been abolished (Daly & Xuan, 2013). If explicit barriers had been an impediment to international investment, together with their disappearing home bias should also disappear. Specially, for investors which experience low transaction costs on financial markets, in particular institutional investors such as pension funds. Empirical research shows that with international capital market liberalization the deviations between the value of equities on domestic markets relative to international markets decline (Lewis, 1999). Covring, Defond & Hung (2007) found evidence that international investment was enhanced and home bias reduced in the European Union with the adoption of International Accounting Standards (IAS) in 2005. Intriguingly, Bekaert & Urias (1996) and Gorman & Jorgensen (1996) suggest that there is no home bias. They state that foreign diversification does not give a statistically significant improvement in portfolio performance. Their studies involve uncertainty in the optimal choice of foreign security holdings. They report that simple comparison of historical means and variances of domestic and foreign stocks returns indicate that investors should invest major part of their wealth in foreign stocks. These computations however do not include the uncertainty of the estimates of means and variances. The authors state that when this uncertainty is taken into account there is not much difference in the performance of portfolios with foreign investments and portfolios with domestic stocks alone.

On the other hand, large part of the literature affirms the existence of home bias.

Despite the fact that international investment barriers ceased due to phenomenon of economic globalization, no preference for domestic securities among investors have shifted and the phenomenon of home bias is still prevalent among institutional investors (Li et al., 2007). The home-bias literature has emphasized that investors do not hold the world market portfolio and points out that investors allocate only a very small fraction of their portfolio to their foreign investments. In this perspective, several authors such as French & Poterba (1991) and Cooper & Kaplanis (1994) state that explicit barriers are not enough to explain the existence of home bias. They also claim that explicit barriers only partially explain home bias and that implicit barriers are the major reasons of the departure from holding a diversified portfolio (Daly & Xuan, 2013). Tesar & Werner (1995) report a strong evidence of home bias in the portfolios of investors in OECD countries. Despite the potential gains from diversification and increase in international investments positions the share of foreign assets in investment portfolios is considerably smaller than standards models would

predict. Kang & Stulz (1997) confirm the existence of substantial home bias and report that the ownership by foreign investors is strongly bias against small firms.

5. DUTCH PENSION SYSTEM

The pension system in the Netherlands is formed by three pillars. The first pillar is the standard government retirement benefits for everyone who's age is above 65. The second pillar constitutes of pension funds, which participation is compulsory for the most employees. This pillar consists of two categories: industry-wide pension funds and company-linked pension funds. Industry –wide pension funds are organized by sectors such as health care industry or steel. These dominate the Dutch pension system. Company –linked pension funds are related to a single company. Third pillar refers to investments which are made on individual basis such as life insurance (Kakes, 2006).

In the Netherlands, some pension funds are too large to invest in domestic markets. Their high domestic position would result in inefficient portfolio diversification and would influence the market prices. At the same time, small pension funds which own high trading costs become inefficient in investing internationally (Rubbiany et al., 2010).

6. METHODOLOGY

6.1 Hypothesis development

There is evidence that institutional investors have better means to overcome the barriers to international investments. Large pension funds employ analysts that can reduce the information asymmetries and can negotiate lower tariffs for cross-border deals (Lewis, 1991; Chan, Corving & Ng, 2009). Therefore, pension funds face information asymmetries in different degrees. Furthermore, large pension funds hold more foreign assets than small ones. Large pension funds have it simpler to operate globally and cope with exchange rate risk (Kakes, 2006). They are able to mitigate the effect of high investing costs through trading in bulk, reducing risk and acquiring higher returns at the given level of portfolio risk (Rubbiany et al., 2010). Countries in which institutional investors manage a larger part of the financial assets exhibit larger international diversification (Lewis, 1991; Schoenmaker & Bosch, 2008; Chan, Corving & Ng, 2009). In the Netherlands, some pension funds are very large. Their higher domestic position would result in inefficient portfolio diversification by capturing the whole domestic market and influencing the market prices. Similarly, international diversification becomes inefficient for smaller pension funds due to higher transaction costs (Rubbiany et al., 2010). In connection with this it is expected that:

H1: The bigger the pension fund is the less it is exposed to home bias.

According to Li et al. (2007) investment experience, sophistication and competence have a strong impact on the investment portfolio. Experience, sophistication and competence in investment activities provide the framework for perceiving and formulating investment opportunities. It enhances the possibilities for a pension fund to perceive correctly how well an investment opportunity fits into the profitable investment strategies. International investments develop new capabilities and augment existing capabilities through operations in foreign markets. Less experienced, sophisticated and competent funds may deliberately choose a lower risk profile for their asset allocation. Small funds with limited sophistication and expertise are to feel less comfortable with high risks. Sophisticated funds are to have some expertise

and to use sophisticated modeling techniques which may make them less averse to risk taking (Dreu & Bikker, 2010). Operational age can be seen as the accumulated investment experience through long-term operations in international financial markets that contributes to the general knowledge and capabilities required for efficient asset allocation and risk diversification (Rubbiany et al., 2010). Therefore, the following hypothesis emerges:

H2: The more mature the pension fund is the less it is exposed to home bias.

Funding ratio is defined as total assets divided by discounted pension liabilities. From risk management perspective a bigger buffer provides room to invest more in risky assets (Dreu & Bikker, 2010). Higher funding ratio means that a pension fund has more buffer against portfolio risks and may provide cushion to bear higher transaction costs for higher returns (Rubbiany et al., 2010). Provided that international diversification offers potentially higher returns at any given level of risk, the following hypothesis arises:

H3: The higher is the funding ratio the less is the pension fund exposed to home bias.

6.2 Model

The list of existing industry-wide pension funds is retrieved from De Nederlandsche Bank. The Nederlandsche Bank is responsible for prudential supervision of Dutch pension funds and their compliance with laws and regulations. Subsequently, the data necessary for the analysis is taken from the annual reports of each pension fund and from the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS). Several pensions were excluded from the sample, due to the following reasons: the annuals reports for the year 2011-2012 were not available; detailed segmentation on equity diversification per region was not provided; or if investments in equity are not made. Therefore, the sample contains 41 industry-wide pension funds for year 2011 and 2012, which indicated the amount in equity investments in Europe and outside Europe. In order to measure to which extend industry-wide pension funds are exposed to equity home bias the following multiple regression equation is applied:

$$EHB_{ti} = constant + size_{ti} + age_{ti} + funding\ ratio_{ti} + error_{ti} + year\ dummy$$

6.2.1 Dependent variable – home bias

According to Baele, Pungulescu & Ter Horst (2007) home bias depends on the characterization of the benchmark weights to which actual holdings can be compared. The researchers make a distinction between model-based and data-based approach to measure home bias. In the model-based approach the optimal portfolio weights from the international asset-pricing model are used as benchmark to compare with actual portfolio holdings. The home bias measure is equal to the difference between the optimal CAMP foreign country weight in the portfolio and observed holdings of foreign equities.

Home Bias = domestic holdings – (home capitalization / world capitalization)

Data-based approach is based on mean-variance theory of Markowitz (1952) where benchmark portfolios can be calculated from a mean-variance optimization problem with sample estimated of the means and variances of stock returns. The weakness of this approach is that expected returns are not observable and the actual returns are used to calculate optimal

portfolio weights. Thus this approach can result in extreme and volatile equity positions.

Chan, Corving and Ng (2005) investigate the existence of home bias in mutual funds and compute home bias on country level and on firm level. On the country level they study investment in different countries and on the firm level investments in different firms. In order to calculate the home bias on the country level they measure the extent to which the mutual fund holdings in the domestic market of country x deviate from the holdings of country x in the global market portfolio. The value of home bias is therefore defined as the log of ratio of the share of country x's mutual fund holdings in the domestic market to the global market capitalization weight of country x. On the firm level the home bias is computed by taking the log ratio of the share of domestic mutual fund holdings in firm x to firm x's market capitalization weight in the global market portfolio. The share of domestic fund holdings in the firm x is calculated as the ratio of the market value of all domestic fund holdings in firm x to the total market value of all domestic fund holdings.

Schoenmaker & Bosch (2008) study the effect of introduction euro currency on home bias in Europe. Fidora, Fratzscher & Thimann (2007) study cross country differences in home bias and differences in home bias across financial assets. Both studies follow the approach of Chan, Corving & Ng (2005) to measure equity home bias and use the following formula:

$$EHB = 1 - \frac{\text{Foreign equity}}{\text{Foreign equity to total market}}$$

where foreign equity is the share of country x's holdings of foreign equity in country x total equity portfolio: 1 - share of domestic equity; and foreign equity to total market is the share of foreign equity in the world portfolio available for country x: 1 - share of country x in the total market capitalization.

Home bias takes values between 0 and 1. Home bias which equals to 0 means that investors show no preference for domestic equity. Ratio between 0 and 1 indicates investors' preference for domestic equity. Value of 1 means that investors hold only domestic assets (Schoenmaker & Bosch, 2008; Fidora et al. 2007). Negative value means that there is an overinvestment in foreign equity.

In this paper the literature is followed and to calculate equity home bias formula of Chan, Corving & Ng (2005), Fidora, Fratzscher & Thimann (2007) and Schoenmaker & Bosch (2008) is applied. In this paper domestic equity is defined as equity invested in European continent. Therefore, foreign equity refers to equity investments in non-European area. In order to derive the value of 'foreign equity' the proportion of foreign equity in the total equity portfolio of each pension fund is calculated. The data is taken from the annual reports of the Dutch industry-wide pension funds. Subsequently, to obtain the

value of 'foreign equity to total market' the proportion of foreign equity in the total equity portfolio for the Netherlands is computed. To obtain this data the literature is followed (Chan, Corving & Ng, 2005) and it is derived from the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS) for year 2011 and 2012. In this survey, countries provide information about their foreign investment assets. Portfolio investment is classified into asset categories and residence of issuer thus providing information about the destination of portfolio investment.

6.2.2 Independent variables – size, age, funding ratio

Size of each pension fund is measured in terms of the total assets which are to be retrieved from the balance sheet for each year. In order to facilitate the analysis and comparison the log is taken of each amount. Age of the pension fund is in terms of the operating age, from the time of the company's establishment until present. Funding ratio of every pension fund is defined as total assets divided by discounted pension liabilities and is given in the annual report. The symbol 't' refers to time/year. The data necessary to measure the explanatory variables are retrieved from annual report of each pension fund for year 2011 and 2012.

7. RESULTS

Table 1 represents the summary of descriptive statistics for the dependent variable 'equity home bias' and independent variables 'age', 'size' and 'funding ratio'. The total sample contains 82 observations. This includes that data for 2011 and 2012. Due to the fact that the years are very similar the data is put together. On average there appears to be no home bias in Dutch industry-wide pension funds during the years 2011-2012 ($M = -0,04$, $SD = 0,29$). T-test is performed to examine the statistical significance. The mean equity home bias is not statistically significant at 5% level of significance. The minimum value for equity home bias is -0,48 and the maximum is 1. Looking at the operating age, there is a big deviation among the maturities of the pension funds ($M = 44$, $SD = 23$). The most mature firm is on the market for 94 years and the youngest for 5 years. Considering the variable 'size' in terms of total assets there is a large spread among the pension funds which quadruples the average value ($M = 12$ million €, $SD = 45$ million €). The smallest fund in the sample has a value of 118 thousand € and the largest is 314 million €. Subsequently, the average value for funding ratio is of 103% ($M = 1,03$, $SD = 0,08$) with minimum of 83% and maximum of 124%.

Table 1. Descriptive statistics

	Mean	Standard Deviation	Minimum	Maximum	Count
Equity Home bias	-0,04	0,29	-0,48	1	82
Age	44	23	5	94	82
Size	12.368.933,09 €	45.710.225,11 €	118.002,00 €	314.916.000,00 €	82
ln (Size)	14,39	1,74	11,68	19,57	82
Funding ratio	1,03	0,08	0,83	1,24	82

Descriptive statistics of equity home bias ratio, operating age, size, ln (size) and funding ratio of Dutch industry-wide pension funds in 2011-2012. The mean of equity home bias is not statistically significant at 5% level of significance ($p = 0,26$).

Correlation and regression analyses are used to examine relationship between equity home bias and its potential determinants. Table 2 represents the correlation matrix for variables included in the regression analysis. In the correlation analysis the associations among the variables are considered individually. According to the matrix there is a moderate positive correlation between equity home bias and age ($r = 0,32$) which is statistically significant at 1% level of significance and is inconsistent with $H2$. The correlation between equity home bias and size has expected negative direction as predicted by $H1$ ($r = -0,08$). The value however is minimal and the correlation is not statistically significant. There

is a weak positive correlation between equity home bias and funding ratio ($r = 0,15$). This correlation is insignificant and inconsistent with $H3$. Furthermore, there is a weak positive correlation between age and size ($r = 0,19$), indicating that the more mature the pension funds is the bigger it becomes in terms of total assets. This correlation is however insignificant. There is negative very weak and insignificant correlation between age and funding ratio ($r = -0,06$). There is a statistically significant weak negative correlation between size and funding ratio ($r = -0,25$) which is consistent with the literature and according to (Rubbiani et al., 2010) shows that liability structure drives the equity allocation across markets in small pension funds.

Table 2. Correlation matrix for variables included in regression analysis

	Equity home bias	Age	ln (Size)	Funding ratio
Equity home bias	1			
Age	0,32**	1		
ln (Size)	-0,08	0,19	1	
Funding ratio	0,15	-0,06	-0,25*	1

** Statistical significance at 1% level (2-tailed).

*Statistical significance at 5% level (2-tailed).

Table 3 represents the regression analysis where the variables are considered all together. It shows that the given model is statistically highly significant (F significance = 0,01, $p < 0,05$) and that age, size, funding ratio and year dummy variable explains the variability in equity home bias by 12% (adj $R^2 = 0,12$). Looking at each of the variables it is possible to see that variable 'age' is statistically highly significant ($p = 0,00$). The sign of this variable is not as predicted by $H2$ and is extremely small ($coef = 0,004$). Therefore, age has very minimal effect on

equity home bias, which is inconsistent with $H2$. Subsequently, coefficient of variable 'size' has expected negative sign ($coef = -0,01$). The value is however very small and statistically insignificant ($p = 0,43$). Funding ratio has a positive effect on equity home bias ($coef = 0,75$). Effect this, is statistically significant at 10% level of significance ($p = 0,09$), which is inconsistent with $H3$. The effect of year dummy on equity home bias is negative ($coef = -0,08$) and statistically insignificant ($p = 0,20$).

Table 3. Regression analysis

ANOVA			
	F	Significance F	
Regression	3,69	0,01**	

	Coefficients	t Stat	P-value
Intercept	-0,66	-1,20	0,23
Age	0,004	3,30	0,00*
ln (Size)	-0,01	-0,78	0,43
Funding ratio	0,75	1,73	0,09***
Year dummy	-0,08	-1,30	0,20

Adjusted R Square	0,12
Observations	82

* Statistical significance at 1% level.

**Statistical significance at 5% level.

*** Statistical significance at 10% level.

8. DISCUSSION

Results indicate that Dutch industry-wide pension funds do not show preference for domestic equity and thus are not exposed to equity home bias during years 2011 and 2012. This is partly consistent with the literature. Runnaniy et al. (2010) who study Dutch pension funds in the period of 1992-2006 report decreasing home bias from 37% to 13%. Schoenmaker & Bosch (2008) who studies home bias in Europe found that the Netherlands had the lowest regional (European) equity bias with value of 0.11 in 2004. Non-preference for domestic holdings in pension funds' portfolio show that they rationally diversify their portfolio and profit from international diversification.

Equity home bias is moderately positively and statistically significantly correlated with age of the pension funds. Furthermore there is highly significant but very minimal positive effect of operating age on equity home bias ratio. This result indicates that the more mature the pension fund is the more it should invest in domestic equity. This is inconsistent with *H2* which states that more mature pension funds have higher understanding about portfolio diversification and risk awareness and possess reduced bias towards portfolio allocation. This is also inconsistent with the literature. Runnaniy et al. (2010) found statistically highly significant results that domestic bias reduces with experience and international portfolio diversification enhances with operating age of pension funds. Investors' experience, sophistication and competence are measured in terms of operating age. Rubbaniy et al. (2010) reports that experienced pension funds have a better knowledge of portfolio diversification but at the same time they become more risk-averse being close to the payout phase. Their experience and knowledge allows them efficiently diversify their portfolios. The weak positive correlation of age and equity home bias could indicate that it is wiser to invest in European equity during years 2011 and 2012.

Equity home bias is very weakly and negatively correlated with size of the pension funds. There is also very small negative effect of pension fund size on equity home bias. This is as predicted by *H1*, which states that the larger the pension fund is the less it is exposed to home bias. The correlation and the effect in this study are however statistically insignificant. On the one hand, this outcome is inconsistent with the research of Babilis & Fitzgerald (2005) who study equity home bias in pension funds in the United Kingdom and found negative and highly significant effect of fund size on home bias. On the other hand, the very small effect of size on equity home bias is consistent with the findings of Rubbaniy et al. (2010) who report that size of pension funds does not matter to its asset allocation decision across markets, but it matters on the asset allocation of different asset categories across markets. They state that economies of scale enhance efficient international diversification and reduce home bias however Dutch large pension funds are conservative and exploit this opportunity for less-risky securities such as fixed-income securities.

There is a statistically significant positive weak correlation between equity home bias and funding ratio. There is a statistically significant positive effect of funding ratio on equity home bias. This is inconsistent with the literature and with *H3* which predicts that the larger the funding ratio is the less the pension fund is exposed to equity home bias. Rubbaniy et al. (2010) found that funding ratio has no effect on the asset allocation of pension funds across markets. However the researchers propose that positive effect of funding ratio on fraction of domestic holdings is attributed to the fact that pension funds having high funding ratio are small or that

pension funds prefer to invest in markets which are well-known to them.

Age and size are weakly positively however statistically insignificantly correlated. Dreu and Bikker (2012) also found that larger pension funds are more sophisticated in their portfolio diversification than smaller funds.

There is a little negative and statistically significant correlation between pension fund size and the cover ratio. This is consistent with the findings of Rubbaniy et al. (2010). (Rubbaniy et al., 2010) suggest that small pension funds have higher cover ratio so they hold more risky exposure to achieve better returns. At the same time the small size allows to make a trade-off between foreign costly but diversified markets and domestic cheap but well-known markets. The results suggest that they avoid risky foreign holdings which could be costly for them due to high transaction costs and prefer domestic risky holdings due to lower transaction costs and well-known markets. Liability structure drives the equity allocation across markets in small pension funds (Rubbaniy et al., 2010).

9. CONCLUSION

This study investigates equity home bias in Dutch industry-wide pension funds during years 2011 and 2012. It is examined to which extent individual characteristics such as size, operating age and funding ratio influence the exposure of pension funds to home bias.

The results provide that Dutch industry-wide pension funds do not show preference for domestic equities and therefore optimally diversify their equity portfolios and profit from international diversification.

The size of the pension fund has expected negative effect on equity home bias. This effect is however very small and insignificant which leads to the rejection of *H1*. This indicates that size does not matter to equity allocation across markets in Dutch industry-wide pension funds in 2011 and 2012.

The maturity of the pension fund has very minimal effect on the exposure to home bias. This leads to the rejection of *H2* and drives to the conclusion that Dutch industry-wide pension funds despite their operating age on the market optimally follow international diversification during 2011 and 2012.

Funding ratio has a positive and significant effect on the equity home bias ratio which is contrary to *H3* and leads to its rejection. This result is attributed to the fact that pension funds having high funding ratio are small or that pension funds prefer to invest in markets which are well known to them.

These results suggest that Dutch industry-wide pension funds as institutional investors despite their size and maturity possess the means to overcome the barriers to international investment and are well-informed, experienced, competent and sophisticated and thus optimally allocate and diversify their equity portfolios during 2011 and 2012.

This paper has several limitations. The sample contains data only for two years, 2011 and 2012. Subsequently, size, maturity and funding ratio are examined as determinants of equity home bias. It is recommended for further research to study other variables which are not included in the model and which could potentially explain equity home bias in pension funds, such as pension plan or familiarity and geographical proximity. Furthermore, it is recommended to examine other asset categories, bonds and real estate and add data from wider time span into the analysis.

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11. REFERENCES

- Adler, M. & Dumas B. (1983). International Portfolio Choice and Corporation Finance: A Synthesis. *Journal of Finance*, 38, 925-984.
- Babilis, S. & Fitzgerald, V. (2005). Risk Appetite, Home Bias and the Unstable Demand for Emerging Market Assets. *International Review of Applied Economics*, 19,(4), 459-476.
- Baele, L., Pungulescu, C. & Horst T. (2007). Model uncertainty, financial market integration and the home bias puzzle. *Journal of International Money and Finance* (26), 4, 606-630.
- Bekaert G. & Urias M.S. (1996). Diversification, Integration and Emerging Market Closed-End Funds. *Journal of Finance* (51), 3, 835-869.
- Brealey, R., Cooper, I. & Kaplanis. E. (1999). What is international dimension of international finance? *European Finance Review* 3, 103-119.
- Chan, K., Covrig V. & Ng. L. (2005). What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide. *Journal of Finance*, 60, 1495-1534.
- Chan, K., Covrig, V. & Ng, L. (2009). Does home bias affect firm value? Evidence from holdings of mutual funds worldwide. *Journal of International Economics*, (78), 2, 230-241.
- Cooper, I. & Kaplanis, E. (1994). What explains the home bias in portfolio investment? *Review of Financial Studies*, 7,45-60.
- Cooper, I. & Kaplanis, E. (1994 b). Home Bias in Equity Portfolios, Inflation Hedging, and International Capital Market Equilibrium. *The Review of Financial Studies* (7), 1, 45-60.
- Covring, V.M., Defond, M.L. & Hung, M. (2007). Home Bias, Foreign Mutual Funds Holdings, and the Voluntary Adoption of International Accounting Standards. *Journal of Accounting Research*, 48, 41-70.
- Dahlquist, M., Pinkowitz, L., Stulz, R.M. & Williamson R. (2003). Corporate Governance and the Home Bias. *The Journal of Financial and Quantitative Analysis* (38), 1, 87-110.
- Daly, K. & Xuan, V.V. (2013). The determinants of home bias puzzle in equity portfolio investment in Australia. *International Review of Financial Analysis* 27, 34-42.
- Dou, P.Y., Gallagher, D.R., Schneider, D. & Walter, T.S. (2013). Cross region and cross-sector asset allocation with regimes. *Accounting and Finance*. doi: 10.1111/acfi.12017.
- Dreu, J. & Bikker, J.A. (2012). Investor sophistication and risk taking. *Journal of Banking & Finance* 36, 2145-2156.
- Eiling, E., Gerard, B., Hillion, P. & Roon, F.A. (2012). International portfolio diversification: Currency, industry and country effects revisited. *Journal of International Money and Finance*, 31, 1249-1278.
- Fedenia, M., Shafer, S. & Skiba, H. (2013). Information immobility, industry concentration, and institutional investors' performance. *Journal of Banking & Finance*, 37, 2140-2159.
- Fidora, M., Fratzscher, M. & Thimann, C. (2007). Home bias in global bond and equity markets: the role of real exchange rate volatility. *Journal of International Money and Finance*, (26), 4, 631-655.
- French, K. R., & Poterba, J. M. (1991). Investor diversification and international equity markets. *American Economic Review*, 81, 222-226.
- Gorman, L.R. & Jorgensen, B.N. (1996). Domestic Versus International Portfolio Selections: A Statistical Examination of the Home Bias. *Working Paper, Kellogg Graduate School Management, Northwestern University Press*.
- Graham, J.R., Harvey, C.R. & Huang, H. (2009). Investor Competence, Trading Frequency, and Home Bias. *Management Science*, 55 (7), 1094-1106.
- Hotvedt, J.E. & Tedder, P.L. (1978). Systematic and unsystematic risk of rates of return associated with selected forest products companies. *Southern Journal of Agricultural Economics*, 10, 135-138.
- Kakes, J. (2006) Financial behaviour of Dutch pension funds: a disaggregated approach. *DNB Working Paper*.
- Kang, J. & Stulz, R. (1997) Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan. *Journal of Financial Economics*,46, 3-28.
- Kilka, M. & Weber, M. (2000). Home bias in international stock return expectations. *Journal of Psychology & Financial Markets*, 3, 215-231.
- Lewis, K.K. (1999). Trying to Explain Home Bias in Equities and Consumption. *Journal of Economic Literature* (37), 2, 571-608.
- Li, Y., Gao, R., Du, R. & Huang, S. (2007) The Research of Chinese Home Bias. *International Conference on Management Science & Engineering* 14, 20-22.
- Markowitz, H. (1952). Portfolio selection. *Journal of Finance*, 7, 77-91.
- Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *Journal of Finance* 42, 483-510
- Reisen, H. (1997). Liberalizing Foreign Investments by Pension Funds: Positive and Normative Aspects. *World Development*, 25, (7), 1173-1182.
- Rubbaniy, G., Lelyveld, v.I.P.P. & Verschoor, W.F.C. (2010). Home Bias and Dutch Pension Funds' Investment behaviour.
- Salehizadeh M. (2003). U.S. multinationals and the home bias puzzle: an empirical analysis. *Global Finance Journal*,14, 303-318.
- Schoenmaker, D. & Bosch, T. (2008). Is the home bias in equities and bonds declining in Europe? *Investment Management and Financial Innovations* (5), 4, 90 – 102.
- Solnik, B. (1974). An equilibrium model of the international capital market. *Journal of Economic Theory*, 8, 500-524.
- Solnik, B. (1988). *International Investments*. Addison-Wesley, Reading, MA.
- Statman, M. (1987). How many stocks make a diversified portfolio? *Journal Finance Quantitative Analysis*, 22, 353-364.

Strong, N. & Xu, X. (2003). Understanding the equity home bias: Evidence from survey data. *Review of Economics and Statistics*, 85, 307-312.

Stehle, R. (1977). An empirical test of the alternative hypothesis of national and international pricing of risky assets. *Journal of Finance* 32, 493–502.

Stulz, R.M. (1991). Globalization of equity markets and the cost of capital. *NBER Working Paper* No. 7021, National Bureau of Economic Research: Cambridge, MA.

Tesar, L. L. & Werner, I.W. (1995). Home bias and high turnover. *Journal of International Money and Finance*, 14, 4, 467-492.

