Investment limits of pension funds

An international analysis of regulation strictness

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1. Introduction

1.1 Problem definition

Much has been written about pensions in the last couple of decades. First of all because of problems related to the ageing society through which many countries now face and were facing fiscal problems for financing the growing pension costs (Barr, 2006). Also because of the rising question how countries should deal with these growing financing costs because the credit crisis has caused the value of pension funds' asset portfolios to shrink severely. This decrease in portfolio value may cause difficulties for the pension fund managers' ability to pay the future pension benefits. One of the causes of this situation is that pension funds invested their funds in risky assets (RNW, 2010). Although investments in risky assets show higher returns on average, this might not compensate the downturn in portfolio value in times of economic downturn.

This raises the question whether government policy should be aimed at limiting such risk seeking behaviour and if governments should have been stricter to avoid such downturns in portfolio value by limiting investments in certain asset groups or setting other quantitative limits on investments by pension funds.

If there would exist a simple relationship between regulation strictness and pension fund success (i.e. maximizing portfolio value over a longer period of years), it would be logical that countries all over the world would probably have more or less the same regulations. This paper will show that this is not the case. This raises the question what other factors play a role in the determination of regulation strictness.

This research has two aims. The first aim is to look for cross-country differences in regulation strictness on investment limits for pension funds. If there are differences found, the second aim of this research is to search for international patterns in regulation strictness. Patterns are defined for this research as relationships between regulation strictness on investment limits for pension funds and demographic, geographic and/or economic characteristics of the different countries. However a causal relationship between country characteristics and strictness on pension fund regulations will not be determined since this lies beyond the scope of this research.

The main research question and the corresponding hypothesis are:

Are there cross-country differences in regulation strictness for pension funds (investment limits) and are these differences related to specific demographic, geographic and/or economic characteristics (i.e. show patterns)?

H0. There are no patterns in the differences in pension fund regulation

H1. There are patterns in the differences in pension fund regulation

1.2 Social and academic relevance

The relevance of this research is that patterns in the differences in regulation strictness towards pension funds could reveal a possible relationship with factors that influence the design of pension funds. The relationships between country characteristics and the pension fund investment regulation strictness could suggest interaction between variables other than portfolio maximization. The design of pension fund regulation and these influences could be of influence for scientific interpretation of pension funds regulations and design.

1.3 Methodology

To be able to investigate cross-country differences in investment regulation strictness on pension funds and whether limits for pension funds are related to other country characteristics an index of pension fund investment regulation strictness is made. The investment limits for pension funds set by governments are used to give scores on regulation strictness and these are used for the index. The countries and information on the different regulations are all taken from a paper published by the Organization for Economic Cooperation and Development (OECD) in which the results of a survey on pension fund investment regulation are shown(OECD, 2010). All OECD countries plus the other countries mentioned in this paper will be used in this research (except for India due to lack of sufficient information). A number of 36 countries are used to provide for enough variability in the index so that the patterns might be easier to interpret and more meaningful.

1.3.1 Index

The following variables are used to construct the index:

<u>Investment limit on different asset-categories:</u>

1. Equity
2. Real Estate
3. Bonds
4. Retail investment funds
5. Private investment funds
6. Loans

7. Bank Deposits
8. Foreign Assets

Other quantitative restrictions:

9. Self investment
10. Investment in single issuer
11. Ownership concentration limits
12. Currency Matching requirement

Per country, I have attributed points ranging from 0 to 10 in which 0 means not strict and 10 means as strict as possible. For all the variables, the investment limits are set as a percentage of total funds. So if it is not allowed to invest more than 10% of total investments in a particular asset class, a score of 9 is given.

Variables 1-11 have been attributed 0 if there is no investment limit set, 1 for a 90% investment limit, 2 if there is a 80% investment limit, 3 for a 70% investment limit, 4 if there is a 60% investment limit, 5 if there is a 50% investment limit, 6 for a 40% investment limit, 7 for a 30% investment limit, 8 for a 20% investment limit, 9 if there is a 10% investment limit, 10 if is not allowed to invest in at all in that particular asset class. Variable 12 received points in the same way but in the exact opposite direction, so the higher the currency matching requirements the higher the points attributed to the strictness index.

Often there are multiple regulations within each asset class represented by one variable. In this case simple weights are taken in order to attribute points for that specific variable to the index. So if there are for example two rules for investment limits on equity e.g. 50% on listed equity, and 30% on non-listed equity, 6 points will be given to the index ((5+7)/2=6).

For investment limits for the first 8 asset classes (i.e. variables), the maximum amount that can be invested in single assets or single issuer are not used as an investment limit for that asset class to attribute points for the index, since this is already done in variable 10 on investment limits for single issue(r). This implies that only investment limits for groups of assets within the asset classes are used to determine the amount of points that is attributed to each of the variables.

All the twelve variables are given an equal weight for the strictness index. Strictness means literally kept within narrowly specific limits and all variables seem to set specific limits for the investment behaviour of the pension funds in the countries. The only variable that is actually weighted is variable 8 on foreign asset investment limits, since this is a composed variable consisting of the same seven categories as variables 1-7(only then for foreign assets).

So all the 7 categories are given scores for foreign assets, but the total score of limits on foreign investments is divided by 7 so that the weight for the index of this variable is the same as the weight of the investment limits of all other variables.

For some countries there are two categories of pension funds (e.g. voluntary and obligatory) described separately in the OECD paper. When there are two categories of pension funds per country they are treated as if they are separate countries for adding up the points of the variables. After this the simple average is calculated and given as a score to represent the countries' total strictness.

From the total scores of each of the countries the average is calculated and all country scores are divided by this average and multiplied by 100 so that the average of the index is approximately 100. The reason for this is that the index will be easier to interpret. It makes it easier to see immediately which countries are more (or less) strict than average and with how many percent they deviate from average. E.g. if a country has a strictness measure of 150, the reader can immediately see that the country is above average strict and that it deviates plus 50 percent from the average strictness measure. For the search for relationships (via correlations and differences in means) this has no influence since the relative differences stay the same.

There is also another index made, which uses weights for the variables that are based on the total pension fund portfolios in the Netherlands. If there are for example certain asset categories that are heavily invested in, a larger weight is attributed to the corresponding variable.

This is to verify whether the relationships that were found using the index with the simple weights described above, are confirmed by an index using weights based on a 'real life' portfolio. If the relationships change severely, this might imply that correlations are very subjective to the definition of regulation strictness for pension funds investment, while if they stay more or less the same, the relationships found are confirmed and these relationships are not so subjective to the precise definition of regulation strictness on pension fund investments.

1.3.2 Patterns

Patterns (i.e. relationships found between the country characteristics and regulations strictness) have been looked for in two ways:

1. In some cases, sub-groups of countries are created by similarities in their country characteristics and the mean in strictness of these groups are compared and analysis is done to see if these groups of countries differ significantly in strictness.

2. Correlations are used to see whether some quantitative characteristics are related to the strictness of these countries. Although this research is not aimed to find a causal relationship, additionally to the tests for correlations a test to find a simple linear regression is used in some cases to find the regression coefficient (B) of the relationship. (B is the coefficient in the regression formula that represents the amount by which the dependent variable grows (or declines if negative) if the independent variable grows by 1).

The paper has the following outline: First, chapter 2 will give a short summary of the related literature on international pension fund characteristics. Then in chapter 3, some introductive information pensions will be presented. Chapter 4 will present the results of the research and in chapter 5 the interpretations of the results will be given. Finally, some conclusions are drawn and recommendations will be made in chapter 6.

2. Related Literature

In this section two related papers and the main findings of these papers are presented.

The first related paper is on patterns in international pension provision (Palacios et al, 2000). The authors have related major demographic projections and other important variables to the public and private pension schemes. The paper focuses on demographic projections, international patterns and regional patterns in pension provision. The difference between the two researches is that the research by Palacios et al uses many demographic projections, while this research uses facts (and not projections) on regulations and demographic, geographic and economic characteristics. Also this paper focuses on regulation strictness which is much narrower than the focus of their paper which presents the results of a research on private and public schemes and related patterns. Nevertheless, the paper has provided some insights in the characteristics of different pension funds and has revealed the importance of demographical characteristics for pensions. They primarily focus on aging, so characteristics like expected average age and fertility rates are projected. In the second part of the research, international and regional patterns have been searched on pension characteristics like spending, replacement rates, payroll taxes, funding, pension reserves, privately managed pension assets etc.

Another linked paper is written on regulations on private pension funds' structure, performance and investments (Srinivas et al, 2000). Countries regulated by relative performance regulation and strict asset-allocation. In this paper cross-country evidence on this

subject is presented. Although this paper is relatively closely linked, the focus of this paper lies in the fact that the authors compare the pension fund regulations in OECD countries with Eastern European and Southern American countries. One of the findings in this paper is that the result of strict regulations is that pension fund portfolios in countries become very similar and their returns are practically indistinguishable. The authors then argue that in order for workers to benefit for their future pensions from competing pension funds and individual choice of funds, regulations need to be loosened. One of the other findings is that Eastern European and Latin American countries are stricter than OECD countries. Only for portfolio limits, some OECD countries seem to be more stringent.

3. Pensions

The term 'pension' is used to refer to all kinds of pensions like disability pensions, survivor pensions and old age pensions. This paper deals with pension funds providing old age pensions. The main purpose of an old age pension is to provide income in the years when people no longer have a job that provides a steady income, so after retirement age, which begins in between the age of 60 and 67 for most jobs in most countries. The four main objectives of this kind of pension provision are consumption smoothing, insurance providence, poverty relief and redistribution (Barr et al, 2006). Different countries have different ways of dealing with the provision of pensions. Some countries have for example fully funded schemes, in which the pension contribution are invested in assets and accumulated. The accumulated wealth is then used to pay for pensions throughout the years. Other countries offer a pay-as-you-go (PAYG) system, which means that the people that are currently working pay for the pensions of people who are retired now via current taxes. Other countries provide a partially funded scheme, which is a mix between these two systems.

Within a funded scheme, distinction is made between defined benefit (DB) and defined contribution (DC). Defined benefit refers to a scheme in which the money that will be received for a pension depends on the income and is calculated using an actuarial formula.

Defined contribution refers to a system in which the money paid prior to the years of pension is put into a personal account, invested in assets and the total returns are used to calculate an annuity. The annuity will be received until death, based on life expectancy, the income of the years prior to investment and the performance of the pension fund. One of the key differences between DC and DB schemes is difference in the person that bears the risk (Clark and Hu 2005). In the defined benefit schemes, employees always receive a particular percentage of

the final salary and so they bear not so much risk In the defined contribution schemes, the employees are relying on the performance of the pension funds and thus on the pension fund management and so they are exposed to a larger part of the risk.

Another characteristic of a pension system is that all countries have an obligatory pension scheme and a complementary voluntary scheme. Some countries also have a complementary mandatory scheme to add up to the basic obligatory pension scheme.

There has been much debate on whether countries should use a mix of funded or PAYG, (complementary) obligatory or voluntary and what mix should be between these alternatives should be used. Although there has been a clear trend from PAYG to funded schemes, this paper focuses on another issue namely on the strictness in pension fund investment regulations. The reason for this is that pension scheme design is a widely debated subject. The research will cover both the obligatory and the voluntary pension funds. This is to ensure that the dataset used represents a government's strictness toward all pension funds and not just a part of the pension system.

The only implication of this for the research is that countries need to have funded or partially funded schemes in order to be investigated in this research. The reason for this is that it will ensure the possibility to investigate the strictness in pension fund investment regulations, since a funded scheme implies that a country makes use of pension funds to pay for the pension benefits in that particular country. All the countries that are investigated in this paper thus make use of a funded or partially funded scheme in their pension provision.

In the next part the results of the research are presented.

4. Results

Now the results of the research are presented. First the index of strictness will be shown in the first paragraph and then some results of the search for patterns will be shown split in paragraphs 2, 3 and 4 showing patterns with respectively geographic, demographic and economic characteristics. Then in the last paragraph, the other index is presented in which the weights of the variables that together form the index are changed. Also the major differences and/or similarities in the patterns found as compared to the index using simple weights are shown. In appendix A the reader can find all the variables used for finding the patterns, including the two indexes.

4.1 Index

Below in figure 1 the reader can see the index. On the X-axis the reader find the names of the countries and on the Y-axis the index number. 100 is the average number. As explained in the methodology part this is set to 100 for means of interpretation easiness. The composition of the index and the different variables can be found in appendix B. In Appendix B the reader sometimes sees multiple indexes per country.
As explained in the section on methodology, the average of these two index totals are then taken to represent the country index number.

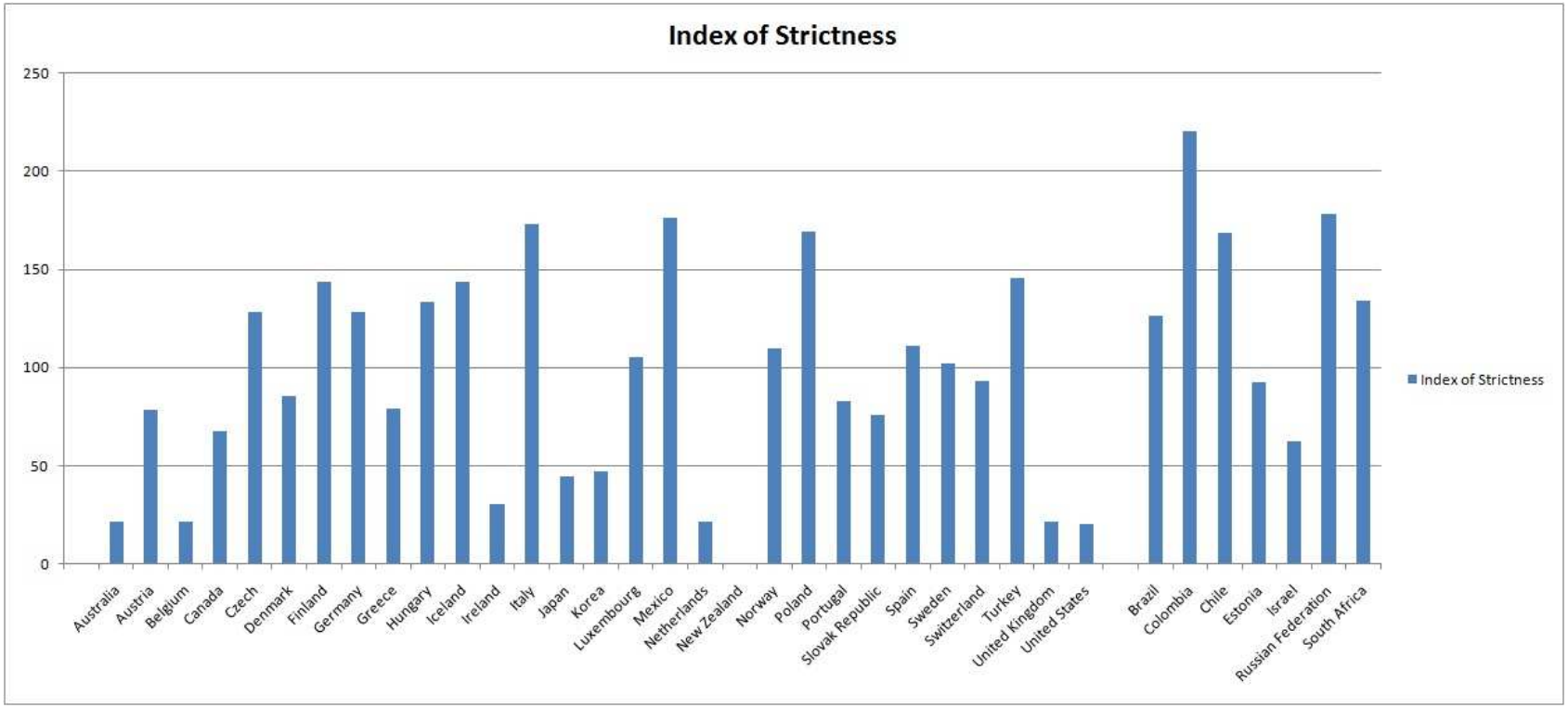

Figure 1: Index of strictness in investment regulations for pension funds in year 2010

What stands out in this index is that Colombia seems to be the strictest in pension fund investment regulations. Also Russia, Poland, Mexico, Chilli and Italy seem to be strict. On the other hand the less strict countries are New Zealand, the Netherlands, Australia, the US, the UK,

Belgium and Ireland. The large diversity in strictness is also something that stands out when looking at the table. The smallest observation has a strictness measure of 0 (New Zealand), while the strictest country has a measure of 220, namely Bolivia. The 0 means is that the strictness is 100% below average and there are no investment restrictions at all. A score of 220 for Bolivia means that it scores 120% higher on the strictness index than the 'average country'. The strictness of all countries for all the variables can be found again in Table B.

It also becomes clear from the totals at the bottom of the table in Appendix B that the variable investment limit on self investment contributes most points to the index. Also investment in single issue(r), loans and real estate investment limits are high contributors to the index. Investment limits on bank deposits and currency matching requirement attribute the least to the index. This means that on average countries have most or fewest restrictions on these asset classes and that adjusting weights of the corresponding variables in the composition of the index could influence the relationships found.

The question is whether the differences in strictness show any relationships with demographic, geographic and economic/financial country characteristics. In the next section of the paper the results of the tests on geographical related characteristics are presented to show the patterns with strictness.

4.2 Geography

In this paragraph geographical characteristics of the countries will be compared with regulation strictness on investments of pension funds to see if this reveals any patterns. First continents are separated in subsets and the means of the strictness of all countries in each continent are compared, then Nordic vs. Olive countries (terms will be specified later) are compared to see whether the strictness means of these continents differ significantly.

4.2.1 Continent

Below in table 1 and 2 the results of an Anova- test are presented. Although the sub-groups show large differences in sample sizes, this test can be used nevertheless, because the test of significance (F-test) uses the information on sample sizes for the degrees of freedom and thus in the outcome of the test,\ this is taken into account. The continents measures of strictness of Asia and Africa can be questioned since of these populations only a small sample is used to calculate the continent means.

Strictness

	N	Mean
Europe	24	101,75
Asia	3	51,00
South America	3	171,33
North America	3	87,67
Africa	1	133,00
Australia	2	10,50

Table 1. Continent Means.

Anova

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39955,556	5	7991,111	3,524	,013
Within Groups	68030,333	30	2267,678		
Total	107985,889	35			

Table 2. Anova test, continent means.

In table 1 the mean strictness of the different continents are presented. Here the reader can see that the countries in Europe have an average strictness measure of around 100 (the total average). This is most likely due to the fact that a large part of the total sample of countries, namely 24 out of 36, is a European country. South America has an average of approximately 171, North America has an average of only 88, Africa has an average of 133 and Australia of only 10.5, which is very small.

Besides the regulation strictness means of all continents, also the one way analysis of variance (Anova) is used to see whether the means of the different continents are unequal. The result is that it has an F statistic of 3.524 resulting in a significance of 0.013. This implies that it is 98,7% certain that these means are not equal, and thus this test shows that the difference is significant at the 5% percent level, meaning that we can state that continent means are unequal. The missing part of Table 1 can be found in Appendix C. However, the table does show that the continents with few observations have a very large 95% confidence interval of the population mean and Europe has a relatively small confidence interval. A 95% confidence interval means that we can be 95% certain that the population mean is within the specified interval, so the larger the interval the less certain we are about the actual mean. Nevertheless, the Anova-test takes the standard deviations and confidence interval into account.

From these results it is thus obvious that within continents there are large differences between the countries, but also continent means in strictness differ much and large enough to state that is highly unlikely that continents are evenly strict on average.

4.2.2 Nordic vs Olive

Another geographical test that has been conducted is a t-test to see if the Nordic countries[1] differ in their average strictness compared to the strictness of the so-called Olive countries.[2]

Group Statistics

	Nordic_ Olive	N	Mean	Std. Deviation	Std. Error Mean
Strictness	Nordic	5	116,40	25,803	11,539
	Olive	6	108,33	42,665	17,418

Table 3. Descriptive statistics of Nordic and Olive countries.

The means of Nordic and Olive countries are respectively 116.40 and 108.33.

There is also a test conducted to see if these means differ significantly. This test can be found in appendix D and the main result is that there is a significance of 0.709 meaning that we cannot state that these means are different of each other. Also these groups have an almost equal sample size, which makes it easier to compare the group means.

Although the test showed that the differences in strictness between countries and continents were rather large, most countries were from one continent namely Europe. In order to create groups of equal sample sizes, more focus has been put on demographical and economical characteristics in order to create more equal sample sizes. In the next paragraph the results of the search for patters and relations with demographical characteristics will be presented.

4.3. Demography

Demographical characteristics might be useful in explaining the differences in strictness of the countries in the sample. The demographical characteristics that are used to find relationships with strictness in regulation are language origin and main religion. These characteristics can be both related to culture. It could be argued that the language origin and the main religion of a country have influence on the country design and governmental policy and thus also regulations, since these characteristics both contain information on the cultural background of a country.

First the results of the language origin of the countries will be shown and then the results of the tests on religion for all the countries will be presented. Both country characteristics are likely to influence the design and regulations of a country.

[1] Denmark, Sweden, Norway, Iceland and Finland

[2] Greece, Italy, Portugal, Spain, Turkey and Israël.

Language origin might be related to the strictness in regulation, because countries with the same language origin are probably more likely to share other characteristics like culture. Four different categories have been distinguished for this sample: Germanic, Germanic/Latin, Latin, Slavic and Other. Countries in each category can be looked up in appendix A.

4.3.1. Language Origin

Below the reader can find the main results of the Anova-test for the equality of means of countries with different language origins. In Appendix E the reader can find the rest of the results of table 4, including the confidence interval, the minima and maxima. It is obvious from this table that the countries with a Latin and a Slavic origin are very strict, while the Germanic and Germanic/Latin show a strictness of around 73 which is far below total average.

STRICTNESS

	N	Mean
Germanic	14	73,86
Germanic+Latin	3	73,00
Latin	10	133,30
Slavic	3	140,67
Other	6	86,33
Total	36	97,94

Table 4. Descriptive statistics Language.

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28774,075	4	7193,519	2,815	,042
Within Groups	79211,814	31	2555,220		
Total	107985,889	35			

Table 5. Anova-test language origin

In table 4 the reader can see that the differences in sample sizes are quite large. From the corresponding appendix it can be seen that this has its effect on the size of the confidence intervals and thus we can be less certain about whether the means stated are actually true if there is a small sample. The differences in sample sizes make the mean comparison less reliable. In table 5, the results of the Anova-test are presented. The main result is that the differences between countries with different language origins are significant at the 5% level, significance being 0,042.

Another related test that is done is a mean comparison between the first two groups, Germanic and Germanic/Latin, and the other three groups. Below in table 6 the reader can find the results of this comparison

Group Statistics

	VAR00001	N	Mean	Std. Deviation	Std. Error Mean
index	3-5	19	119,63	51,700	11,861
	1-2	17	73,71	50,590	12,270

Table 6. Descriptive statistics of test of language origin.

The means are quite different namely 74 for the Germanic and Germanic/Latin countries and 120 for the others. The significance between these two groups is 0.011 and thus the strictness between these two groups is significant at the 5% level. In appendix F, the results can be found of the t-test showing the significance.

4.3.2. Religion

Below are the results of a comparison of index strictness in the relation to main religion per country[3]. Although state religion might be closer related to government policy than the main religion of a country, main religion of a country as a variable is chosen because most countries in the sample do not have a state religion and thus this variable might show better results. Also main religion is likely to influence government policy, although not as much as state religion, and thus also pension fund regulation since the government represents the people of a country and the norms and values of the people and religion is very much related to this.

The main results from the table 7 are that in the category other[4] the lowest strictness can be found and also countries with Protestant Christian as the main religion tend to be less strict than the overall average. In the 'Orthodox Christian' (Greek and Russian) and 'Catholic countries' the highest strictness is found. Also 'Muslim countries' show a high strictness but this represents only one country namely Turkey. Furthermore, in table 8 the results of the Anova-test are shown and it clear that the differences between the means are not significant at the 5% level because the significance is 0,281. The complete version of table 7 can be found in Appendix G.

[4] Meaning not in one of the other religion categories: countries are:Japan, South Korea and Israël.

Strictness

	N	Mean
Catholic	18	109,67
Protestant	12	83,08
Muslim	1	145,00
Other	3	51,00
Orthodox	2	128,50
Total	36	97,94

Table 7: Descriptive statistics, Religion

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15816,472	4	3954,118	1,330	,281
Within Groups	92169,417	31	2973,207		
Total	107985,889	35			

Table 8: Anova-Test Religion

Another test that is conducted is a t-test to see if catholic countries differ significantly in their strictness from protestant countries. From this test, which can be found in Appendix H, the significance score is 0.206 meaning that this test is not significant at the 5% level, but it is sure that if we would repeat this sample, 80% of the times the means would not be the same and this sample is a large part of the total population. This implies that we can be almost absolutely certain that these two groups of countries differ in their average strictness.

In the next paragraph the results of the economical and financial patterns found are presented.

4.4 Economy & Finance

Economical and financial characteristics might be related to the design of the financial system of a country and thus also to the strictness in pension fund investment regulations. In the next few paragraphs the results of economical and financial patterns with regulation strictness are presented. First of all the findings on differences in mean strictness between OECD countries and non-OECD countries, western and non-western countries are presented. Second the gross savings as a percentage of GNI will be shown. After this investments as a percentage of GDP will be investigated and finally the results on the patterns with GDP per capita will be presented. Gross savings as a percentage of GNI are used instead of gross savings as a percentage of GDP, because the information on gross savings as a percentage of GDP was hard to find and both are representative for national income.

4.4.1. OECD Membership & Western countries

Below in table 9, the differences between strictness in OECD member countries and non-OECD member countries are shown.

	OECD_NON-OECD	N	Mean	Std. Deviation	Std. Error Mean
index	OECD	29	87,83	51,913	9,640
	NON-OECD	7	139,86	53,636	20,272

Table 9. Descriptive statistics, OECD Membership

The results in the table show that OECD countries have an average strictness measure of 88 on the strictness index, while the non-OECD have an average score of 140. This seems to be a large difference and indeed, when checked for significance with a t-test which can be found in appendix I, this difference turns out to have a significance of 0.046 meaning that the means of these two groups are significantly different at the 5% level.

Another test that is conducted is to if countries differ in their strictness measure if they are western or non-western countries. This test showed that the difference in the average strictness between the two groups is larger than in the test for OECD membership and is 131 for non-western and 79 western countries and the significance of this difference has even become 0.008 so this difference is even significant at the 1% level. The results of the T-test and the descriptive statistics of the means, variances, minima and maxima can be found in Appendix J.

4.4.2 Savings as a percentage of GNI

Gross savings as a percentage of Gross National Income are compared with the index to investigate whether strictness in pension fund investment regulations has something to do with the risk attitude of citizens of countries, because savings can be seen as risk avoiding behaviour. If gross savings as a percentage of gross national income is very high it can be argued that the people in that country are risk avoidant since they save because might be uncertain what the future might bring them. If the savings are very low people take high risks regarding their future economic situation. Below in table 10 the reader can see the highlights of the regression. The rest of the regression results can be found in appendix K.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,008[a]	,000	-,029	56,355

a. Predictors: (Constant), Savings_of_GNI

Table 10. Regression results, Savings as a % of GNI

The results in the table show that the regression has an R of 0.008 meaning that there is a relation of 0.8 %. Also when looking at the coefficients of the regression results in Appendix K, the coefficient B of the regression is equal to -.067 meaning that there is a very small negative relation which is also not significant and has a significance of 0.963 which is extremely low. These results show that there is almost 100% certainty that there is no relation between savings as a percentage of GNI and the pension investment regulation strictness index.

4.4.3 Investments as a percentage of GDP

Another variable that can also be related to the risk attitude of the citizens of a country is total investments as a percentage of GDP. The logic is that the higher the total investment as a percentage of GDP is, the higher the risk seeking behaviour of a country is. The importance of this relationship lies in the relative differences in the investments as a percentage of a countries' gross income. Both GDP and GNI are likely to be very highly related to each other. So if a relationship is found between savings as a percentage of GDP and strictness in regulation, this provides us with sufficient information to find an answer to the underlying reasoning described above.

Below, in table 11, some highlights of the regression analysis are shown. The rest of the results can be found under Appendix L.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,071[a]	,005	-,024	56,214

a. Predictors: (Constant), Investment_ofGDP

Table 11, Regression results, Investment as a % of GDP

From the results above it becomes clear that the regression has a correlation of 0.071 meaning that there is a very small relation between the two. The coefficient that describes the sign and magnitude of the relation (B) of this regression is 1.096 meaning that there is a positive relation with the index.

It has a significance of 0,681 meaning that there is small chance that this relation is the actual relation and thus this outcome has very little predictive power.

4.4.4. GDP per Capita

In this section GDP per capita will be compared with the index by testing it for correlations. In table 12, the results of the correlations for both the nominal GDP as for the GDP PPP with the pension funds strictness index are shown.

Correlations

		GDP_percapita_ppp	index	GDP_percapita_nominal
GDP_percapita_ppp	Pearson Correlation	1	-,458**	,965**
	Sig. (2-tailed)		,005	,000
	N	36	36	36
Index	Pearson Correlation	-,458**	1	-,384*
	Sig. (2-tailed)	,005		,021
	N	36	36	36
GDP_percapita_nominal	Pearson Correlation	,965**	-,384*	1
	Sig. (2-tailed)	,000	,021	
	N	36	36	36

Table 12. Correlations, GDP per Capita PPP & GDP per Capita Nominal

From the table above it becomes clear that GDP per capita nominal has a correlation of -.384 meaning that the higher the GDP per capita, the lower the strictness will be. This relation has a significant of 0.021 and so this relation is significant at the 5% level.

GDP per capita covered for purchasing power even has a larger relationship and it is -.458 meaning that the higher the GDP per Capita becomes, the lower the strictness is. This relationship has a significance of 0.005 and so this relationship is even significant at the 1% level, which makes it even more certain that there is relationship between these variables.

Since these numbers both have a large correlation we can conclude that there is an obvious negative relation between GDP per capita and pension fund investment regulation strictness.

4.5 Alternative Index

In this section of the paper, an alternative index and the major conclusion regarding the patterns found are presented. The weights of the variables are changed to see whether this reveals other patterns than in the previous sections, or confirms the patterns that were also found in the previous section of this chapter.

For this alternative index, the weights used for the variables are based on the portfolio division of the total of Dutch pension funds. Since the Netherlands have few restrictions on the investment behaviour of pension funds, it is interesting to see if using weights based on the situation in the Netherlands influences or changes the relationships and patterns found using the index based on simple weights. The information used for this process is found in the database of the Dutch central Bank (De Nederlandsche Bank). Using the information available gives an idea of the portfolio. Weights based on the differences in relative size of the asset classes are used for the new index. The importance of this additional index lies not in the precise correctness of the weights, but in the effect that these weights based on a real life case has on the relationships found. This index not only takes into account the regulation strictness in an absolute sense like the paper written so far, but tries to grasp the effect of the regulation strictness on a real life pension fund with this total case as a basis. This increases the relevance of the research and the ability to draw the right conclusions.

One of the major implications is that foreign assets should be given a high weight since a very high percentage of the assets are invested in them. Of course the Netherlands is a country that is small and has almost no strictness in regulation, but nevertheless for this part of the paper it is assumed that this is more or less representative for the pension funds of all countries in the sample used for this research.

Also equity and bonds are assets that are invested in relatively high and so this variable should also be given some extra weight. Only a small portion of the funds is invested in real estate, loans and bank deposits and thus these are given some lower weights. The rest of the weights have remained the same, since there was no information available or the shares of these asset-classes were neither high nor low.

Based on the data found in the DNB Database, the following weight division is given to the variables:

Var 1: 2	Var 2: 0.5	Var3:1.5	Var4: 1	Var 5: 1	Var6: 0.5
Var 7: 0.5	Var8: 2	Var9:1	Var10:1	Var11: 1	Var12:1

Like the rest of the data used for this paper, the exact numbers of the investment regulation strictness index can be found in appendix A, in this case under Dutch Index (i.e. the name for the index used in SPSS based on the portfolio totals in the Netherlands)
The main results of this index are that Mexico, Poland, Chile, Russia and Colombia are the countries with the highest strictness, just as in the index using simple weights. Of the countries that were strict in the index using simple weights, only the strictness measure of Italy has become slightly lower. In the index based on the Dutch case, the same countries are the less strict countries as with the index made of variables using simple weights. Furthermore some countries have a higher score, and other lower scores and all information can be found in appendix A.

4.5.1. Geography

Patterns on geography have been verified using the index based on the situation in the Netherlands and the SPSS output can be found in appendix N. The average strictness of the continents have changed a bit, but more or less stayed the same and the differences between the continents have become slightly less significant, but significant at the 5% level and thus this verifies the finding that continent means are unequal. The difference in strictness between the so-called Olive and Nordic countries has increased because the average of Nordic countries have increased to 124.60 and of the Olive countries have decreased to 97.33, but nevertheless the difference is still not significant but has increased to 0.166. Since this sample represents almost the total population of Nordic and Olive countries we can thus state that the difference between the two is significant and thus they are not equally strict.

4.5.2 Demography

Also the demographical characteristics have been related to the index based on the situation in the Netherlands of which the results can be found in appendix O. It is found that the language origin of countries still has a good relationship with strictness in regulation, although the significance has dropped to 0.086, meaning that the relationship is not significant at 5%. But this sample is a large part of the total population and thus we can say that the means are not equal. Germanic and Germanic/Latin countries still differ much from Latin and Slavic countries in their strictness. Also between the different main religions in countries and the new index we still see more or less the same differences between the countries. Protestant countries are still less strict on average than Catholic and Orthodox countries.

So in conclusion, although the individual observations of the demographical have slightly changed, the patterns with the new index are the same as with the patterns of the old index.

4.5.3 Economy & Finance

Also the economical and financial data used in the previous sections of this chapter have been verified in order to check whether (or not) major changes were found in the patterns. All the SPSS results showing the outcomes can be found in appendix P. The difference in mean strictness between OECD Members and non-OECD members and western and non-western countries is still significant. The differences between the means have more or less stayed the same and the significance shows also no change.

Also GDP per capita is still highly correlated to the index based on the total pension fund portfolios in the Netherlands. As the reader can see in appendix P under GDP per capita, GDP per capita nominal has a correlation of -.390 and GDP per capita has a correlation of -.439 and both correlations are significant at the 5% level. This means that the GDP per capita nominal has a slightly higher correlation with the index based on the total pension fund portfolio in the Netherlands than the index with simple weights for every variable. The GDP per capita PPP has dropped slightly in relationship. Nevertheless the relationship still exists and thus this pattern is confirmed.

Investments as a percentage of GDP and savings as a percentage of GNI show the highest shifts in their relationship compared to the relationship with the other index. While there was almost no relationship between the previous index and the variables, now that the weights are slightly changed, there is much more relationship between these statistics. The variable investments as a percentage of GDP has a regression coefficient of 1.470, meaning that for every percent this increases the index of strictness increases with 1.47 percent. Savings as a percentage of GNI have a regression coefficient of 0.279 meaning that for every percent savings as a percentage of GNI increase, the index also increases. This relationship is much weaker than the investments as a percentage of GDP. Nevertheless, both results are still very insignificant, meaning that there is a linear relationship if we would draw a line through the scatter plot, but the individual observations lie far from the line so the result is not very significant. On the next two pages in table 13 a summary of the data/information used for the tests of which the results were presented in this chapter is presented. This summary includes the country names, geographical, demographical and economical/financial statistics.

In the next chapter, the interpretation of the results shown in this chapter will be given.

Table 13: Data summary

Countries	INDEX	Dutch Index	OECD membership	continent	GDP nom	GDP PPP	Main Religion	Western	Nordic/Olive	Investment of GDP
Australia	21	21	Yes	Australia	38,911	45,587	catholic	yes		27,6
Austria	78	107	Yes	Europe	38,839	45,989	catholic	yes		20,7
Belgium	21	21	Yes	Europe	35,422	43,533	catholic	yes		21,3
Canada	67	57	Yes	North America	38,025	39,669	catholic	yes		22,6
Czech	128	125	Yes	Europe	24,093	18,557	catholic	yes		27,8
Denmark	85	86	Yes	Europe	35,757	56,115	protestant	yes	Nordic	22,4
Finland	143	159	Yes	Europe	33,556	44,492	protestant	yes	Nordic	20,5
Germany	128	126	Yes	Europe	34,212	40,875	protestant	yes		18,9
Greece	79	85	Yes	Europe	29,889	29,635	orthodox	yes	Olive	24,9
Hungary	133	122	Yes	Europe	18,567	12,927	catholic	no		15,2
Iceland	143	155	Yes	Europe	38,023	37,977	protestant	yes	Nordic	21,9
Ireland	30	29	Yes	Europe	39,468	51,356	catholic	yes		19,8
Italy	172	144	Yes	Europe	29,109	35,435	catholic	yes	Olive	20,5
Japan	44	22	Yes	Asia	32,608	39,731	other	no		22,5
Korea, republic	47	111	Yes	Asia	27,978	17,074	other	no		27,1
Luxembourg	105	107	Yes	Europe	78,395	104,512	catholic	yes		19,3
Mexico	176	194	Yes	North America	13,628	8,135	catholic	no		22,9
Netherlands	21	21	Yes	Europe	39,938	48,223	protestant	yes		20,3
New Zealand	0	0	Yes	Australia	26,708	27,259	protestant	yes		23,6
Norway	109	114	Yes	Europe	52,561	79,085	protestant	yes	Nordic	20,3
Poland	169	189	Yes	Europe	18,072	11,288	catholic	no		22,7
Portugal	82	75	Yes	Europe	21,859	21,408	catholic	yes	Olive	21,9
Slovakia	75	79	Yes	Europe	21,245	16,282	catholic	no		25,9
Spain	110	97	Yes	Europe	29,689	31,946	catholic	yes	Olive	30,1
Sweden	102	109	Yes	Europe	35,965	43,986	protestant	yes	Nordic	19,6

Switzerland	93	89	Yes	Europe	43,007	67,560	catholic	yes		21,5
Turkey	145	111	Yes	Europe	12,476	8,723	muslim	no	Olive	21,0
UK	21	21	Yes	Europe	34,619	35,334	protestant	yes		16,7
US	20	20	Yes	North America	46,381	46,381	protestant	yes		14,6
Brazil	126	137	No	South America	10,514	8,220	catholic	no		18,6
Colombia	220	225	No	South America	8,936	5,087	catholic	no		23,1
Chile	168	177	No	South America	14,341	9,525	catholic	no		23,7
Estonia	92	83	No	Europe	17,908	14,267	protestant	no		29,4
Israel	62	72	No	Asia	28,393	26,797	other	yes	Olive	18,0
Russia	178	173	No	Europe	14,920	8,694	orthodox	no		24,7
South Africa	133	140	No	Africa	10,244	5,824	protestant	no		20,1

5. Interpretation

In this chapter, the interpretations of the results will be given. It will use the same outline as the chapter showing the results and thus start with a section on geographical patterns, then continue with demographical patterns, then the results of economical and financial factors will be shown and finally the interpretation of the results on the index based on the situation in the Netherlands will be given.

5.1. Geography

Geographical related variables might be of importance to regulation strictness, since it is logical that countries that are in the same area might share some characteristics like regulation strictness or share characteristics that influence regulations since they are literally geographical proximate.

Geographically seen, the strictest countries are in South America and Africa. The less strict countries have been found in North America, Europe, Asia and Australia. The Anova-test produced a significance of 0.013 meaning that there are indeed continental mean differences between continents. But also within continents there are still some large differences. In Europe for example, the strictness index lies between 21 and 178, so almost 80% below average and 80% above average. Nevertheless there seems to be continental patterns that show that some continents tend to be less strict on average than others.

Africa has only one observation, while there are 53 countries in the continent Africa and thus this is not a very representative figure, also considering that South Africa is probably the richest country in South Africa.

One possible explanation of the continental differences in average pension fund investment regulation strictness is that when countries are geographically close, spillovers between geographical proximate countries in government and regulation structure are present. Geography might play a role in the design and governance of pension systems and thus also in the strictness in regulations of pension funds. More research would however be necessary to determine whether spillovers due to geographical proximity are the reason that there are geographical patterns. Also the economic situation in continents differ much which could also be an explanation for the differences in strictness.

The other test on geography that is conducted is to see if the Nordic countries differ much from the Olive countries in strictness. The finding of this comparison is that the means are

actually very close. The mean of the Nordic country is approximately 116, while the mean of the Olive countries is 108. The difference between these means is not significant meaning that from the result of this sample we cannot draw conclusions about the whole population. Nevertheless, it must be kept in mind that this sample represents actually almost the entire population of Olive and Nordic countries and thus this difference is meaningful.
The results show that there is no significant difference in pension fund investment regulation strictness between the Nordic and so-called Olive countries on average.

The results on geography teach us that there are some geographical patterns in the investment regulation strictness for pension funds. Inter-continent differences are quite large in some cases. One of the explanations of geographical patterns might be that countries that are proximate have spillovers in their pension fund design and regulations. One contra argument to this might be that countries that are geographically proximate to each other, also share demographical and economical characteristics and this than could be the real influence on pension fund regulation strictness. Nevertheless, geography might also be the determinant of demographical and economical characteristics. For future research aimed at finding a causal relationship, this risk of multicollinearity has to be taken into account. However, a relationship is found which is one of the goals of this research was and determining a causal relationship as said before is beyond the scope of this research.
In the next paragraph the results on demographical patterns are interpreted.

5.2. Demography

The first demographical characteristic that has been looked at is language origin. Since the test on continent means showed some differences but a large part of the sample was from the same continent, namely Europe, it is interesting to see if language origin also reveals any patterns with regulation strictness, since this splits the sample into more equal sized sub-samples. Also language origin might contain information on culture that influences pension fund investment regulations. From the tests it is clear that countries with a Slavic or Latin language origin tend to be much stricter on average than countries with a Germanic or other language origin that is non-European. Countries with a Latin language origin mostly come from the south of Europe and South America and the Latin Slavic language origin covers eastern-European countries and Russia. One of the possible interpretations of this might be

that on average these are countries that have much stricter regulation for all kinds of areas and are countries which tend to have a less free market economy.
This intuition is confirmed if we test the means difference between the Germanic and the Germanic/Latin countries and compare them with the rest of the language origins and the significance of this difference in strictness even increases. Most Germanic and Germanic/Latin countries are in North-West Europe, North America or Australia. These three areas consist of countries that have free market economies. Another explanation might be that these countries have a higher GDP on average, and this also might have its relation with regulation strictness and the other way around. And indeed looking at the result of a comparison of GDP per capita and language origin in appendix M, the results show us that the Germanic and Germanic/Latin countries have a GDP average of 38,942 USD and for the countries with another language origin the GDP is 21,697 USD on average. This difference is also significant. The GDP per capita and strictness is regulation have been also compared and results of this will be interpreted in the paragraph on economical and financial patterns.

Another factor that was researched is whether there is a relationship between the main religion in countries and pension fund investment strictness. It turned out that 'Protestant Christian countries' were less strict, than 'Orthodox, Catholic and Muslim countries'. The category 'other religions' in this sample consists of Japan, South Korea and Israel and were the least strict on average of all countries. The Anova-test showed that the means in strictness were not significantly different from each other for the continents and also the catholic and protestant countries are not significantly different in their strictness. Nevertheless this result is meaningful since the sample of catholic and protestant countries represents a large part of the total population of all catholic and protestant countries. We can thus conclude that protestant countries are on average less strict than catholic countries.

These results reveal that these two culture- related variables, main religion per country and language origin, are related to pension fund investment regulation strictness, which could imply that culture influences pension fund investment regulation.
In the next paragraph the interpretation of the results on economical and financial patterns are given.

5.3 Economy and Finance

The first two factors in this category that were being researched were OECD membership and western countries (or not). Both the differences in means were significant, the latter being more significantly different than the former. OECD membership could intuitively reveal information about the member's attitude towards regulation and other sociological backgrounds while the latter could reveal something about being a rich country or not. Having said this, OECD-member countries have on average also a higher GDP per capita than non-OECD member countries. So interpreting these results we can say that there is definitely a pattern between as well OECD membership and strictness, as western or non-western and strictness, but the question is whether these characteristics tell us something about the reason of the relationship.

Savings as a percentage of gross national income and investments as a percentage of gross domestic product both show a very low relationship with the strictness index. Nevertheless, the results are relevant because the variables that were researched are both directly related to the risk-attitude of a nation. The intuition behind this is that the regulation strictness has a positive relationship with risk-seeking behaviour (investment) and a negative relationship with risk-avoiding behaviour (saving) to the risk-attitude of a country. So if savings compared to GDP would be high in a country, the country is risk-averse and strictness through investment regulation would be probably low. On the other hand, if total investment would be high compared to GDP, the country could be seen as risk-seeking and there would be strict regulation concerning pension fund investments.

These regression results thus show that there is almost no relation and from this we can conclude that regulation strictness on investments of pension funds is not related to the countries' saving or investment behaviour and thus we could interpret this as that strictness in pension fund investment regulation is also unrelated to the risk attitude of a country.

The last two variables that were being researched were GDP per capita, both nominal and covered for purchasing power. These variables have been discussed earlier in this chapter and both variables turned out to be highly correlated to the pension fund investment regulation index. They had a correlation of respectively -.384 and -.485 and so they are both significant at the 5% level. This tells us that GDP per capita is related to strictness in investment regulation. GDP per capita, covered for purchasing power has a higher correlation than GDP per capita nominal with the index, which could imply that average individual wealth is a key

determinant for regulation strictness. Also the other way around it could be argued that regulation strictness has its influence on individual wealth.

5.4. Alternative index

Almost all the relationships stayed more or less the same when comparing the data with the Dutch index. This confirms that these country characteristics are related to investment regulation strictness for pension fund, rather than being related to the specific definition of investment strictness for the index using simple weights only. Also when the weights are changed, based on a real-life example (in this case the Netherlands) the patterns still exist.

The only relationship that showed a large change was total investments as a percentage of GDP and the index, of which the regression coefficient moved to almost 1.5. This means that investment show a relative large relationship with strictness, what could imply that regulation strictness is related to the risk-seeking behaviour of a country. If investments are high, the risk seeking behaviour can assumed to be high and also the strictness in pension fund regulation is high, which could be seen as a way in which government try to limit the risk-seeking behaviour by setting investment limit for pension funds. Nevertheless this relationship is very highly insignificant, meaning that there is too much deviation around this linear relationship for being able to accept this relationship as a true one.

So it is certain that investments and savings as a percentage of income, which can be related to the risk-attitude, are not related to the strictness in pension fund investment regulations.

The other relationships found in the previous paragraphs more or less remained unchanged and via this the relationships with regulation strictness is confirmed, also when the definition of pension fund investment regulation strictness is changed by changing the weights of the individual variables, together forming the index.

The most important relationships found with this research show us that pension fund investment regulation strictness is related to geographical, demographical and economical/financial characteristics of a country.

Possible explanations for this might be that geographical proximity, culture, and individual wealth play a role in the strictness in pension fund investment regulations. The explanations above will never fully grasp the variation in strictness between countries that are geographical proximate, share a relatively large part of the culture and have just as much GDP per capita. Thus the question that remains is what causes the differences in the unexplained variation in the first place.

6. Conclusion

6.1. Conclusions

With this research it has been attempted to find differences in strictness in pension fund investment regulations between countries. From the international differences in regulation strictness found, a search for patterns is conducted by relating the differences in strictness with similarities in other country characteristics.
It is important so state again that the goal of this research was not to determine any causal relationships, although this research might provide a base for finding causal relationships which could be of interest for future research.

This research has proven that there are definitely relationships between pension fund investment regulation strictness and country characteristics. Continental differences in average strictness were rather large. Demographical characteristics related to culture, like religion and language origin are also related to pension fund investment regulation strictness. The wealth of a country or the individual wealth of the citizens is also a related characteristic to the strictness in pension fund investment regulation, since OECD members and western countries were less strict than non-OECD members and non-western countries. Also the with GDP per capita nominal and GDP per capita PPP proved this intuition.
Investments and savings as a percentage of total income seemed to be unrelated to strictness in regulation on pension fund investment, meaning that the risk attitude of a country is probably unrelated to the strictness in pension fund investment regulation.
All the findings above were also confirmed when comparing that data with an index based on the portfolio totals in the Netherlands.
Concluding, there are certainly cross-country differences in regulation strictness on pension fund investments and these differences do form patterns as they are related to several geographical, demographical and financial/economical characteristics.

H0, stating that there are no patterns is thus rejected.

6.2. Implications/recommendations

The conclusions drawn from this research could be of help for determining the causes of regulation strictness and the design of pension funds.

However, when analyzing these results to determine causal relationships, it should be kept in mind that the factors used to find patterns are also related to each other. The tests in this research conducted were primarily used to search for patterns in regulation strictness and not to find causal relationships. For this research, multicollinearity was thus not very important. When determining the cause or the reasons of patterns, this becomes important since multicollinearity is a sign of a possible untrue relationship, which seems to be true.

The patterns found in this research suggest that strictness in pension fund investment regulation is affected by geographical proximity, culture and individual wealth of the citizens of countries

Thus the main implications of this research are that these patterns could be one major step in finding the determinants of regulation strictness on investments by pension funds and when trying to find causal relationships, the backgrounds and correlations with the other factors should be kept in mind.

7. Appendixes

7.1. Table of contents

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Appendix A: Complete data used

Countries	INDEX	Dutch Index	OECD membership	continent	GDP nom	GDP PPP	Main Religion	Western	Nordic/Olive	Investment of GDP
Australia	21	21	Yes	Australia	38,911	45,587	catholic	yes		27,6
Austria	78	107	Yes	Europe	38,839	45,989	catholic	yes		20,7
Belgium	21	21	Yes	Europe	35,422	43,533	catholic	yes		21,3
Canada	67	57	Yes	North America	38,025	39,669	catholic	yes		22,6
Czech	128	125	Yes	Europe	24,093	18,557	catholic	yes		27,8
Denmark	85	86	Yes	Europe	35,757	56,115	protestant	yes	Nordic	22,4
Finland	143	159	Yes	Europe	33,556	44,492	protestant	yes	Nordic	20,5
Germany	128	126	Yes	Europe	34,212	40,875	protestant	yes		18,9
Greece	79	85	Yes	Europe	29,889	29,635	orthodox	yes	Olive	24,9
Hungary	133	122	Yes	Europe	18,567	12,927	catholic	no		15,2
Iceland	143	155	Yes	Europe	38,023	37,977	protestant	yes	Nordic	21,9
Ireland	30	29	Yes	Europe	39,468	51,356	catholic	yes		19,8
Italy	172	144	Yes	Europe	29,109	35,435	catholic	yes	Olive	20,5
Japan	44	22	Yes	Asia	32,608	39,731	other	no		22,5
Korea, republic	47	111	Yes	Asia	27,978	17,074	other	no		27,1
Luxembourg	105	107	Yes	Europe	78,395	104,512	catholic	yes		19,3
Mexico	176	194	Yes	North America	13,628	8,135	catholic	no		22,9
Netherlands	21	21	Yes	Europe	39,938	48,223	protestant	yes		20,3
New Zealand	0	0	Yes	Australia	26,708	27,259	protestant	yes		23,6
Norway	109	114	Yes	Europe	52,561	79,085	protestant	yes	Nordic	20,3
Poland	169	189	Yes	Europe	18,072	11,288	catholic	no		22,7
Portugal	82	75	Yes	Europe	21,859	21,408	catholic	yes	Olive	21,9
Slovakia	75	79	Yes	Europe	21,245	16,282	catholic	no		25,9
Spain	110	97	Yes	Europe	29,689	31,946	catholic	yes	Olive	30,1
Sweden	102	109	Yes	Europe	35,965	43,986	protestant	yes	Nordic	19,6

Switzerland	93	89	Yes	Europe	43,007	67,560	catholic	yes		21,5
Turkey	145	111	Yes	Europe	12,476	8,723	muslim	no	Olive	21,0
UK	21	21	Yes	Europe	34,619	35,334	protestant	yes		16,7
US	20	20	Yes	North America	46,381	46,381	protestant	yes		14,6
Brazil	126	137	No	South America	10,514	8,220	catholic	no		18,6
Colombia	220	225	No	South America	8,936	5,087	catholic	no		23,1
Chile	168	177	No	South America	14,341	9,525	catholic	no		23,7
Estonia	92	83	No	Europe	17,908	14,267	protestant	no		29,4
Israel	62	72	No	Asia	28,393	26,797	other	yes	Olive	18,0
Russia	178	173	No	Europe	14,920	8,694	orthodox	no		24,7
South Africa	133	140	No	Africa	10,244	5,824	protestant	no		20,1

Appendix B: Composition of the database

	Equity(=1)	Real estate(=2)	bonds(=3)	Retail investment funds(=4)	Private investment funds(=5)	Loans(=6)	Bank deposits(=7)	Foreign Assets(=8)	Self investment(=9)	Investment in single issue(r)(=10	Ownership concentration limits(=11)	Currency matching requirement(=12)	Total
country													
OECD													
Australia	0	0	0	0	0	0	0	0	9.5	0	0	0	**9.50**
Austria	4	0	6	0	0	0	0	7	9.5	8.666666667	0	0	**35.17**
Belgium	0	0	0	0	0	0	0	0	9.5	0	0	0	**9.50**
Canada	0	8	0	0	0	0	0	0	9	6.166666667	7	0	**30.17**
Czech	6.25	9	4.166667	6.25	6.25	10	0	1.130952381	0	5.4	4	5	**57.45**
Denmark	3	0	1.5	4.25	9	4.9	0	0	0	7.457142857	0	8	**38.11**
Finland-vol	7	6	4.5	4.666666667	4.75	4	0	4.5	7.5	7.5	9.5	8	**67.92**
Finland-statutory	4.25	0	4.25	4.25	4.25	3.166666667	0	4	9.5	9.25	9.5	8	**60.42**
Germany-klassen	7.75	7.5	5	5.041666667	15.60606061	5	5	0	9.5	6.375	9	7	**82.77**
Germany-fonds	0	0	0	0	0	0	0	0	9.5	6.166666667	9	7	**31.67**
Greece	3	0	1.5	3	3.333333333	10	0	5	9.5	0	0	0	**35.33**
Hungary	4.5	9	0	0	9.733333333	10	0	1.571428571	10	5.833333333	9	0	**59.64**
Iceland	6	10	6.4	4	7	10	0	7.857142857	0	5	8	0	**64.26**
Ireland	0	0	0	0	0	0	0	0	0	4.5	9	0	**13.50**
Italy	0	10	0	8	8	10	8	2.713285714	9.5	8.5	9.25	3.3333	**77.30**
Japan	0	10	0	0	0	10	0	0	0	0	0	0	**20.00**
Korea(pers)	4.5	8.5	0	0	0	0	0	2.285714286	9.7	4.5	0	0	**29.49**
Korea(corp)	8.5	10	5	5.5	5	10	0	3.5	9.5	8	0	0	**65.00**
Luxembourg(SEPcav and Assep)	0	0	0	0	0	0	0	0	9.5	0	0	0	**9.50**
Luxembourg(CAA)	9.25	9	7.48	8.5	8.5	10	8	4.75	9.5	9.4125	0	0	**84.39**
Mexico	8.5	10	7.5	0	9.1	10	0	8	9.5	9.7	6.5	0	**78.80**
Netherlands	0	0	0	0	0	0	0	0	9.5	0	0	0	**9.50**
New Zealand	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**
Norway	6.5	0	3.5	7	0	9.5	0	0	8	6.166666667	0	8	**49.07**
Poland(OPF)	7.625	10	5.3	8.75	10	0	8	9.5	10	7.4	8.5	0	**85.08**
Poland (EPF)	9.5	10	0	0	10	0	0	7	9	7.4	6.5	7	**66.40**
Portugal occupational	0	0	0	0	0	0	0	1.214285714	9.5	9	0	3	**22.71**
Portugal PPR	4.5	8	0	0	0	8	8	1.285714286	9.5	9	0	3	**51.29**
Slovak Republic	3.5	2.5	0	0	N/A	10	0	5	6.666666667	6.2	0	0	**33.87**
Spain	0	7	3.5	3.5	3.5	7	0	0	9.5	6.083333333	9.5	0	**49.58**
Sweden(OP= oc. Pensions)	4.5	0	9	0	0	9	0	0	9.5	5.6	0	8	**45.60**
Switzerland	5	7	0	N/A	N/A	7.5	0	1.285714286	9.5	4.375	0	7	**41.66**
Turkey	0	10	0	9	N/A	9	9	0	9.5	9.15	9.5	0	**65.15**
United Kingdom	0	0	0	0	0	0	0	0	9.5	0	0	0	**9.50**
United States	0	0	0	0	0	0	0	0	9	0	0	0	**9.00**
Non-OECD													
Brazil	5.75	8.9	1	0	0	8.75	2	9.714285714	9	3.5	8	0	**56.61**
Columbia	7.25	10	5	9.5	9.5	10	6.166666667	8.142857143	9	8	9	7	**98.56**
Chile	5.75	10	6.5225	7.9	10	4	0	4	10	9.5	7.7	0	**75.37**
Estonia mand	2.5	6	4.5	0	0	9	0	0	5	8.7875	8.625	0	**44.41**
Estonia vol	0	3	4.5	0	0	9	0	0	5	8.1875	8.625	0	**38.31**
Israel	0	0	0	0	0	0	0	5	9.25	4.625	9	0	**27.88**
Russian Federation	3.5	10	5	10	10	10	8	8	8	7.142857143	0	0	**79.64**
South Africa	2.5	7.5	0	10	10	4.75	0	8	9.5	7.535714286	0	0	**59.79**
	144.875	**216.9**	**101.11917**	**119.1083333**	**153.5227273**	**222.9666667**	**62.16666667**	**120.451381**	**333.6166667**	**240.0815476**	**174.7**	**89.3333**	<Total

Appendix C: Continent, Anova Results

Descriptives

Index

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Europe	24	101,75	46,802	9,553	81,99	121,51	21	178
Asia	3	51,00	9,644	5,568	27,04	74,96	44	62
South America	3	171,33	47,089	27,187	54,36	288,31	126	220
North America	3	87,67	80,027	46,204	-111,13	286,46	20	176
Africa	1	133,00	.	.	.	.	133	133
Australia	2	10,50	14,849	10,500	-122,92	143,92	0	21
Total	36	97,94	55,546	9,258	79,15	116,74	0	220

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39955,556	5	7991,111	3,524	,013
Within Groups	68030,333	30	2267,678		
Total	107985,889	35			

Appendix D: Nordic vs Olive Countries, Mean strictness comparison

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
index	Equal variances assumed	1,549	,245	,368	9	,721	8,067	21,893	-41,458	57,592
	Equal variances not assumed			,386	8,343	,709	8,067	20,893	-39,771	55,904

Appendix E Language Origin

Descriptives

index

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Germanic	14	73,86	53,219	14,223	43,13	104,59	0	143
Germanic+Lat	3	73,00	45,431	26,230	-39,86	185,86	21	105
Latin	10	133,30	50,127	15,851	97,44	169,16	67	220
Slavic	3	140,67	57,047	32,936	-1,05	282,38	75	178
Other	6	86,33	42,758	17,456	41,46	131,21	44	145
Total	36	97,94	55,546	9,258	79,15	116,74	0	220

Appendix F: Germanic and Germanic/Latin in comparison to the rest, Mean strictness

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
index	Equal variances assumed	,013	,911	2,688	34	,011	45,926	17,087	11,201	80,650
	Equal variances not assumed			2,691	33,709	,011	45,926	17,065	11,234	80,618

Appendix G: Religion, Mean strictness comparison

Descriptives

index

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Catholic	18	109,67	57,235	13,490	81,20	138,13	21	220
Protestant	12	83,08	53,422	15,422	49,14	117,03	0	143
Muslim	1	145,00	.	.	.	.	145	145
Other	3	51,00	9,644	5,568	27,04	74,96	44	62
Orthodox	2	128,50	70,004	49,500	-500,46	757,46	79	178
Total	36	97,94	55,546	9,258	79,15	116,74	0	220

Appendix H: Prostestant & Catholic, Mean strictness comparison

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
index	Equal variances assumed	,009	,924	1,279	28	,211	26,583	20,784	-15,990	69,157
	Equal variances not assumed			1,297	24,858	,206	26,583	20,489	-15,628	68,794

Appendix I: OECD membership, Mean strictness comparison

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
index	Equal variances assumed	,014	,908	-2,366	34	,024	-52,030	21,991	-96,721	-7,338
	Equal variances not assumed			-2,318	8,923	,046	-52,030	22,448	-102,877	-1,182

Appendix J: Mean difference between Western and Non-Western Countries

Group Statistics

	Western 1_nonwester2	N	Mean	Std. Deviation	Std. Error Mean
Index	1,00	23	79,13	48,130	10,036
	2,00	13	131,23	53,602	14,867

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
index	Equal variances assumed	,075	,785	-2,995	34	,005	-52,100	17,394	-87,450	-16,751
	Equal variances not assumed			-2,905	22,842	,008	-52,100	17,937	-89,220	-14,981

Appendix K: Regression results Savings as a % of GNI

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6,764	1	6,764	,002	,963[a]
	Residual	107979,125	34	3175,857		
	Total	107985,889	35			

a. Predictors: (Constant), Savings_ofGDP

b. Dependent Variable: index

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	99,450	33,950		2,929	,006
	Savings_ofGDP	-,067	1,445	-,008	-,046	,963

a. Dependent Variable: index

Appendix L: Regression results: total investments as a % of GDP.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	543,855	1	543,855	,172	,681[a]
	Residual	107442,033	34	3160,060		
	Total	107985,889	35			

a. Predictors: (Constant), Investment_ofGDP

b. Dependent Variable: index

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	73,835	58,866		1,254	,218
	Investment_ofGDP	1,096	2,643	,071	,415	,681

a. Dependent Variable: index

Appendix M: Language origin and average GDP per Capita

Group Statistics

	Language_origin	N	Mean	Std. Deviation	Std. Error Mean
GDP_percapita_ppp	>= 3	19	21,69737	8,290562	1,901985
	< 3	17	38,94153	13,441348	3,260006

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
GDP_percapita_ppp	Equal variances assumed	,088	,769	-4,688	34	,000	-17,244161	3,678545	-24,719865	-9,768457
	Equal variances not assumed			-4,569	26,062	,000	-17,244161	3,774280	-25,001403	-9,486919

Appendix N: Dutch Index, Geography

Descriptives

DUTCH_INDEX

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Europe	24	101,13	46,444	9,480	81,51	120,74	21	189
Asia	3	68,33	44,613	25,757	-42,49	179,16	22	111
Sout Amer	3	179,67	44,061	25,438	70,21	289,12	137	225
North Amer	3	90,33	91,664	52,922	-137,37	318,04	20	194
Africa	1	140,00	.	.	.	.	140	140
Australia	2	10,50	14,849	10,500	-122,92	143,92	0	21
Total	36	100,08	57,192	9,532	80,73	119,43	0	225

ANOVA

DUTCH_INDEX

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39979,625	5	7995,925	3,220	,019
Within Groups	74501,125	30	2483,371		
Total	114480,750	35			

Group Statistics

	Nordic_ Olive	N	Mean	Std. Deviation	Std. Error Mean
DUTCH_INDEX	1	5	124,60	31,437	14,059
	2	6	97,33	27,046	11,041

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DUTCH_INDEX	Equal variances assumed	,454	,517	1,548	9	,156	27,267	17,608	-12,566	67,100
	Equal variances not assumed			1,525	8,016	,166	27,267	17,877	-13,942	68,476

Appendix O: Dutch Index, Demography

Descriptives

DUTCH_INDEX

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Germanic	14	79,14	57,765	15,438	45,79	112,50	0	159
Germanic+L	3	72,33	45,358	26,187	-40,34	185,01	21	107
Latin	10	131,30	54,864	17,349	92,05	170,55	57	225
Slavic	3	147,00	59,431	34,312	-,63	294,63	79	189
Other	6	87,33	37,580	15,342	47,90	126,77	22	125
Total	36	100,08	57,192	9,532	80,73	119,43	0	225

ANOVA

DUTCH_INDEX

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25772,936	4	6443,234	2,252	,086
Within Groups	88707,814	31	2861,542		
Total	114480,750	35			

Main Religion

Descriptives

DUTCH_INDEX

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Catholic	18	110,83	60,038	14,151	80,98	140,69	21	225
Protestant	12	86,17	57,311	16,544	49,75	122,58	0	159
Muslim	1	111,00	.	.	.	.	111	111
Other	3	68,33	44,613	25,757	-42,49	179,16	22	111
Orthodox	2	129,00	62,225	44,000	-430,07	688,07	85	173
Total	36	100,08	57,192	9,532	80,73	119,43	0	225

ANOVA

DUTCH_INDEX

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9219,917	4	2304,979	,679	,612
Within Groups	105260,833	31	3395,511		
Total	114480,750	35			

Protestant And Catholic

Group Statistics

	Main_Religion	N	Mean	Std. Deviation	Std. Error Mean
DUTCH_INDEX	1	18	110,83	60,038	14,151
	2	12	86,17	57,311	16,544

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	,001	,981	1,122	28	,271	24,667	21,981	-20,360	69,693
Equal variances not assumed			1,133	24,499	,268	24,667	21,771	-20,218	69,551

Appendix P: Alternative Index, Economy+Finance

Gdp per Capita

Correlations

		DUTCH_INDEX	GDP_percapita_ppp	GDP_percapita_nominal
DUTCH_INDEX	Pearson Correlation	1	-,439**	-,390*
	Sig. (2-tailed)		,007	,019
	N	36	36	36
GDP_percapita_ppp	Pearson Correlation	-,439**	1	,965**
	Sig. (2-tailed)	,007		,000
	N	36	36	36
GDP_percapita_nominal	Pearson Correlation	-,390*	,965**	1
	Sig. (2-tailed)	,019	,000	
	N	36	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Investments of GDP

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,092[a]	,009	-,021	57,778

a. Predictors: (Constant), Investment_ofGDP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	978,232	1	978,232	,293	,592[a]
	Residual	113502,518	34	3338,309		
	Total	114480,750	35			

a. Predictors: (Constant), Investment_ofGDP

b. Dependent Variable: DUTCH_INDEX

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	67,749	60,503		1,120	,271
	Investment_ofGDP	1,470	2,716	,092	,541	,592

a. Dependent Variable: DUTCH_INDEX

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,032[a]	,001	-,028	57,997

a. Predictors: (Constant), Savings_ofGNI

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	118,480	1	118,480	,035	,852[a]
	Residual	114362,270	34	3363,596		
	Total	114480,750	35			

a. Predictors: (Constant), Savings_ofGNI

b. Dependent Variable: DUTCH_INDEX

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	93,782	34,939		2,684	,011
	Savings_ofGDP	,279	1,487	,032	,188	,852

a. Dependent Variable: DUTCH_INDEX

OECD Membership

Group Statistics

	OECD1_NON2	N	Mean	Std. Deviation	Std. Error Mean
DUTCH_INDEX	1	29	89,52	53,575	9,949
	2	7	143,86	53,946	20,390

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DUTCH_INDEX	Equal variances assumed	,031	,861	-2,406	34	,022	-54,340	22,589	-100,247	-8,433
	Equal variances not assumed			-2,395	9,087	,040	-54,340	22,687	-105,588	-3,092

Western Countries

Group Statistics

	Western 1_nonwester2	N	Mean	Std. Deviation	Std. Error Mean
DUTCH_INDEX	1	23	80,00	48,210	10,052
	2	13	135,62	56,020	15,537

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DUTCH_INDEX	Equal variances assumed	,146	,705	-3,136	34	,004	-55,615	17,732	-91,651	-19,579
	Equal variances not assumed			-3,005	22,042	,007	-55,615	18,506	-93,989	-17,241

8. References

Barr N, Diamond P, 2006, *The economics of pensions*, Oxford review of economic policy vol. 22, no 1

Barr Nicholas, 2006, *Pensions: overview of the issues,* Oxford review of economic policy, vol. 22. pp 1-14

Cia World Factbook, *Religion*, https://www.cia.gov/library/publications/the-world-factbook/fields/2122.html (Accessed July 2010)

DNB, *Pension fund portfolio*, http://www.statistics.dnb.nl/index.cgi?lang=nl&todo=Pen1 (accessed July 2010)

Hu, Yu-Wei, 2006, *Pension Fund Investment and Regulation- A Macro Study*. Brunel University, London

IMF, *Investments of GDP*, http://www.imf.org/external/ns/cs.aspx?id=28 (accessed July 2010)

Moore, David. George McCabe. William Duckworth. Stanley Sclove. 2003. *The practise of Business Statistics*. New York. W.H. Freeman and Company.

Nation Master, *Savings of GNI*, http://www.nationmaster.com/graph/eco_adj_sav_net_nat_sav_of_gni-adjusted-savings-net-national-gni (accessed july 2010)

OECD, 2009, *Pensions at a glance 2009,* OECD publishing, Paris

OECD, 2010, *Survey of investment regulation of pension funds,* Paris

Palacios R, Montserrat Pallarès-Miralles, 2000, *International Patterns of Pension Provision,* Social Protection Discussion Paper Series, The World Bank.

RNW, 2010, Dutch pension funds still not out of danger, *RNW* , April 1, http://www.rnw.nl/english/article/dutch-pension-funds-still-not-out-danger (accessed July 2010)

Srinivas, P.S. Edward Whitehouse, Juan Yermo, 2000, *Regulating private pension funds' structure, performance and investments: Cross-country evidence.* Published in: Social Protection Discussion Paper Series, The World Bank.

Wikimedia, *Western countries,* http://upload.wikimedia.org/wikipedia/commons/f/f9/Westerncultures_map2.png (Accessed July 2010)