Home Bias in Greater Resolution – A Sectoral Analysis of Home Bias in the Euro Area

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Contents

1. ABSTRACT

This paper exploits the capabilities of the Securities Holding Database compiled by the European Central Bank to examine home bias, the propensity for investors to overinvest in their domestic market despite apparent diversification benefits. The study is conducted using quarterly data over the period 2014-2019 for euro area countries, and calculates home bias metrics in accordance with the prevailing quantitative methods, primarily by applying a weighting consistent with the International Capital Asset Pricing Model. It uses descriptive and inferential statistics to examine heterogeneity among home bias metrics at the national and sectoral levels.

It further identifies considerably variance among national and sectoral home bias metrics, and specific home bias tendencies for the two largest sectors – investment funds and non-financial companies – which respectively tend to have lower and higher home bias scores relative to their national metrics. The research concludes that

extant research conducted at the national level may mask underlying dynamics and complexities, and that there would be a benefit in conducting future research at a finer degree of resolution.

1.1 Declaration

The author declares that the work being submitted for examination is wholly their own work and that all materials consulted and ideas garnered in the process of researching the dissertation have been properly and accurately acknowledged.

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2. INTRODUCTION

Modern Economic and Finance theory proposes a world where "capital is fully mobile across borders", and where rational, informed participants efficiently price information into markets and minimise risk in their portfolio whilst maximising returns (***Coeurdacier & Rey***, 2012).

Despite such assertions, home bias i.e. the propensity for investors to disproportionally invest in their home markets despite apparent diversification benefits, remains steadfastly observable in equity and other markets. While international portfolio allocation has been considered by economists since the 19th century, French and Poterba's pivotal paper brought home bias to the fore by noting that, despite the benefits of international diversification "most investors hold nearly all of their wealth in domestic assets" (***French & Poterba***, 1991, p. 340). The scale of the phenomenon measured by French and Poterba, with 94% of US equity investment in the domestic market, led to home equity bias subsequently being declared one of the six major puzzles in international macroeconomics (***Obstfeld & Rogoff***, 2000), and to abundant academic analysis seeking to understand and explain it. Despite significant advancements in ease of international capital flow and a reduction in information asymmetries, home bias has proven extremely resilient and difficult to comprehensively explain (***Ardalan***, 2018). To demonstrate the scale of this issue, the home bias pattern "applies for almost every country in this planet" (***Xiang & Su***, 2016, p. 3).

Most attempts to measure and explain home bias do so at the national level or on a bilateral basis, i.e. to what extent does a given country exhibit overinvestment in its domestic market or a given foreign market: (***Ahearne, et al.***, 2004); (***Baele***, et al., 2007); (***Bohn & Tesar***, 1996); (***Coeurdacier & Rey***, 2012); (***Mishra***, 2015); (***Xiang & Su***, 2016). While the composition of the international balance sheet of a country is central in understanding its sensitivity to external shocks, the degree of international risk sharing, and the potential for reduced risk in international portfolio investment, may also be limiting in understanding the complexity of the home bias conundrum (***Galstyan & Velic***, 2018) (***Galstyan, et al.***, 2016). Investors have different goals, varied

access to information and resources, and different levels of expertise and sophistication. It is therefore reasonable to assume that they may be more or less prone to bias in their investment selection and that such complexities may be masked by viewing portfolio allocation at the national level. This creates a gap in academic examination of home bias whereby a wide-ranging analysis of the component sectors of national investment flows has yet to be conducted.

Advances in the availability of information now permit an analysis at the level of economic sector of investors and it may be advantageous to examine home bias by gauging underlying domestic investment patterns at a finer degree of resolution. This can be accomplished by examining the extent to which different investor types exhibit home bias, and to what extent they are homogenous or heterogeneous to the national measurement (***Jochem & Volz***, 2011); (***Galstyan, et al.***, 2016); (***Galstyan & Velic***, 2018). Indeed, Dr. Phillip Lane, Chief Economist of the ECB stated "that patterns evident in the aggregate data do not uniformly apply across the various holding and issuing sectors, such that a full understanding of cross-border portfolio positions requires granular-level analysis" (***Galstyan, et al.***, 2016, p. 100).

In the past, research has been restricted by available data. The current study harnesses a powerful dataset, the Securities Holding Statistics Database ("SHSDB"), which facilitates such analysis.

This research will ask the question:

"To what extent do economic sectors in a euro area country exhibit homogenous or heterogeneous home bias relative to national home bias?"

The purpose of the study is to determine if there are significant variances in sectoral displays of home bias, and if so, to what extent variances deviate from national aggregates. This may therefore indicate whether the study of home bias at the national level is truly meaningful or would benefit from reframing so that home bias can be analysed for smaller groupings. The study will be conducted using quantitative methods over a six-year review of panel data for eighteen euro area countries. It will

make appropriate use of both descriptive and inferential statistics to support or reject the research question.

The study will add to the academic understanding and exploration of this important phenomenon in a number of ways.

First, it will perform a detailed sectoral measurement of home bias for multiple countries at the national **and** sectoral levels, thereby allowing comparison between economic sectors in multiple countries.

Second, it will be the earliest use of the Securities Holding Statistics database ("SHSDB") to examine this phenomenon for multiple countries[1]. The SHSDB provides some significant advantages to other databases used in the examination of this topic, chiefly, security-by-security data is collected at the sectoral level using consistent statistical frameworks, and furthermore, third party holdings are separately identifiable.

Third, since most investigations rely on the Co-ordinated Portfolio investment Survey ("CPIS")[2], home bias examinations are primarily framed as equity holdings of both equity in companies and equity in investment funds. This appears less meaningful than an examination based solely upon the holdings of equity in companies, since investment funds themselves hold equity in companies, and since, in the study area, investment funds are able to avail of passport to market in other areas and are frequently managed by investment managers that are not resident in the country of incorporation. Furthermore, investment funds are frequently organised to pursue a certain asset type or geographical distribution, e.g., emerging market debt, 'tech' sector, etc.

It is anticipated that this research will demonstrate that research may be enhanced by considering the implications of observable variations in home bias metrics at the investor sector, rather than being based simply upon national investment position.

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[1] Jochem and Volz, 2011 perform a sectoral analysis for Germany.

[2] CPIS is a voluntary data collection exercise conducted under the auspices of the IMF that collects an economy's data on its holdings of portfolio investment securities (data are separately requested for equity and investment fund shares, long-term debt instruments, and short-term debt instruments.

3. LITERATURE REVIEW

3.1 Background

The home bias puzzle is underpinned by the pervasive influence of two durable economic theories, i.e. Modern Portfolio/Markowitz theory and the International Capital Asset Pricing Model.

Modern Portfolio theory is heavily influenced by the seminal work of Henry Markowitz in 1952, Portfolio Selection (***Markowitz***, 1952). Markowitz mathematically demonstrated that risk could be minimised by efficient portfolio allocation, which availed of diversification benefits arising from the co-variance of stocks. His findings govern portfolio selection to this day and provide a major theoretical matrix in which the examination of home bias takes place. In addition, the International Capital Asset Pricing Model ("ICAPM") postulates that investors should hold equities from a country as per that country's share of the world market capitalisation (***Sharpe***, 1964; ***Lintner***, 1965)[3]. Since international diversification benefits are proposed to reduce risk while maintaining expected return, why does the phenomenon of home bias persist?

Despite these theories, in 1991 French and Poterba demonstrated that portfolio selection was overwhelmingly concentrated on domestic markets, with domestic investment in the USA, Japan, UK and France accounting for 92.2%, 95.7%, 92% and 89.4% respectively (***French & Poterba***, 1991). Many further empirical studies demonstrate high levels of equity home bias have since been undertaken: ***(Bohn & Tesar,*** 1996); (***Coval & Moskowitz***, 1999); (***Benartzi***, 2001); (***Mishra***, 2015); (***Sahin, et al.***, 2016).

3.2 Themes of Existing Research

There is extensive literature on the topic of home bias, ranging from analysis of how it applies to certain markets, propositions to explain the phenomenon, and attempts

[3] Although, despite the persistent presence of ICAPM, it has not proven to be observable in empirical data, as later sections will show.

to propose various tools to accurately measure and model the phenomenon: (***Baele, et al.***, 2007); (***Mishra***, 2015); (***Ardalan***, 2018). While significant insight has been gained in relation to the topic, Kavous Ardalan noted in his recent review that "the vast literature has not succeeded in providing a generally accepted explanation for the equity home bias… this implies that equity home bias is complex and very hard to model theoretically" (***Ardalan***, 2018, p. 964). Even as trade and investment barriers have relaxed and information has become more accessible to all, the tendency of capital to remain close to the investor has persisted.

There are three broad and interrelated academic traditions in which to interpret home bias:

1. Macroeconomic theory – largely based around assessing the macroeconomic risks and causes of home bias. Research in this area generally assumes that actors are rational and often assumes that markets are broadly open and free from friction. Studies may be empirical or model based.
2. Finance theory – where investors seeks to maximise returns whilst minimising losses, and market frictions may restrict choice. Studies tend to be more empirical in focus and seek to understand home bias through the lens of maximising returns while minimising risk, usually measured as volatility.
3. Behavioural economics and finance – where investors are subject to biases that influence their investment choice, leading to domestic overinvestment.

It should be noted that these three approaches are not entirely discrete and there may be areas of overlap.

3.2.1 Macroeconomic Theory

Broadly speaking, macroeconomic investigation seeks to measure home bias from a level of international risk and capital flows and proposes rational reasons for the existence of the phenomenon. It may also seek to examine macroeconomic correlates of home bias. I will include some of the themes of macroeconomic research below.

3.2.1.1 Hedging Home Risks

This body of research has suggested that that investment in the home economy allows the investor to uniquely hedge home risks such as that of home inflation, real exchange rate risk and non-tradable forms of wealth such as human capital: (***Krugman***, 1981); (***Adler & Dumas***, 1983); (***Uppal***, 1992); (***Baxter & Jermann***, 1997); (***Fidora***, 2007).

In relation to hedging inflation and human capital, early research on home bias was largely based around proposing theoretical general equilibrium economic models with limited inputs and outputs and relied on the assumption that domestic equity returns are correlated with inflation or non-tradeable income, and that such a relationship would be large enough to warrant the observed degree of domestic overinvestment (***Krugman***, 1981); (***Adler & Dumas***, 1983). Such research often lacked available empirical data and in subsequent empirical research a negative relationship between domestic equity returns and inflation has been demonstrated**: (*Cooper & Kaplanis*,** 1994**)**; **(*Baxter & Jermann*,** 1997**)**; **(*Coeurdacier & Rey*,** 2012**)**; (***Xiang & Su***, 2016). In addition, Uppal investigated some of these risks along with taxes and capital controls, and found that the combination of such factors was not adequate to explain home bias (***Uppal***, 1992). Baxter and Jermann found that a hedge for human capital risk could not be undertaken solely by using domestic marketable assets ***(Baxter & Jermann,*** 1997).

Real exchange rate risk, i.e. the risk that the purchasing power of the investor could be reduced relative to international investors, is a complicating factor in portfolio investment as it can affect expected returns, incur costs to hedge, and can affect the purchasing power of investors. Real exchange rate risks were examined by Fidora et al, who found that exchange rate volatility could account for up to 30% of equity home bias (***Fidora***, 2007). However, there is not much further examination of this relationship.

While it is possible that hedging home risks could be a factor in explaining home bias, *a priori*, the author finds such explanations unsatisfying. The motivation to hedge unique macroeconomic home risk presupposes an awareness that such risks exist and

can be hedged in this fashion. The author would contend that many household investors may not be aware of such risks; yet, as this analysis will show, they still exhibit home bias at higher levels compared to other economic sectors. It may be appropriate to supplement such examination with qualitative research to further assess these motivations.

3.2.1.2 Gravity Style Models

While not necessarily directly measuring home bias, gravity style models seek to explain the variables that drive capital investment flows, be they domestic or international: (***Faruqee***, et al., 2004); (***Lane & Milesi-Ferretti***, 2008); (***Jochem & Volz***, 2011); (***Xiang & Su***, 2016); (***Galstyan, et al.***, 2016); (***Galstyan & Velic***, 2018). Such analyses tend to combine elements of the finance and macroeconomic traditions and tend to measure investment between countries and regions on bilateral bases, presenting capital flow as a dependent variable on several independent variables such as distance, market capitalisation of capital destination, GDP per capita, trade flows etc. They also frequently incorporate cultural variables such as shared language and religion. It is important to note that such investigations often do not exclusively focus solely on equity investment but may also consider the role of investment in debt securities (though credit is usually not included). Distance is used to proxy for many other inferred variables, such as information costs, familiarity and even transaction costs. Distance is consistently demonstrated to be highly correlated to underinvestment in equities relative to optimal portfolios, i.e., the further away a country is, the less likely it is that it will be optimally invested in.

Lane and Milesi-Ferreti found that international equity investment was strongly correlated with international trade flows for 67 countries and that this was particularly prevalent for emerging markets[4] (***Lane & Milesi-Ferretti***, 2008). In a gravity analysis of equity bias for Turkey, Sahin et al found that international trade and cultural similarities had the greatest correlation with equity investment from a range of

[4] However, this could also be considered as a form of proxy for familiarity or distance.

independent variables, including exchange rate risk, corporate governance and GDP[5] (***Sahin, et al.***, 2016). Faruquee et al found that market capitalisation was the most significant correlate (though they did not include trade flows and performed for a smaller set of countries) (***Faruqee, et al.***, 2004).

Galstyan and Velic examine investment patterns on a German sectoral basis. While they do not measure home bias directly, they find that imports and distance are a strongly correlated factor to bilateral capital flows. They also note that the results "show heterogeneity in the sensitivities of holdings to the proposed covariates across domestic sectors for a given domestic holding sector. The regression findings thus underline the point that aggregate-level patterns in international portfolio holdings may not persist in the sector-level data" (***Galstyan & Velic***, 2018, p. 684). Such a finding strongly reinforces the value of the current research, which is the first to examine sectoral differences for multiple countries of domestic equity holdings. This importance is further reinforced by Galstyan et al, who present a gravity style analysis of international portfolio investment on a disaggregated sectoral basis for emerging market and advanced market economies. They find that "there is clear evidence that the elasticities of holdings to the various gravity variables differ across the various holding and issuing sectors. At a basic level, these findings show that there is clear value in having access to the disaggregated sectoral data, in terms of understanding the composition of the investor base" (***Galstyan, et al.***, 2016, p. 107)[6].

3.2.3 Finance Theory and Home Bias

Finance theory mostly examines the relationships between risk, as measured by volatility, and expected returns (***Coeurdacier & Rey***, 2012) (***Ardalan***, 2018). It does not

[5] Nonetheless, it is worth noting that Soderstrom, 2008 shows that international trade flows appear to be correlated *with* cultural similarities.

[6] Despite being influenced by the work of Galstyan et al, 2016, it should be noted that this examination differs in a number of key ways. Firstly, it concentrates exclusively on home bias rather than international investment. Secondly, it concentrates on specific countries, rather than emerging and advanced markets. Thirdly, it uses a different dataset, and is therefore able to disentangle equity in companies from equity in investment funds, which is expected to have a significant impact.

emphasise frictionless markets in the same way that model based macro-economic investigations do.

3.2.3.1 Return-based Examinations of Home Bias

While measurements of home bias are frequently presented as deviations from weights suggested by ICAPM, many analysts assess home bias based on the non-optimisation of portfolios based on expected returns and implied volatility: ***(Tesar & Werner***, 1995); (***Xiang & Su***, 2016); (***Scott, et al.,*** 2019). Indeed, much of this research legitimately challenges the weightings suggested by ICAPM.

Scott et al demonstrate that while risk reduction can be gained from foreign diversification, optimal foreign investment appears to be around 40-50% of the portfolio, significantly below that suggested by ICAPM. After the 40-50% level, increased international portfolio diversification actually increases portfolio risk as measured by volatility (***Scott, et al.***, 2019). This research is conducted on UK, US, Australia and Canadian portfolios, and is backed up by the research of Xiang and Su, who contend that home bias is more normal and reasonable where a country has a higher contribution to global systemic risk (***Xiang & Su***, 2016).

FTSE Russell examine home bias for Pensions Funds in the UK, US, Australia, Canada and Japan and find that home bias was warranted for US pension funds, since domestic returns in the US exceeded international returns (FTSE Russell, 2019). However, for all four other countries, the reverse was true and pension funds would have benefitted from increased international diversification.

3.2.3.2 Obstacles to External Investment[7]

The idea that investors overinvest in domestic markets due to barriers in foreign investing has been examined by a number of researchers: (***Ardalan***, 2018); ***(Cooper &***

[7] Obstacles to investment have are dealt with here under the finance approach since much of the research looks at the obstacles as associated costs and attempts to justify whether such costs impact returns. Some aspects of this category could legitimately be classed under both economic and finance literature.

Kaplanis, 1994); (***Tesar & Werner***, 1995); (***Lane & Milesi-Ferretti***, 2008)[8]. Such barriers can include taxes, capital restrictions, transactions costs and information asymmetries.

While transaction costs have been observed to be generally higher for foreign equities, numerous pieces of research suggest that this is not an adequate explainer of home bias. Ardalan notes that "costs of foreign equity holdings are in general difficult to assess since investors differ in terms or relevant costs. Whatever the relevant costs, it seems likely that these costs have been declining over time" (**Ardalan**, 2019, p. 953). Coeurdacier and Rey note in their review of extant literature that "transaction costs would need to be very high… unless diversification benefits are very small." (***Coeurdacier & Rey***, 2012, p. 93). Tesar and Werner observed that turnover was generally higher in foreign stocks than domestic stocks, also seeming to suggest transaction costs were not a motivator in determining home bias (***Tesar & Werner***, 1995). However, much of the research contends that transaction costs cannot be viewed in isolation, and need to be meaningfully compared to diversification benefits and correlation with foreign returns: (***Tesar & Werner***, 1995); (***Ardalan***, 2019); (***Coeurdacier & Rey***, 2012); (***Xiang & Su***, 2016).

It is not unreasonable to consider that taxes may influence portfolio selection. Even in a relatively integrated market like the euro area, taxes can influence costs. For example, in the case of Ireland, investment in domestic stocks by households incurs a stamp duty of 1%, whereas investment in Irish investment trusts are exempt from such stamp duty (***Comyn***, 2017). Such an upfront cost is not an inconsiderable expense. While this study does not directly address such factors, it may inform further such studies, as it can be co-ordinated with sectoral and country specific taxation mechanisms.

Capital controls have been dismissed by Ardalan as an important factor in explaining home bias – "these days, all developed markets and a number of emerging markets are open to foreign investors. In other words, equity home bias, which is highly

[8] For a thorough and complete review of the analysis of obstacles to investment, see Ardalan, 2019. Only the most salient arguments are presented here.

persistent and still prevalent, cannot be explained by international capital controls" (***Ardalan***, 2018, p. 952). Also, Ahearne et al, downplay the impact of transaction costs in favour of our next major cause for consideration – information asymmetries – "the effects of direct barriers to international investment, when statistically significant, are not economically meaningful. More important are information asymmetries that owe to the poor quality and low credibility of financial information in many countries" (***Ahearne, et al.***, 2004).

Information asymmetries can arise due to lower information quality (***Coeurdacier & Rey***, 2012), (***Ahearne et al.***, 2004) or less confidence in the signals received on the performance of foreign stocks (***Brennan & Cao***, 1997). Numerous papers have correlated information asymmetry to increases in home bias (***Ahearne, et al.***, 2004). Such costs can include assessing foreign accounting practice, tax implications and the legal environment. Other aspect of this barrier can include general familiarity. Kang et al observed that non-Japanese investors invest in Japanese stocks that are better known, even when superior expected returns are available (***Kang, et al.***, 1997). Similarly, diaspora and emigration have been shown to be connected with capital allocation in reducing home bias (***Leblang***, 2010). One of the central arguments to the effect of information asymmetries is that the "benefits of international diversification might not be sufficiently clear to justify moving away from a local default position" (***Ardalan***, 2018, p. 32).

If information asymmetries do a play a role in home bias, it may be reasonable to assume we will observe less severe home bias in investors that are well informed and that have economics of scale which reduce their impact. This research appears to bear this out by the smaller home bias of investment funds relative to household investors, though further research would be needed to prove this comprehensively.

3.3 Behavioural Factors and Culture

The previous sections generally work under frameworks of economics and/or finance, where there is an assumption that investors are perfectly rational and make

informed, conscious choices. However, significant psychological research suggests that, in fact, the opposite is true and that humans are subject to a number of biases: (***Kahnmeman***, 2016); (***Bargh***, 2018). Indeed, French and Poterba suggest that behavioural factors are necessary to explain home bias (***French & Poterba***, 1991). Furthermore, Huberman rebuts analysis that focuses "only on financial attributes of assets" (***Huberman***, 2001, p. 675).

Recently, the field of behavioural economics and finance has offered a broad range of explanations for home bias, including variously categorised social determinants such as optimism, familiarity, competence and patriotism; and cultural similarities such as shared language and religion (though language could also be recorded under the information asymmetry principle).

While the current research does not seek to address behavioural explanations for home bias, it does allow the dissection of the problem in a number of smaller contributory sectors. This may allow examining the biases and behaviours in a more meaningful context, as research can be conducted and conclusions drawn on the behaviours of certain sectors relative to others. By way of illumination, the investment biases and behaviours of government are likely to be different than those of non-financial companies or households. A brief overview of some of the more prominent behavioural factors follows.[9]

3.3.1 Familiarity and Competence

Huberman found in his 2001 study that "A person is more likely to invest with a company he knows (or thinks he knows)" (***Huberman***, 2001, p. 678). In his study, he demonstrated that people are more likely to invest in telephone companies that provide them with service without any apparent return-based incentives to do so. He also observed how employees in the US are more likely to invest their retirement plans in the companies they work for or in companies that are headquartered in the region in which they work, even when they have other, ostensibly better, options. Supportive

[9] At least two analyses already exist – see Ardalan, 2019 and Coeurdacier & Rey, 2012.

findings on familiarity are presented by Kang et al on foreign holdings of Japanese equity, and by GrinBlatt and Keloharju, who found that Finnish households were more likely to invest in Finnish stocks if they were headquartered geographically closer to them (***Kang, et al.***, 1997) (***GrinBlatt & Keloharju***, 2001).

Related to familiarity, a number of studies suggest that investors believe they are more competent at investing domestically than in foreign markets, and that the investors' perceived competence impacts their portfolio selection (***Huberman***, 2001); ***(Graham & Harvey***, 2009). De Vries et al show that individuals are likely to invest in companies with familiar brands rather than less relatively well known companies, and cite multiple supporting studies (***De Vries, et al.***, 2017).

The author would contend that familiarity provides an intuitive reason for home bias, particularly among household investors. It would appear to be easier to invest in what is known rather than what is unknown.

3.3.2 Culture, Patriotism and Optimism

Ardalan notes culture as a factor in the choice of many kinds of financial investment and consumption, such as bank-based versus market-based financing, life insurance consumption, investor rights protection, international trade, and trading volumes, citing numerous sources (***Ardalan***, 2019). As stated above, culture frequently forms a component of gravity models (***Sahin, et al.***, 2016). Similarly, religion and shared language, and aspects of culture are also used (***Lane & Milesi-Ferretti***, 2008).

Culture is an abstract phenomenon and difficult to quantify precisely. Many analysts use the Hofstede cultural differences database, where self-report questionnaires are completed by individuals in many countries considering such aspects as masculinity, uncertainty avoidance, individualism and power distance. Accordingly, while the author would contend that culture does appear to be a factor in home bias, its precise quantification should be observed with some scepticism. It is further noted that cultural similarity may also affect familiarity, as discussed above.

Several studies examine the link between patriotism and home bias, with research indicating a correlation, and that investors systematically have higher expectations about returns from the domestic stock market relative to foreign investments: (***Ardalan***, 2019); (***French & Poterba***, 1991); (***Morse & Shive***, 2004). French & Poterba observe that domestic investors are consistently over-optimistic about the returns on domestic stocks relative to foreign stocks for a number of countries. Benos and Jochec contend that investors in the US subconsciously gravitate to stocks with a patriotic name, particularly during wartime, by showing positive abnormal returns for such companies (***Benos & Jochec,*** 2013). Morse and Shive analysed survey data from 39 countries and contend that patriotism accounts for circa 5% of home bias, with more patriotic countries likely to experience greater degrees of home bias (***Morse & Shive***, 2004).

3.4 Home Bias Measurement

In addition to seeking to analyse and explain home bias, there is some academic literature on appropriate methods to measure home bias, particularly by Mishra and Cooper et al (***Mishra***, 2015); (***Cooper, et al.***, 2018). While a fuller treatment will be given in the methodology section below, it may be appropriate to consider some of this material in the context of the literature review.

Mishra examines many popular methods of measuring home bias, which is generally presented as actual holdings in a national portfolio versus a reference optimal portfolio of international stocks. Results are then calibrated by subtracting from one, such that the "score" for home bias is on a continuum from zero to one, with zero indicating no home bias, and one indicating total investment in the domestic market. This formula is presented below. **Home Bias** measure for country *i* is:

$$HB_i = 1 - \frac{Actual_i}{Optimal_i}$$

This formula requires the identification and calculation of two additional components: namely, the $Actual_i$, being the portfolio held by investors in country i, and the $Optimal_i$,

being an idealised portfolio for country i in line with various economic and financial theories.

While the calculation of the actual portfolio is straightforward and relatively consistent, being the ratio of the foreign equity holdings of a country to its total equity holdings, there are many proposed methods of calculation for the optimal portfolio. Mishra presents the following popular methods:

- Mean-variance approach: this uses expected returns for domestic portfolio relative to expected returns for all global national indices, adjusted for covariance[10]. He identifies a number of problems with this approach, chiefly that expected returns calculations are very unreliable due to the high volatility of returns and that it significantly overweighs securities that have large expected returns. It is also subject to high variability based on the review period of the data and frequency of observations.
- Minimum-variance portfolio: as above but seeks the leftmost portfolio of the efficient frontier, i.e. minimising risk and being indifferent to return. This does not likely represent investor behaviour and still faces many of the above problems, though expected returns are not presented as important
- International Capital Asset Pricing Model: this implies that rational investors hold the world market portfolio, i.e. invest in each country proportionally to its contribution to global market capitalisation. However, the model is not observable empirically in investor behaviour.
- Bayesian style models: these have various subsets and seek to constrain or adjust the mean-variance or ICAPM model in various ways.

Mishra performs calculations for forty-two selected countries by each method above. While there are variations in the findings, reassuringly, most calculations yield results for a given country in a relatively tight range, though he notes the greatest differences tend to be between the Bayesian approaches and ICAPM[11].

[10] For a full treatment of the mean-variance approach see Methodology section at p.29.

[11] Mishra, 2015 uses market data obtained from Standard and Poors for each country. Nevertheless, it is worth noting that this data does not include market value of investment funds, and solely includes

Table 1: Measure of Home Bias using various methodologies by Anil Mishra, 2015

Home bias measures (weekly).

Country	ICAPM (1)	Mean variance (2)	Minimum variance (3)	MPC1 (4)	Bayes–Stein (5)	MPC2 (6)	Bayesian (7)	MPC (8)
Argentina	0.7916	0.7884	0.7877	0.7883	0.7834	0.7860	0.7869	0.7879
Australia	0.7552	0.7756	0.7781	0.7760	0.7581	0.7706	0.7562	0.7570
Austria	0.4036	0.4141	0.4092	0.4133	0.3922	0.4026	0.3877	0.3899
Belgium	0.4226	0.4604	0.4483	0.4584	0.4155	0.4357	0.4081	0.4110
Brazil	0.9820	0.9834	0.9834	0.9834	0.9815	0.9827	0.9820	0.9822
Canada	0.7034	0.7131	0.7226	0.7147	0.7090	0.7173	0.7079	0.7095
Colombia	0.9631	0.9604	0.9611	0.9606	0.9621	0.9615	0.9628	0.9626
Czech Republic	0.8239	0.7310	0.7346	0.7316	0.7478	0.7400	0.7535	0.7531
Denmark	0.4512	0.3403	0.3642	0.3444	0.4442	0.3986	0.4410	0.4405
Egypt	0.9816	0.9806	0.9807	0.9806	0.9812	0.9809	0.9814	0.9813
Finland	0.3894	0.4109	0.4093	0.4106	0.3662	0.3929	0.3743	0.3783
France	0.6345	0.6788	0.6815	0.6793	0.6399	0.6662	0.6346	0.6377
Germany	0.4609	0.5429	0.5383	0.5421	0.4629	0.5111	0.4564	0.4609
Greece	0.6790	0.6882	0.6856	0.6878	0.6712	0.6801	0.6721	0.6731
Hong Kong	0.7985	0.8079	0.8077	0.8079	0.8068	0.8073	0.8045	0.8046
Hungary	0.6316	0.6500	0.6499	0.6499	0.6105	0.6352	0.6210	0.6238
India	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986
Indonesia	0.9961	0.9963	0.9963	0.9963	0.9960	0.9962	0.9961	0.9961
Israel	0.7296	0.6954	0.6964	0.6956	0.7240	0.7080	0.7253	0.7253
Italy	0.3902	0.4006	0.3883	0.3986	0.3847	0.3869	0.3782	0.3828
Japan	0.7916	0.7664	0.7599	0.7653	0.8069	0.7811	0.8045	0.8042
Korea	0.9108	0.9145	0.9150	0.9146	0.9093	0.9128	0.9101	0.9109
Malaysia	0.9300	0.9242	0.9240	0.9242	0.9268	0.9251	0.9256	0.9254
Mexico	0.9395	0.9409	0.9419	0.9411	0.9374	0.9402	0.9385	0.9387
Netherlands	0.3285	0.3836	0.3732	0.3819	0.3177	0.3523	0.3092	0.3143
Norway	0.2536	0.3130	0.3113	0.2299	0.2484	0.2052	0.2445	0.2429
New Zealand	0.6500	0.6171	0.6114	0.6767	0.6421	0.6633	0.6394	0.6423
Pakistan	0.9962	0.9959	0.9959	0.9959	0.9962	0.9960	0.9962	0.9962
Philippines	0.9997	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996
Poland	0.9410	0.9437	0.9431	0.9436	0.9386	0.9414	0.9397	0.9401
Portugal	0.3825	0.3228	0.3102	0.3206	0.2955	0.2189	0.3005	0.2967
Russia	0.9914	0.9915	0.9915	0.9915	0.9909	0.9913	0.9914	0.9914
South Africa	0.8564	0.7727	0.7717	0.7684	0.7716	0.7704	0.7687	0.7692
Singapore	0.5034	0.2915	0.2961	0.3050	0.2802	0.2938	0.2927	0.2947
Spain	0.8923	0.8932	0.8964	0.8937	0.8926	0.8949	0.8917	0.8924
Sweden	0.5035	0.5645	0.5660	0.5647	0.4956	0.5406	0.4915	0.4975
Switzerland	0.4614	0.3818	0.3785	0.3893	0.4649	0.3482	0.4606	0.4611
Thailand	0.9733	0.9743	0.9742	0.9743	0.9733	0.9739	0.9729	0.9730
Turkey	0.9983	0.9984	0.9984	0.9984	0.9983	0.9983	0.9983	0.9983
UK	0.5629	0.5003	0.4793	0.4970	0.5671	0.5181	0.5639	0.5656
US	0.6118	0.6418	0.6327	0.6404	0.7421	0.6856	0.7360	0.7382
Venezuela	0.9876	0.9868	0.9866	0.9868	0.9878	0.9871	0.9876	0.9874

Note: Home bias measures are for end of year 2011. Home bias measures are computed from weekly data. Home bias measures for remaining years vary. ICAPM is home bias measure using ICAPM framework. Mean Variance is home bias measure as per Mean-Variance framework. Minimum Variance is home bias measure as per Minimum-Variance model. Bayes-Stein is home bias measure computed using Bayes-Stein shrinkage factor model. Bayesian is home bias measure computed in Bayesian framework. MPC1 is home bias measure as per Multi-Prior framework applied to Mean-Variance data based approach. MPC2 is home bias measure using Multi-Prior framework applied to Bayes–Stein approach. MPC is home bias measure computed in Multi-Prior framework.

Source: Measures of Home Bias puzzle, by Anil Mishra, 2015

Cooper et al propose a new method of measurement of portfolio bias that incorporates both home and foreign bias and that is incorporated into a distance based model. They identify scaling issues with other methodologies which make it difficult to compare home bias metrics for countries that have different sized domestic equity markets.

market cap for equity in companies. This means that Mishra is comparing holdings of equity and investment funds, with a market cap based on equity in companies, thereby creating a mismatch in sources. The author recreated Mishra's measurements precisely for Germany and Belgium and found that the inclusion of market cap for investment funds caused significant changes in the home bias scores.

Since they note no satisfactory solution to this issue, they nominate an alternative measurement method, known as Covar-W[12].

Covar-W is the measure of difference between the covariance of a country's domestic equity returns from two portfolios – the portfolio held by the investors of a country and the world market portfolio[13]. While Cooper et al use this a measurement of home and foreign bias, the author considers *a priori* that this approach more closely resembles reality than ICAPM or mean variance, since it focuses on how the holdings of a country deviate from the risk and returns of their domestic market versus the risk and returns of the world market, i.e. it utilises the *actual* portfolio of the country to calculate potential diversification and return benefits, rather than their national index. As Cooper et al note, "An asset's world covariance always is a weighted average of asset's covariance with each of the national portfolios. As such, it reflects a weighted average of the expectations in the various investor countries. The World CAPM would assume these expected net returns to be the same for all investors. We do not need any such assumption" (***Cooper, et al.***, 2018, p. 1478). Therefore, it more lucidly articulates the home bias measurement based on returns and volatility differences that their current portfolio can benefit from. While this appears to be inherently valuable, it has yet to see widespread adoption as a measurement methodology.

4. **Research Question and Motivation**

The research question is:

> **"Does home bias in equity investment in companies by economic sectors differ significantly from home bias in equity investment at the national level in respect of euro area countries?"**

[12] The scaling issue is particularly pertinent for comparing countries with a large difference in the percentage of global market cap. Most of the countries in this research are within 1% difference of global market cap and so scaling issues are minimal. Also the primary purpose of this research is to compare sectors to their national total, and so the scaling issue is not relevant to this research.

[13] The Covar-W method is discussed in more detail in the methodology section, p.31.

The research specific objective is to comprehensively assess whether there is merit in switching the focus of work on understanding home bias from the national level down to a sectoral level, as some recent research has proposed, notably Galstyan et al, 2016 and Galstyan et al, 2018. It is envisaged this could lead to advancing academic research in the field by demonstrating that additional insight on the complex and pervasive issue of home bias may be gained by reframing analysis at the sectoral level of investment. Furthermore, such reframing may be critical to adequately explain and understand the phenomenon.

While the scope of the research question is necessarily tightly framed, this work will also provide up to date measurements on home bias in the euro area, and is the first piece to directly measure home bias for all economic sectors for multiple countries. It will facilitate an examination of home bias for each country in the euro area and show how such a measurement may be separated into components which contribute to that total. This will allow for observations to be made about behaviours relating to portfolio investment by each sector and will facilitate analysis to be conducted on home bias at both a national level and sectoral level, and may develop avenues for further research.

Additionally, it will provide updated measures that relate exclusively to equity in companies, which have been disentangled from equity in investment funds.

To support answering the research question, the author will use descriptive statistics, inferential statistics and analysis. In particular, the research will use Mann-Whitney U tests to compare each country sector with its national total to determine if they are statistically different.

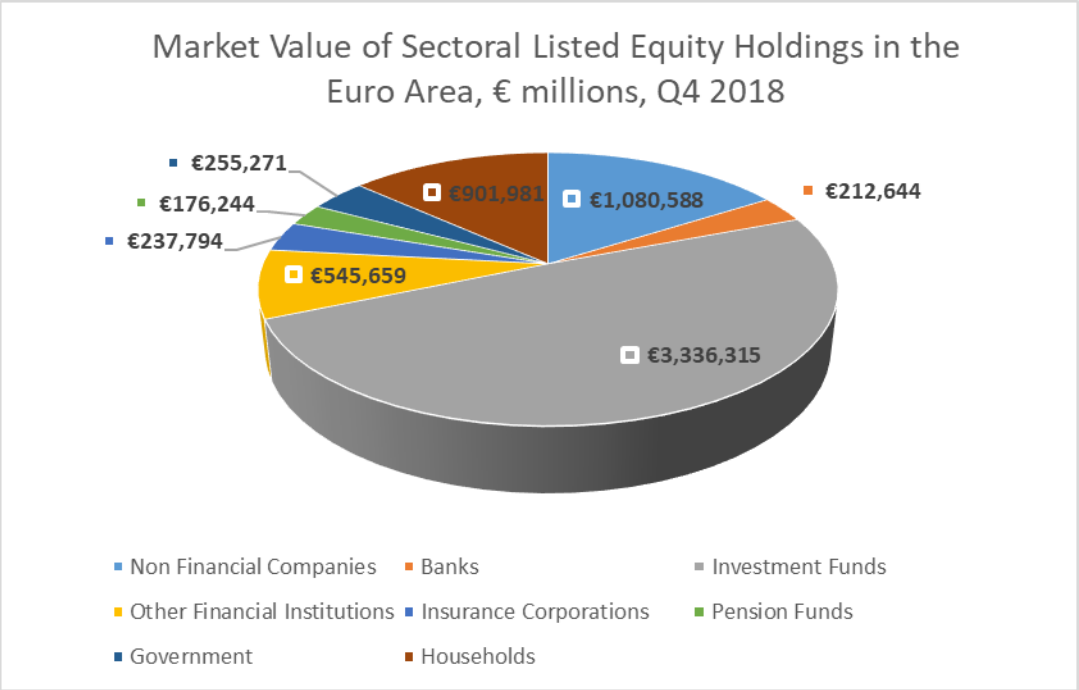
The data is broad in scope and will provide 126 home bias metrics for country sectors combinations which have not been measured before and will therefore add to the academic research. As a secondary research objective, it will seek to analyse some of the relationships that emerge between similarities and differences in sectoral measurements of home bias.

5. DATA

5.1 Stylised Facts

Data primarily includes holdings of euro area equity in companies at the national and sectoral level. Some facts about the dataset are presented here to facilitate interpretation of the data by providing context on the scale of national and sectoral holdings of equity in companies.

Chart 1 – Holdings of Listed Equity in the Euro Area by Sector, Q4 2018



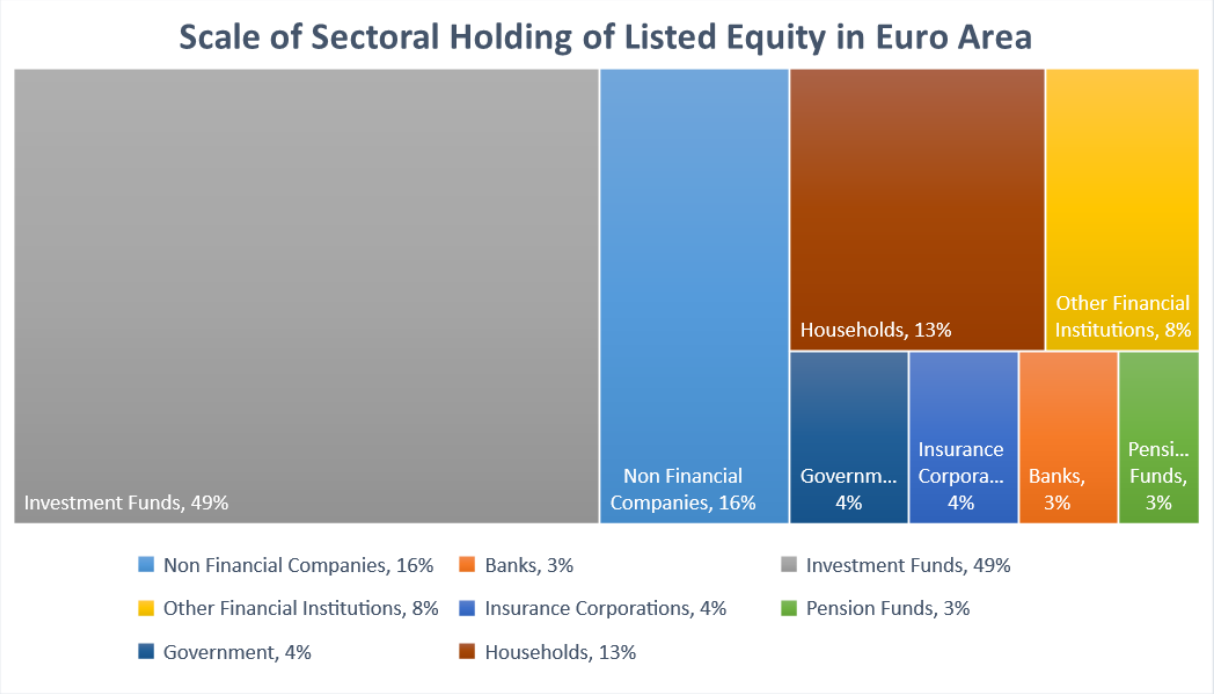
Source: SHSDB

The holdings of equity in companies in the euro area was €6.7 trillion, approximately 11% of all listed equity in companies in the world as of Q4 2018 (see chart 1)[14].

[14] Note: for all illustrative charts, Form SHSDB, Q42018 is used. The SHSDB is subject to revision and Q42018. Most revisions take place over a one-year period and so Q42018 is used as the most recent quarter that is not likely to undergo revisions.

Investment funds are by far the largest holders of equity, with just under half of all equity in Europe. They are followed by non-financial companies and households respectively (see Chart 2).

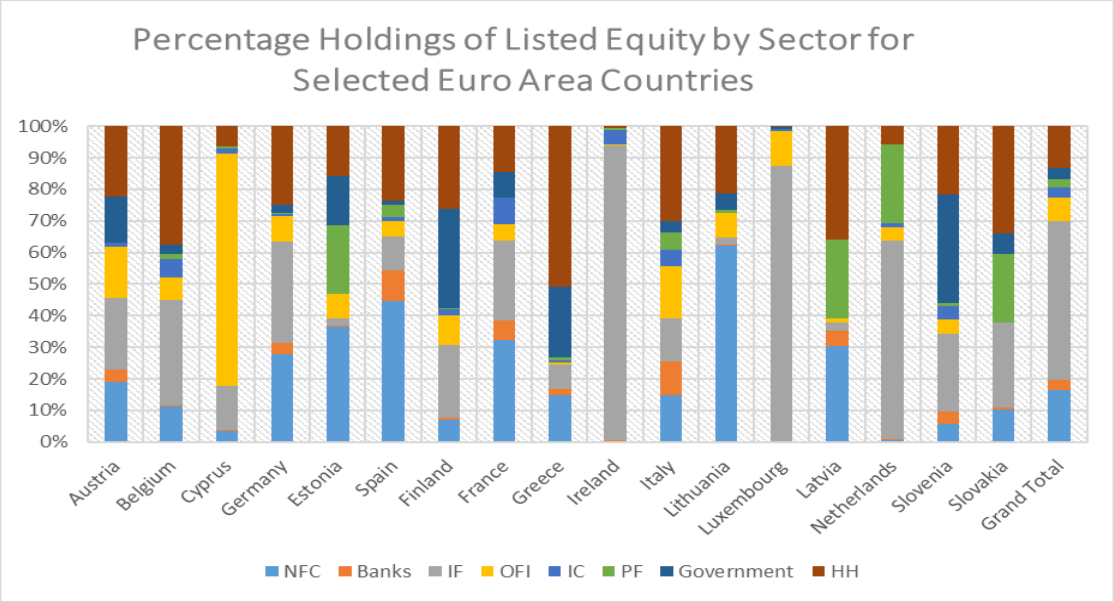
Chart 2: Hierarchy of Sectoral Holdings of Listed Equity in Euro Area, Q42018



Source: SHSDB

There is considerable heterogeneity in the scale of sectoral holdings from country to country in the euro area (see Chart 3). For example, Ireland and Luxembourg are dominated by investment fund holdings, Lithuania and Spain have large holdings by non-financial companies, whereas Greece is dominated by household investment. If difference in behaviour can be noted by difference in sectors, this would imply that there may be a value in examining home bias at the sectoral level.

Chart 3: Percent Sectoral Holdings of Listed Equity for Selected Euro Area Countries



Source: SHSDB

5.2 Data Concerning Portfolio Investment

In the past, examinations of home bias have been limited by the availability of data. Most recent papers that examine home bias calculate portfolio holdings using the CPIS database produced by the IMF: (***Lane & Milesi-Ferretti***, 2008); (***Galstyan & Velic***, 2018); (***Galstyan, et al.***, 2016); (***Xiang & Su***, 2016); (***Cooper, et al.***, 2018).

5.2.1 SHSDB

This research uses the SHSDB compiled by the European Central Bank and is the first multi-country analysis of home bias using the securities holding database[15]. The SHSDB is a dataset combined from a number of statistical balance sheet returns in euro area countries. It aims to give a complete picture of all publicly traded securities (stocks, bonds and fund shares), as held by economic sectors in each euro area country. It is a granular database, with information being recorded on an individual security-by-security level.

[15] Great gratitude is given to the work of the Working Group on Securities Stats for the co-ordination of this database and the approval of the use of the data for this research.

Data for the SHSDB is generally collected as granular statistical returns that are governed by multiple EU and domestic regulations. Institutions include all authorised banks, investment funds, custodians, securitisation vehicles and insurance companies. Pension funds generally do not report directly and have their holdings derived from custodian returns[16]. The SHSDB is collected and compiled in euro and the observations are recorded in the market prices of the security at each quarter's end. Sectors are as described by the European System of Accounts (ESA 2010).

The research uses quarterly data on holdings covering a six-year period from 2014 to 2019.

Important to note is that, while both equity in companies and equity in investment funds are available in the SHSDB, this research uses investment in companies exclusively. The reasons for this difference are discussed in the methodology section.

5.2.2 Comparison of CPIS and SHSDB

There are some caveats and limitations to CPIS data as presented by its users that appear to be addressed by the use of the SHSDB (***Mishra***, 2015); (***Cooper, et al.***, 2018).

First, the CPIS collection approach varies by country, including whether data is collected at the aggregate or security-by-security level, how the data is collected and whether the data is mandatory or voluntary. Conversely, the SHS data is collected on a granular security-by-security level, directly from relevant institutions and is governed by mandatory legal frameworks. This considerably increases the likelihood of obtaining accurate, complete and consistent data.

Secondly, the CPIS data does not disentangle Third Party Holdings ("TPH"), i.e. the holdings of an investor that are held in a country that is different from the investor. Mishra noted that this can have an impact "particularly with regard to financial centres such as Luxembourg, Ireland…" (***Mishra***, 2015, p. 301). Other researchers make adjustments for TPH based on estimates. However, the SHSDB directly

[16] However, direct pension fund data will be incorporated from the new pension fund Regulation, which became live in 2020.

measures TPH such that not only do they not pollute the data, but they may be examined as a separate subset.

Thirdly, the CPIS does not disentangle equity in companies from equity in investment funds. While not directly addressed in the literature, this creates a number of problems, particularly for the euro area. Investment funds are intermediary vehicles and so the location of underlying investors is difficult to unravel. Furthermore, in the euro area, investment funds can avail of a European passport to market their units equally in all countries, while being authorised in only one. This leads to a very large funds industry being located in a number of offshore centres, particularly Ireland and Luxembourg. Also, investment funds frequently invest in a specific region or company type. It may reasonably be assumed that the investor in the share of an investment fund is seeking access to the risk and returns of the underlying assets of the fund and therefore domicile is not as relevant to the home bias analysis of the fund. For example, an investment fund in France that tracks US tech stocks, or emerging market debt. The author would note that most research does not address these issues, however, as earlier stated, such a disaggregation was not possible with the CPIS data.

5.3 Data Governing Market Capitalisation

Data governing market capitalisation for European equities on a per country basis is taken from the Statistical Data Warehouse ("SDW") of the European Central Bank. This data set records the share price of listed companies and excludes the stock of companies that are headquartered in a different region but listed on a local stock exchange. It is collected at market prices and denominated in euro. It is therefore closely and consistently related to the data from the SHSDB.

The data for global market capitalisation is taken from the World Bank. Values for 2019 were not available for all euro area countries and so supplementation for domestic market cap was derived from Bloomberg Equity Indices[17].

[17] These countries are Estonia, Latvia, Lithuania and Finland.

6. METHODOLOGY

6.1 Measure of Home Bias

In the extant research, home bias is usually measured as the difference between the actual portfolio holdings of a given country and a specific idealised benchmark international portfolio, though numerous deviations from this method exist (***Mishra***, 2015) (***Coeurdacier & Rey***, 2012) (***Cooper et al.***, 2018). Results are then calibrated by subtracting from one, such that the metric for home bias is on a continuum from zero to one, with zero indicating no home bias, and one indicating total investment in the domestic market. This formula is presented below:

Home Bias measure is $HB_i = 1 - \frac{Actual_i}{Optimal_i}$

This requires the identification and calculation of two additional components: namely, $Actual_i$, being the portfolio held by investors in country *(i);* and $Optimal_i$, being an idealised portfolio for country *(i)* in line with various economic and financial theories which are dealt with below.

The research seeks to address whether home bias at the sectoral level is significantly different from bias at the national level. Therefore, it is key that the measurement method is applied consistently at these levels as comparison is primarily made between sector and national metrics. Comparison between countries is less important for this research, since it seeks to examine if sectors within a country are significantly different to the total for that country, rather than comparing metrics between different countries (though some comparison between sectors in different countries may generate insight into sectoral behaviour with regard to international investment).

6.1.1 Actual Portfolio

Throughout the literature, the calculation of the actual portfolio is generally very similar. The actual portfolio typically represents the investment in non-domestic equity by country$_i$ divided by the total equity investment of country$_i$. Mishra notes that "The actual foreign holding is the ratio of the foreign equity holdings of a country

and total equity holdings. The total equity comprises both foreign and domestic holdings. The domestic equity holding is the difference between the country's market cap and foreign equity liabilities." (***Mishra***, 2015, p. 296)

The below method is suggested by ***Mishra***, 2015 and (***Xiang & Su***, 2016):

$$Actual_i = \frac{Foreign\ Equity\ Asset_i\ (the\ investment\ in\ foreign\ equity)}{Foreign\ Equity\ Asset_i + Market\ Cap_i - Foreign\ Equity\ Liability_i}$$

It is worth noting that because both Mishra and Xiang & Su use the CPIS data, they necessarily must use foreign equity liabilities and market cap to estimate domestic equity holdings in the denominator[18].

The author presents a slight variation on the above method, since foreign holdings, domestic holdings and total holdings are directly observable.

$$Actual_i = \frac{Total\ domestic\ holding\ of\ foreign\ equity}{Total\ domestic\ holding\ of\ foreign\ equity + total\ domestic\ holding\ of\ domestic\ equity}$$

The above method is used in this research to calculate actual portfolio holdings and should yield the same results as Mishra and Xiang & Su.

6.1.2 Optimal Portfolio

There is a large degree of variation in the methodology applied to the calculation of the optimal portfolio in the literature. The three methods considered for this study are dealt with below.

6.1.2.1 ICAPM

The most commonly[19] used method calculates the optimal portfolio based on the level a country's stock market contributes to the overall world capitalisation (***Cooper, et al.***, 2018). It may generally be interpreted as the share of a domestic market capitalisation

[18] Domestic equity holdings are not available in the CPIS data, another advantage which the SHSDB grants.

[19] Indeed, Coeurdacier and Rey, 2012, present no other alternative methodologies.

in the global market capitalisation, and uses the following formula to calculate the optimal portfolio:

$$Optimal_i = \frac{World\ Market\ Capitalisation - Domestic\ Market\ Capialisation}{World\ Market\ Capitalisation}$$

It should be noted that some researchers do not present alternatives to using ICAPM to calculate the optimal portfolio, which appears as a default, e.g. Couerdacier and Rey, who offer the following formula:

$$HB_i = 1 - \frac{Share\ of\ Foreign\ Equity\ in\ Country\ i\ Holdings}{Share\ of\ Foreign\ Equities\ in\ World\ Market\ Portflio}$$

While Sahin et al select this method, they note that "investors are assumed to have a dogmatic belief in the ICAPM, despite reasonable doubt about the validity of the model" (Sahin, et al., 2016, p. 165). It is the author's view that using the size of a market's stock exchange relative to the world total as the only determinant for an optimally diversified portfolio seems over simplistic. However, this formula is easy to apply, provides a consistent metric and pervades the literature, being used by Mishra, Cooper and Kaplanis, Jochem and Volz, Couerdacier and Rey, Xiang and Su, Sahin et al., among others. It also yields directly comparable results for sectors without the noise[20] that can be created by other methods' sensitivity to expected returns.[21]

6.1.2.2 Mean-Variance Approaches

The second general approach is to use a mean-variance approach, which compares the excess returns from each country's stock market index and their relative covariance, adjusted for risk aversion[22]. Mishra presents the following formula to calculate the optimum weight of foreign holdings in the portfolio:

$$MAX_w\ w'\mu - \frac{y}{2}w'\sum w$$

[20] See section 5.1.2.2, Mean-Variance approaches.
[21] Since the impact of expected returns are not relevant to the optimal portfolio.
[22] The risk aversion parameter, y, is a variable to indicate a hypothetical investor's risk appetite.

Where w is the optimal portfolio of N risky assets, μ is N- the vector of expected excess returns over the risk free asset, ∑ is the *N x Ncovariance* matrix and y is the risk aversion parameter. It is essentially an efficient frontier of world stocks. However, it tends to be calculated using stock market returns from national indices rather than individual stocks.

A minimum-variance approach can also be accommodated, being the leftmost portfolio of the mean-variance efficient frontier and seeks to minimise $w'\sum w$. The minimum variance approach is indifferent to expected returns and instead seeks to minimise risk, assuming that investors are extremely risk averse.

While this method is more complex, and is calculated based on observed historical returns, it also has a number of difficulties. Of particular importance is the sensitivity to expected returns. Sahin et al note the following, citing numerous sources: "An important disadvantage is that the weights are extremely sensitive to the assumed vector of expected returns, an input that is notoriously difficult to estimate" ***(Sahin, et al.,*** 2016, p. 169). Mishra further notes that expected returns are difficult to estimate and unreliable (***Mishra***, 2015, p. 296).

Furthermore, both the mean-variance and ICAPM approaches are subject to significant scaling issues, as explained by Cooper et al. "For example, assume Sweden invests 30% at home whereas the world average investor puts just 1% into those same assets. What then is the comparable number for the home bias of the USA if US stocks have, say, a world weight of 35%? Is the US investor really equally biased if investing 64% at home (so that the weight gap is again 29%?)" (***Cooper, et al.***, 2018)[23].

6.1.2.3 Covar-W

Covar-W methodology, introduced in the literature review, was proposed by Cooper et al (Cooper, et al., 2018). This measure computes *Yi*, the optimal weight of

[23] It should be noted that the scaling issues are not a factor in choice of method for this study, as it does not seek to compare results *between* countries. Rather, it compares sectors with the country total, and therefore uses precisely the same denominator in the home bias metric.

investment in country i by investors in country i, using the difference between the covariances of r_{pi}, being the portfolio held by the investors of country i, from the returns on two portfolios, r_i and r_w, being the return on the domestic stock market and the returns on the world stock market portfolio respectively[24].

$$Y_i \coloneqq cov(r_i, r_{pi}) - cov(r_w, r_{pi})$$

The author generally considers this a superior approach to measuring home bias, as it expresses home bias in terms of potential returns with minimised risk that can be accrued by rebalancing a country's portfolio, i.e. it takes into account covariance risks with other assets *relative to the actual portfolio held by the country*. However, it does not appear to be the appropriate choice for this research, because:

1. It has limited use in the extant literature and therefore limited comparability;
2. There are difficulties in calculating the expected returns due to the limited number of observations;[25]
3. It is a composite measurement for home and foreign bias, whereas this research focuses exclusively on home bias;

There is considerable extra effort required to use this method for each sector, and each such calculation introduces an increased possibility of error due to the limited observations from which to calculate expected returns, and therefore covariance. Therefore, it is more likely to yield results for sectors that may contain considerable noise relative to the ICAPM method.

[24] It should be noted that Cooper et al present this formula as a combined measure of home and foreign bias. Therefore, they introduce an additional country j, which is presented as the target country of optimal investment by country i. Thus, the author has simplified the formula so that it reflects exclusively home bias. For further details please see Cooper et al.

[25] Efforts were made to reproduce Cooper's measurements for Germany. While the results were similar in absolute terms, they were still an order of magnitude higher. This partially represents the significantly lower values generated by this approach versus the mean variance approaches or the ICAPM approaches, due to the usually higher covariance by using the actual portfolio of the country as the reference portfolio.

6.1.2.4 Justification of ICAPM to Measure Home Equity Basis

Having considered many variations of the calculation of home bias, the author has opted for the more traditional measure of home bias as the differentiation from the world market suggested by ICAPM. The reasons for this decision are as follows:

1. The overarching study aims to investigate the homogeneity or heterogeneity of home bias between sectors of a country and the national aggregate of a country. Therefore, the traditional scaling issues associated with comparing countries are not as relevant to research question, and therefore the added complexity does not yield an improved answer to the research question;
2. The study uses the most common method pervading the literature and prior research. Therefore, it would be more convenient for comparison to previous studies to see if results at the national level are meaningful, or if there is a benefit in examining at the sectoral level;
3. The data used in the study has limited observations. Given the sensitivity of mean-variance and Covar-W methodologies to expected returns, and therefore covariance, these methods are likely to create 'noise' for the comparative purposes from sectoral to national calculations;

While the method proposed by Cooper et al infers more meaning on *a priori* grounds, the difficulties in comparison for various datasets mean that calculations of mean-variance and covariance between the reference portfolios have a large impact and may be distorted by homogeneous data sources. For example, Cooper uses the MSCI global indices, which tend to omit the full range of domestic stocks and, in some cases, can encompass only 85% of the national stock market. Such distortions would mean the measurement using the Covar-W covariance may outweigh the benefits of its increased complexity. Conversely, the data sources of the ECB and SHS are directly comparable, facilitate the complexities of third party holdings, and encompass the entire national universe of domestic stocks and domestic holdings.

6.2 Calculation of Sectoral Home Bias Measurements

The only study to perform sectoral calculations of home bias is conducted by Jochem and Volz (***Jochem & Volz***, 2011)[26].

Similar to Jochem and Volz, we calculate each observation of sectoral bias as independent, i.e. we compare the results of the sectoral home bias to the national average *without* weighting, i.e. each sector is calculated as if it was its own national aggregate. The optimal portfolio calculation remains consistent, i.e. the proportion of international investment should be the same for the country as the sector. The formula for the actual portfolio holdings changes to:

$$Actual\ sector_j = \frac{Total\ domestic\ holding\ of\ foreign\ equity\ by\ sector\ j}{Total\ domestic\ holding\ of\ foreign\ equity\ by\ sector j\ + total\ domestic\ sectoral\ holding\ of\ domestic\ equity\ by\ sector\ j}$$

National aggregates are calculated independently by the use of total national portfolio investment. However, the same result is achieved by combing each sector multiplied by its respective weight in the national aggregate (less any minor adjustments for unallocated holdings).

Galstyan and Velic and Galstyan et al also investigate sectoral weightings but do not do so by the calculation of a home bias metric (***Galstyan & Velic***, 2018) (***Galstyan, et al.***, 2016). Rather, they present sectoral holdings with an explicit monetary amount and gravity covariates.

6.3 Use of Equity in Companies

As previously stated, most recent researchers perform home bias calculations using both equity in companies and equity funds. While not explicitly dealt with in the literature, this appears to be as a result of the use of the CPIS data, which does not disaggregate the two types of equity. However, an examination of home bias based upon holdings in equity in companies appears more suitable for this examination,

[26] The study conducted by Jochem and Volz uses the Securities Holdings database maintained by the Deutsche Bundesbank. As such, this database would directly contribute to the German national securities holdings data in the SHSDB.

particularly in respect of the euro area where funds can offer common passport. There are a number of reasons for this:

1. As identified by Courdacier and Rey, since investment funds are intermediary vehicles, in order for investment funds to be truly meaningful in the research, it would be necessary to disentangle the location of the underlying investors in the fund (***Coeurdacier & Rey***, 2012). For example, over 90% of investment fund ownership in Ireland is by foreign investors, and over 92% is invested in foreign assets[27]. Accordingly, research that includes both asset classes is likely to skew findings which may be better considered distinctly;
2. In the region of study, the euro area, investment funds can avail of a passport which allows them to market and sell their products in any other country whilst using the home country prospectus and authorisation. Accordingly, the notion of location and headquartering is considerably less meaningful for investment funds than for companies;
3. Investment funds frequently have an underlying sector/region/asset class focus, to which an investor seeks exposure, e.g. emerging market equity, Sterling short-term debt, technology stocks, etc. Accordingly, it is reasonable to assume the investor may exercise some deliberateness in their selection of investment fund based on these criteria, rather than location;
4. The motivations for investing in funds may be different from direct equity holdings, and therefore they would be best studied separately. For example, 37% of the assets of all euro area investment funds[28] are invested in bonds, which have been observed to have different home bias behaviour than equities (***Galstyan, et al.***, 2016) (***Xiang & Su***, 2016).

[27] Data from the Central Bank of Ireland Investment Funds data: https://www.centralbank.ie/statistics/data-and-analysis/other-financial-sector-statistics/investment-funds

[28] Data from Q4 2019, ECB Statistical Data Warehouse.

6.5 Inferential Statistics

Data for each country was examined for skewness and kurtosis, of which values are generally high and therefore the data cannot deemed to be normally distributed. Furthermore, selected observations for each sector are not random. Therefore, only non-parametric tests are available to test statistical significance.

Mann-Whitney U tests were therefore performed for each sector against the national total of their respective countries at 0.95 confidence level[29]. The assumptions of the Mann-Whitney U test were met as follows:

- The dependent variable should be measured on an ordinal scale or a continuous scale. In this case the dependent variable is the home bias metric.
- The independent variable should be two independent, categorical groups. The independent variable is something that categorises the dependent variable. In this case it is the national home bias metric and the sectoral home bias metric.
- Observations should be independent. In other words, there should be no relationship between the two groups or within each group. The sectoral categories can be considered independent since the national aggregates are calculated independently from the sectoral values.

Additionally, confidence levels have been graphed for selected countries to show the median values and their respective ranges, again at the 95% confidence level. This is primarily to facilitate easy consumption of the results.

The null hypothesis is established as "there is no statistically significant difference between a country's national home bias score and that country's sectoral scores". It is set up thusly:

H_0 = *There is no significant difference between sectoral scores and national total.*

H_1 = *There is significant difference between sectoral scores and national total.*

[29] Mann-Whitney U tests were conducted in SPSS.

If the P value is below 0.05, the null hypothesis is rejected in favour of the alternative hypothesis[30]. It should be further noted that each test can only specifically speak for the difference between that country's sector and that country's total, rather than a statement about all sectors versus their national total. However, a summary of these results will be presented.

To provide support and for ease of interpretation, percentage holdings of domestic and foreign equity by each sector for each country for Q4 2018 have been provided for selected countries in the results section and for all relevant countries in the appendix.

7. Results

For 126 Mann-Whitney U tests performed for a country's sector relative to its national total at the 95% confidence level, the null was rejected in 111 of these cases, and accepted in only 15 cases (see Table 2). For eight countries in the study, every sector was statistically different from the national total. In three countries, three sectors were not deemed different from the national total, and this the maximum acceptance of the null hypothesis, therefore implying that there is still a merit in considering sectors differently from national totals. This appears to indicate that there is a statistically significant difference between the sectoral and national home bias metrics, and that such a difference is observable in the vast majority of cases.

Despite the non-parametric tests not being considered as having as much verifiable power as parametric tests, the inferential statistics strongly indicate that the research question is proven, and that sectoral home bias scores are statistically different from national home bias scores. Furthermore, using confidence intervals we can visualise the likelihood that sectors are statistically different from the national totals. I have presented a sample of some of these below.

[30] It should be noted that t-stat values of zero indicate that there is no overlap in the ordinal arrangement of sectoral home bias metrics and national home bias metrics.

Table 2 – Profile of Acceptance and Rejection of Null Hypotheses on per Country Basis

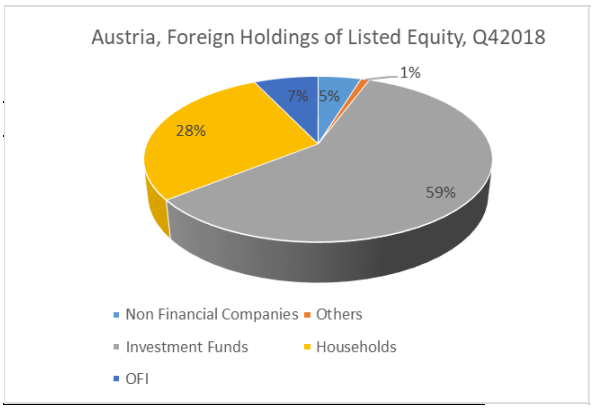
No of Countries	Null rejected	Null accepted
9	7	0
5	6	1
2	5	2
2	4	3
18	111	15

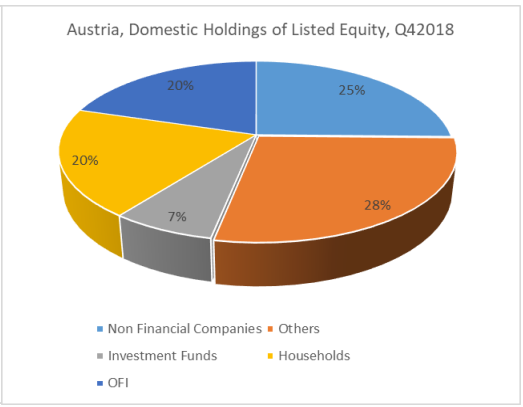
Below are findings for a number of representative countries. A complete list of all descriptive and inferential stats, along with illustrative graphs are found for each country in the Appendix.

Table 3 – Summary of analysis for Austrian home bias measurements

Austria

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.8690	0.0423	0.8053	0.9338	0.8590	0.8294	0.9184	0.2601	-1.3953	0	<0.001
MFI	24	0.6971	0.2579	0.4003	0.9519	0.8903	0.4256	0.9360	-0.1733	-2.1361	264	0.6210
IF	24	0.2435	0.0178	0.2017	0.2743	0.2487	0.2399	0.2547	-0.8422	0.2665	0	<0.001
IC	24	0.9517	0.0098	0.9241	0.9789	0.9524	0.9485	0.9573	-0.1994	3.9332	0	<0.001
HH	24	0.6344	0.0256	0.5832	0.6857	0.6414	0.6191	0.6503	-0.4157	0.0780	25	<0.001
GOV	24	0.9991	0.0012	0.9951	0.9999	0.9996	0.9987	0.9997	-2.0774	4.6915	0	<0.001
OFI	24	0.8874	0.0173	0.8553	0.9244	0.8865	0.8757	0.8957	0.3753	-0.0650	0	<0.001
Total		0.6813	0.0180	0.6553	0.7181	0.6814	0.6665	0.6989	0.3699	-0.9652		





Source: SHSDB and home bias metrics from Appendix.

In respect of Austria we can see the diversity in the aggregate findings with each sector (Table 3). The table shows the descriptive and inferential statistics associated with the

metrics for Austria. In particular, it is of note that the value for investment fund home bias is relatively much lower than all other sectors. It also has a relatively low standard deviation and appears to have a significantly different profile than the other sectors. This considerably lower measurement noted for investment funds can be observed regularly throughout the data, and will be discussed further in analysis. If the P value is in the range of $-0.05 < p < 0.05$, we reject the null and consider it likely that that sector exhibits a different group than the national metric. Thus, we can observe in the case of Austria, that all sectors are statistically different from the national metric, with the exception of MFIs.

We can also graph the confidence intervals to see how likely the relative home bias metric is statistically different from national metric at the 95% level of confidence[31]. Below are a number of graphs displaying medians presented at the 0.95 confidence interval to facilitate a speedy visual analysis of the results for some countries. Each sector (denoted on the X-axis) can be compared to the national total (the right most value on the X-axis). If any overlap exists between the upper and lower bounds of the confidence intervals on the Y-axis (representing the home bias metric) of each sector relative to the total, then the null hypothesis from the Mann-Whitney U test is not rejected, and it cannot be assumed that sector is different from the total. Where there is no overlap, the null has been rejected and there is statistically significant difference implied by the Mann-Whitney U test. In the below graphs the null is rejected for all sectors for Portugal and Italy, not rejected in the case of Insurance Corporations and MFIs for Germany, and not rejected in the case of Banks (MFIs)[32], OFIs and NFCs for Greece. Greece is one of the countries with the lowest amount of rejections for any country in the study, whereas Italy and Portugal are amongst the highest, with full rejection. The relationships between sectors can also be observed in a similar way.

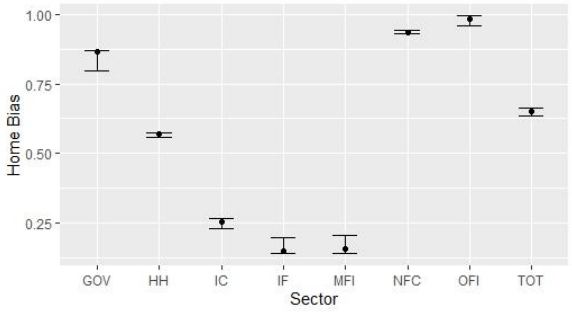
[31] The use of confidence intervals to infer statistical difference is well documented, e.g. Altman & Bland and Bart.

[32] It can be noted from Graph 3 on page 24 that Banks tend to hold only a very small amount of equity in companies. Accordingly, even small movements in holdings over the six-year period can lead to wide confidence intervals, as is observed with Greece.

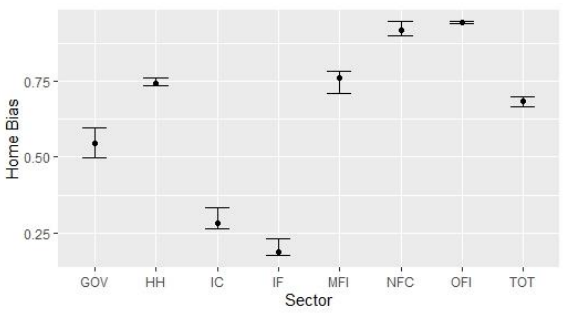
Whilst not formally backed by Mann-Whitney U tests, differences in sectors will be significant at the 0.95 confidence interval if their confidence intervals do not overlap.

Chart 4: Median Values and 0.95 confidence intervals from Mann-Whitney U tests for Selected Countries

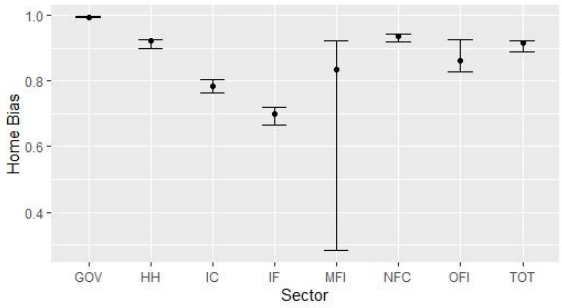
Portugal



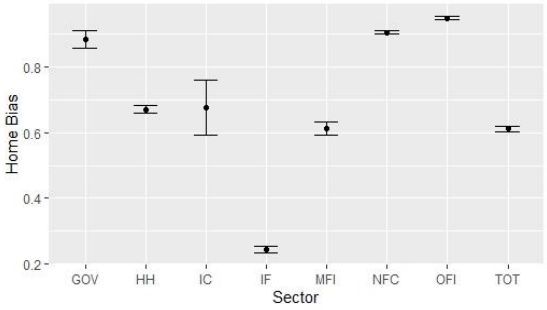
Italy



Greece



Germany



8. ANALYSIS AND DISCUSSION[33]

8.1 National Versus Sectoral Analysis

As stated earlier, almost all extant research on home bias is conducted at the national level, with a few notable exceptions. The main motivation of this research is to examine if national level approaches are the most sensible, or if there would be value in reframing the research to a finer degree of resolution.

The data and hypothesis testing (particularly the Mann-Whitney test from Table 2) strongly imply that measurements conducted at a sectoral level are statistically different from measurements conducted at the national level. This complements the research of Galstyan et al, who found considerable heterogeneity in sectoral holding gravity covariates (see section 2.2.1.2). It is also consistent with the findings of Jochem and Volz, who found heterogeneity on home bias metrics for German sectors, while doing so on a broader scale for multiple countries (***Jochem & Volz***, 2011). As can be seen from the confidence interval graphs from Chart 4, sectors tend to have significantly different medians and ranges from national metrics. This has a potentially profound implication for the manner in which research in this area may be conducted since analysis at the national level appears to cloud more complex underlying realities and dynamics. The author would contend that this presents strong evidence for the reframing of home bias study to a finer degree of granularity.

For example, let us consider for a moment that we wish to examine home bias in Italy. We may gather data and generate a home bias metric. In this case we would generate a mean home bias metric over the six-year period of 0.6899. We may then say that Italy exhibits similar home bias to Spain, which has a metric of 0.7026[34]. However, without the context of sectoral investment we may lead to a false comparability of these results.

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[33] The author chose to present these sections together due to the wide scope of the research. Accordingly, analysis presented and then discussion provided for a number of themes. This is to locate the relative analysis in close proximity to discussion relating to that analysis.

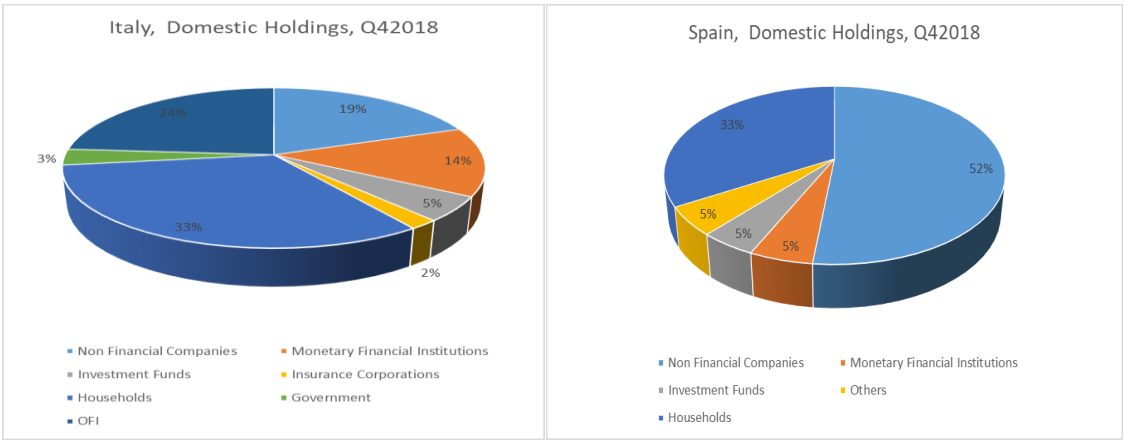
[34] Such comparisons should be performed with caution due to the scaling issues outlined in section 5.1.2.2. However, in this instance a comparison may reasonably be performed due to the relative closeness each country contributes to global market cap at €542 billion for Italy and €632 billion for Spain, as at end 2018 according to the SDW.

To highlight this, we may observe a considerable deviation in the mean and median metrics for non-financial companies for both countries (Italy mean 0.9206, Spain mean, 0.7832) even whilst they experience similar dispersion, with standard deviations of approximately 0.03 (see Table 4). This is further compounded when we consider the degree to which non-financial companies contribute to the national metric for Spain, with 52% of domestic holdings, whereas Italian NFC's account for 19% of holdings (see Chart 5). We may also observe large differences in measures of central tendency for OFI and government and banking sectors. While an initial look at the national metrics may imply similarity, a more granular approach appears to belie substantial heterogeneity in composition and sectoral behaviour.

Table 4 - Select Descriptive Statistics for Italy and Spain Home Bias Metrics

	Italy					Spain				
	Mean	**Std. Dev**	**Min**	**Max**	**Median**	**Mean**	**Std. Dev**	**Min**	**Max**	**Median**
NFC	0.9206	0.0341	0.8543	0.9724	0.9177	0.7832	0.0298	0.7290	0.8343	0.7795
Banks	0.7564	0.0497	0.6919	0.8456	0.7609	0.3776	0.0527	0.2958	0.5764	0.3702
IF	0.2024	0.0331	0.1620	0.2572	0.1879	0.2875	0.0338	0.2065	0.3424	0.2850
IC	0.3060	0.0564	0.2390	0.4076	0.2827	0.4951	0.0445	0.4013	0.5456	0.5159
HH	0.7468	0.0373	0.6850	0.8171	0.7421	0.9476	0.0071	0.9314	0.9567	0.9486
Gov	0.5501	0.0651	0.4447	0.6563	0.5453	1.0000	0.0001	0.9997	1.0000	1.0000
OFI	0.9414	0.0067	0.9288	0.9552	0.9406	0.5198	0.1380	0.3275	0.7039	0.5726
Total	0.6899	0.0367	0.6372	0.7634	0.6850	0.7026	0.0310	0.6572	0.7576	0.6922

Chart 5: Percentage Domestic Holding of Listed Equity by Sector, Italy and Spain, Q4 2018



Source:SHSDB

Nonetheless, there are a few caveats to the recommendation that sectoral analysis is superior to national analysis. The study has been conducted exclusively on the developed countries, and similar behaviour may not be observed for emerging markets. Additionally, while the decision to study at the sectoral level appears to be validated by the findings, it may not be the only way to study the phenomenon at a higher resolution. For example, with advances in data and data science, there may be other ways to categorise investors, such as by scale of investment (e.g. small, medium or large), number of holdings, or even on an individual basis.

8.2 Heterogeneity in Sectors and Countries

Looking at select descriptive statistics for measurements for all countries, we can observe a wide range of variations between sectors in the different countries of the study group (see Table 5). While these data can be instructive in showing the dispersion of values, the table should be approached with caution, as results for countries are not generally comparable due to scaling issues identified in Methodology section on page 29, and as considerable variation exists in the contribution of each sector to their respective national scores (see Graph 3, page 19).

Information is presented at the 10^{th} and 90^{th} percentiles on account of outliers that may skew the data. For example, some smaller countries have negligible sectoral equity holdings and all 24 of their home bias metrics for a given sector may be thus zero or one. This is particularly relevant for government holdings, which tend to be completely domestic, or to have no holdings at all, and for insurance corporation holdings for certain economies, such as Slovakia and Latvia, which tend to have no recorded equity holdings of listed companies.

Table 5 – Descriptive Statistics on Home Bias Metrics for Sectors of all 18 countries

	10th percentile	*90th percentile*	*Average*	*Std. Dev.*
GOV	0.02566	1.00000	0.73997	0.36782
HH	0.13377	0.90767	0.59934	0.27253
IC	0.00668	0.91781	0.47590	0.31116
IF	0.01155	0.41852	0.16829	0.17428
MFI	0.00748	0.88487	0.42473	0.31590
NFC	0.31819	0.96499	0.75512	0.27078
OFI	0.06022	0.96576	0.62927	0.32845
TOT	0.02165	0.83575	0.49927	0.29607

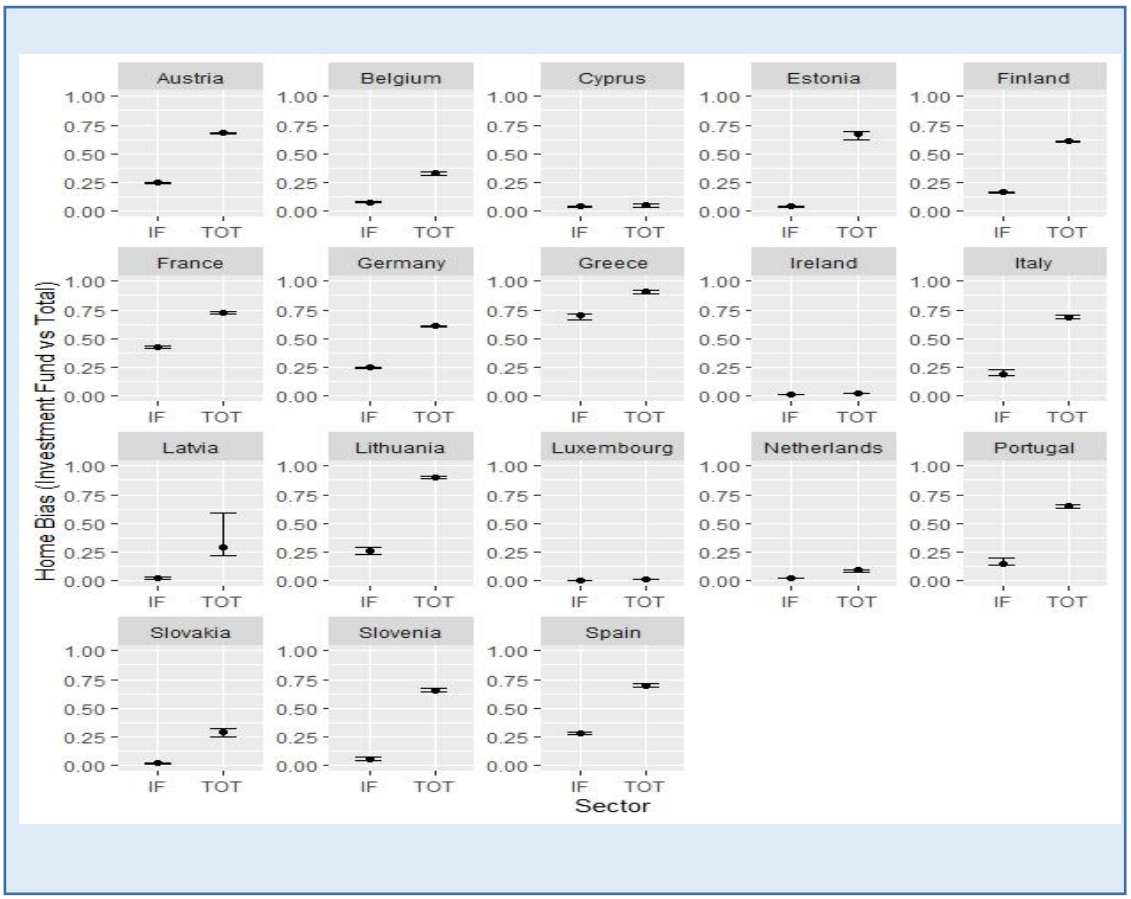
Source: Home bias metrics recorded in Appendix.

Again, these findings appear to support earlier research by Galstyan et al and Jochem and Volz (Galstyan & Velic, 2018) (Jochem & Volz, 2011).

8.3 Investment Funds as a Distinct Group

From Graph 3, we note that investment funds account for half of all investment in equity in the euro area. However, investment funds display consistently lower home bias metrics relative to their national metrics for every country in the study, (with the exception of Ireland and Luxembourg, where investment funds account for over 93% and 87% of equity ownership respectively, and therefore dominate the national home bias metrics, see Graph 3, page 19). While it is unsurprising that international investment vehicles managed by professional portfolio managers may be more internationally diversified, it nonetheless infers that the most significant contributory sector to the national home bias metric has a consistent and observably different behaviour in respect of its domestic investment. Also, we can note that countries with very large investment fund sectors have considerably lower national home bias metrics, e.g. Ireland, Luxembourg and The Netherlands. When considering the scale of home bias on a national level, it would seem appropriate to consider the size of the investment fund sector. This appears to support the goal of the current research to indicate that analysis of home bias may be better conducted at a finer degree of resolution.

Chart 6: Comparison of Median and Home Bias metrics at 0.95 Confidence Intervals for Investment Funds and Total for 18 Countries, 2014-2019



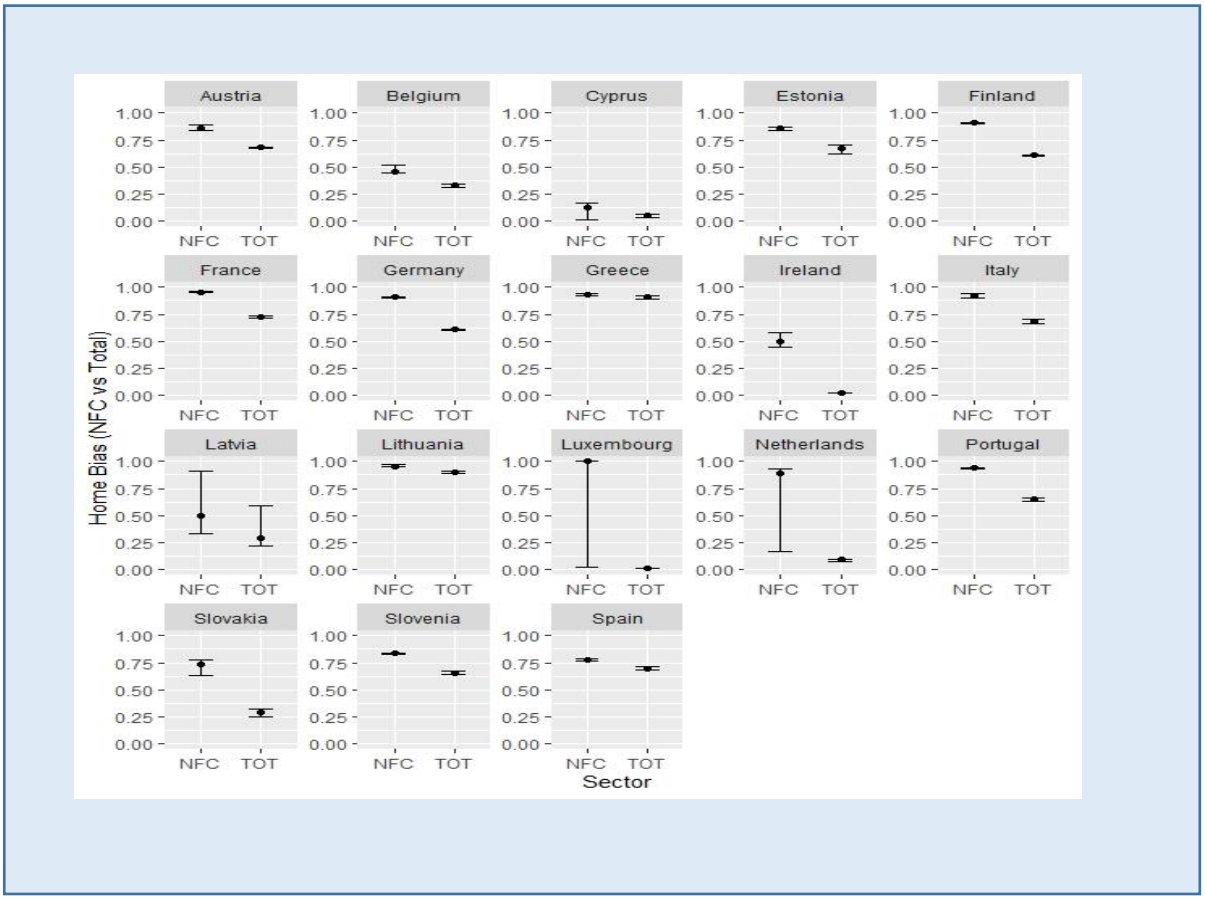
Source: Home bias metrics in Appendix.

8.4 Non-Financial Companies as a Distinct Group

Whilst investment funds display noticeably less home bias, non-financial companies display the opposite behaviour and have consistently higher home bias metrics (see Chart 7). This finding, coupled with that of 8.2, relating to investment funds, may be considered significant, since together they form the two largest contributors to national metrics, yet display behaviour that tends to influence that national metric in opposite directions. Again, this finding reinforces the value of examining home bias at the sectoral level, since more complex dynamics underpin the national home bias metric.

However, the finding is limited in its explicatory power. The research cannot indicate what reasons or motivations underpin the observation in respect of non-financial companies, and further investigation would be needed to ascertain this.

Chart 7 – Comparison of Median and Home Bias metrics at 0.95 Confidence Intervals for Investment Funds and Total for 18 Countries, 2014-2019



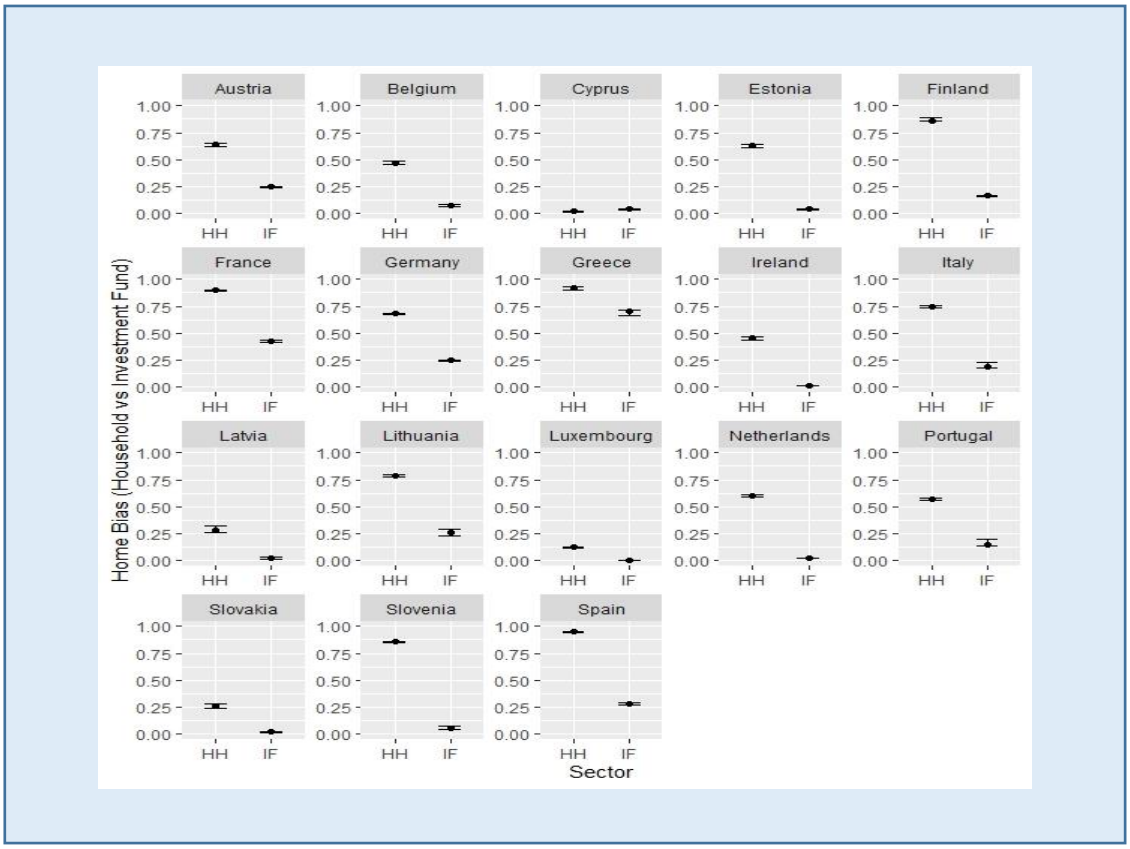
Source: Home bias metrics in Appendix

8.5 Obstacles to External Investment

The findings may be considered in respect of some of the theories which seek to explain home bias in the literature review. In section 2.2.3.2, the author reviewed theories on obstacles to external investment such as information asymmetries (including increased cost of obtaining information, and lower quality of signals relating to foreign stocks). It is not unreasonable to assume that professional portfolio managers have increased access to information and reduced transaction costs based

on economies of scale and available resources, particularly compared to households and non- financial companies[35]. We can also see from Chart 8 that investment funds display considerably less home bias than households, in 17 of 18 countries. While certainly not enough to prove this theory, it does lend credible observations that are consistent with the theory. We can also observe with confidence that household investors and investment funds also display observably different trends in domestic investment, with households exhibiting a pattern of higher home bias.

Chart 8 Comparison of Median and home bias metrics at confidence intervals for Investment Funds and Total for 18 Countries, 2014-2019



Source: Home bias metrics in appendix

[35] Nonetheless, this is an assumption and further research would be required to determine comprehensively that investment funds do in fact face reduced obstacles and information asymmetries.

While this research has set out to prove that there is value in examining home bias at the sectoral level, it also has a number of limitations. Firstly, the metrics are designed for comparability of sectors within a country to that country's total, while the metrics indicate location on a continuum, absolute scores should be considered as indicators rather than directly comparable values.

8.6 Measurement Methods

The use of the ICAPM method has been justified in section 6.1.2.4 and is appropriate to the specific aim of this research, i.e. to compare sectoral home bias metrics to national home bias metrics, and to attempt to establish sectoral tendencies and relationships in respect of domestic investment. However, it is clear that such a metric is also to be approached with caution for comparison between countries and as a tool for fully understanding home bias.

In order to further progress the findings of this research, i.e. that there is value in conducting home bias research at the sectoral level, it is important to abstract the reasons why research in home bias has attracted so much interest. The author would contend that the field of home bias research has been conducted primarily to understand if/why investors are not capitalising on implied international diversification benefits, particularly in a world of increased information flow and accessibility. However, it would seem that such a question cannot be answered without recourse to an accurate calculation of potential return gains and diversification benefits *that accrue to the investor*, and ICAPM does not provide this in a convincing way (***Mishra***, 2015) (***Cooper, et al.***, 2018).

By suggesting that an investor should hold the world market portfolio in proportion of the national contribution made by each country ignores potential covariance and expected return implications between countries. While the mean-variance approach attempts to tackle the covariance issue, it fails to take account the complexity of the actual portfolio held by a given country, instead comparing the national index to other

national indices (***Cooper, et al.***, 2018). Assuming that a domestic investor achieves the returns of their domestic stock index appears an oversimplification.

The author would argue that in order for such measurements to be robust they should be conducted on a granular analysis of the return and volatility characteristics of the actual stocks that comprise the portfolio held by sector of each country and how that portfolio differs from available international diversification as proposed by Cooper et al using the Covar-W methodology. While such calculations would be significantly more complex, they also appear to be significantly more meaningful, as they directly measure diversification and returns benefits with direct reference to the actual portfolio holdings [36].

Accordingly, a future avenue of research would be to attempt to recreate the home bias measurements using the Covar-W methodology, though adapted exclusively to home bias, though it is likely that such research would need to be conducted on a smaller scope due to the increased complexity.

8.7 Additional Comments

Much of the theory around home bias relates to behavioural factors that influence investor choice. However, this research offers no data on motivations. Therefore, while we may infer behaviours from the observations and metrics, we cannot offer robust comment on the motivations or biases that drive such behaviours. The author is of the opinion that such considerations are necessary to understand why home bias persists. Therefore, this style of study would need to be further reinforced by analysis which analyses biases that drive behaviours at the sectoral level.

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[36] Due to advances in the availability of data, such calculations may be possibly performed using the SHSDB in combination with the Centralised Securities Database maintained by the ECB. The Centralised Securities Database contains monthly information on market prices for ISIN coded securities for over 7 million instruments. Such calculations could therefore be performed on an ISIN-by-ISIN basis, since SHSDB coverage is mostly recorded by ISIN. This may afford reasonably accurate calculations, as monthly price movements in directly held stocks could be calculated, together with market value trades in each position on a quarterly basis. While actual profit or loss on traded positons would not be possible to calculate, this would appear to yield significantly improved accuracy. Further research is needed.

However, the research may indicate that such an analysis of behavioural factors conducted at a sectoral level could provide insight, and so it may offer avenues of further research by conducting behavioural analysis at the sectoral level.

9. CONCLUSION

Almost all researchers acknowledge the persistence of home bias and the difficulty to fully understand or explain the phenomenon. The author's view is that home bias has proven to be a consistently inaccessible to explanation partly because it is a complex interplay of market forces and human behaviour, and partly because research has been restricted from looking in the right places by availability of data. Such data restrictions are diminishing, and in order to properly understand the phenomenon, there may a benefit in reframing the home bias research to a finer degree of resolution, specifically that of economic sectors.

The research has measured national and sectoral home bias for a broad range of European countries and demonstrated that there is considerable heterogeneity among sectors and that there appears to be a valid argument for this approach. It has used inferential statistics to demonstrate that sector metrics are statistically different from national metrics.

Furthermore, it has demonstrated behaviour by the two largest sectors that consistently deviates from national metrics in specific directions, i.e. investment funds displaying lower home bias metrics and non-financial companies displaying higher metrics. This research strongly supports and reinforces recent findings by Galstyan et al and Jochem and Volz, that sectoral analysis of home bias yields heterogeneous results and that sectoral analysis is necessary to adequately explain home bias behaviour (Jochem & Volz, 2011) (Galstyan & Velic, 2018).

These findings direct further research. Non-financial companies demonstrate higher home bias relative to other groups. Is such behaviour driven by rational choices, or should policy be directed at informing non-financial companies to diversify internationally? Home bias still has many unanswered aspects, but looking at a finer degree of resolution may equip researchers to access such answers.

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Appendix

Definition of Sectors- Source Central Bank of Ireland Statistics

Sector		Definition
MFI	Monetary Financial Institutions	The deposit-taking corporations, excluding the central bank, sector includes all financial corporations and quasi-corporations, except those classified in the central bank and in the MMF sub-sectors, which are principally engaged in financial intermediation and whose business is to receive deposits and/or close substitutes for deposits from institutional units, hence not only from MFIs, and, for their own account, to grant loans and/or to make investments in securities. The following financial intermediaries are classified in this sector: • commercial banks, 'universal' banks, 'all-purpose' banks; • savings banks (including trustee savings banks and savings banks and loan associations); • post office giro institutions, post banks, giro banks; • rural credit banks, agricultural credit banks; • cooperative credit banks, credit unions; • specialised banks (e.g. merchant banks, issuing houses, private banks); and • electronic money institutions principally engaged in financial intermediation.
GOV	Government	The central government subsector consists of the institutional unit or units making up the central government plus those non-market Non Profit Institutions ("NPIs") that are controlled by central government. The political authority of central government extends over the entire

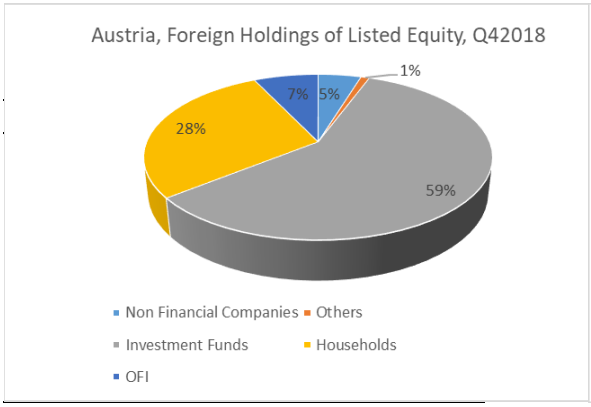
		territory of the country. Central government has therefore the authority to impose taxes on all resident and non-resident units engaged in economic activities within the country. Its political responsibilities include national defence, the maintenance of law and order and relations with foreign governments. It also seeks to ensure the efficient working of the social and economic system by means of appropriate legislation and regulation. It is responsible for providing collective services for the benefit of the community as a whole, and for this purpose incurs expenditures on defence and public administration. In addition, it may incur expenditures on the provision of services, such as education or health, primarily for the benefit of individual households. Finally, it may make transfers to other institutional units, namely to households, Non Profit Institutions, corporations and other levels of government. This includes all general government subsectors including: • Local Government • State Government • Social Security Funds
OFI	Other Financial Intermediaries	The other financial intermediaries sector, excluding insurance corporations and pension funds and investment funds, consists of all financial corporations and quasi-corporations who are principally engaged in financial intermediation by incurring liabilities in forms other than currency, deposits, or investment fund shares, or in relation to insurance, pension and standardised guarantee schemes from institutional units. The OFI Sector also includes Financial vehicle corporations (FVC) are entities that undertake or intend to undertake securitisation transactions and are insulated from the risk of bankruptcy or any other default of the originator. An FVC issues, or intends to issue, securities, securitisation fund units, other debt instruments and/or financial derivatives and/or legally or

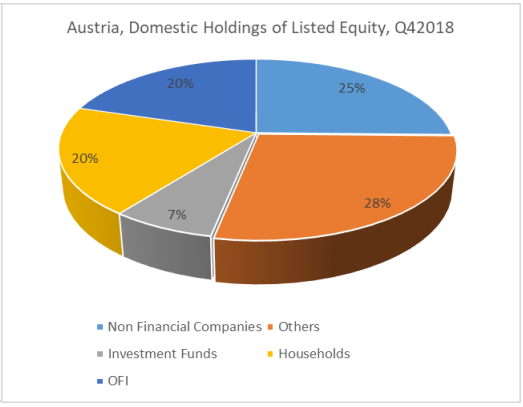
		economically owns, or may own, assets underlying the issue of securities, securitisation fund units, other debt instruments and/or financial derivatives that are offered for sale to the public or sold on the basis of private placements.
ICPF	Insurance Corporations and Pension Funds	The insurance corporations sector consists of all financial corporations and quasi-corporations who are principally engaged in financial intermediation as the consequence of the pooling of risks mainly in the form of direct insurance or reinsurance. Insurance corporations provide the following services: • life and non-life insurance to individual units or groups of units; • reinsurance to other insurance corporations. The pension funds sector consists of all financial corporations and quasi-corporations who are principally engaged in financial intermediation as the consequence of the pooling of social risks and needs of the insured persons (social insurance). Pension funds as social insurance schemes provide income in retirement, and often benefits for death and disability. This sector consists of only those social insurance pension funds that are institutional units separate from the units that create them. Such autonomous funds have autonomy of decision and keep a complete set of accounts. Non-autonomous pension funds are not institutional units and remain part of the institutional unit that sets them up.

NFC	Non-Financial Corporations	The non-financial corporations sector consists of institutional units which are independent legal entities, and market producers, and whose principal activity is the production of goods and non-financial services. The non-financial corporations sector also includes non-financial quasi-corporations.
IF	Investment Funds (excl. MMFs)	The non-MMF investment funds sector consists of all collective investment schemes, except those classified in the MMF sub-sector, which are principally engaged in financial intermediation. Their business is to receive from institutional units, issue investment fund shares or units which are not close substitutes for deposits, and, on their own account, to make investments primarily in financial assets other than short-term financial assets and in non-financial assets. Non-MMF investment funds cover investment trusts, unit trusts and other collective investment schemes whose investment fund shares or units are not seen as close substitutes for deposits.
HHS	**Households (including Non-profit institutions serving households)**	The households sector consists of individuals or groups of individuals as consumers and as entrepreneurs producing market goods and non-financial and financial services (market producers), provided that the production of goods and services is not by separate entities treated as quasi-corporations. It also includes individuals or groups of individuals as producers of goods and non-financial services for exclusively own final use. The non-profit institutions serving households (NPISHs) sector consists of non-profit institutions which are separate legal entities, which serve households and which are private non-market producers. Their principal resources are voluntary contributions in cash or in kind from households in their capacity as consumers, from payments made by general governments and from property income.

Austria

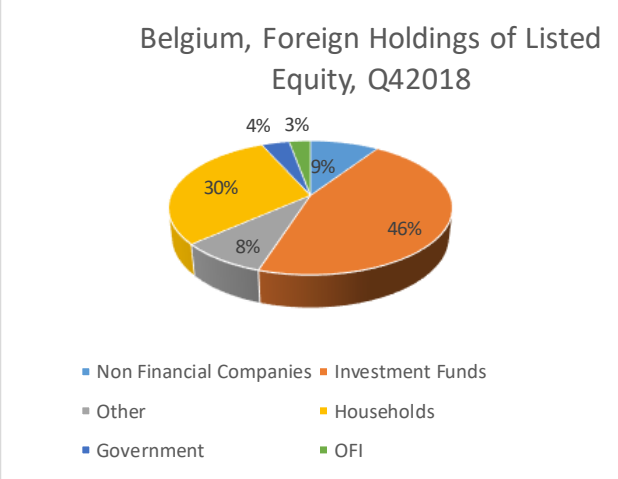
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.8690	0.0423	0.8053	0.9338	0.8590	0.8294	0.9184	0.2601	-1.3953	0	<0.001
MFI	24	0.6971	0.2579	0.4003	0.9519	0.8903	0.4256	0.9360	-0.1733	-2.1361	264	0.6210
IF	24	0.2435	0.0178	0.2017	0.2743	0.2487	0.2399	0.2547	-0.8422	0.2665	0	<0.001
IC	24	0.9517	0.0098	0.9241	0.9789	0.9524	0.9485	0.9573	-0.1994	3.9332	0	<0.001
HH	24	0.6344	0.0256	0.5832	0.6857	0.6414	0.6191	0.6503	-0.4157	0.0780	25	<0.001
GOV	24	0.9991	0.0012	0.9951	0.9999	0.9996	0.9987	0.9997	-2.0774	4.6915	0	<0.001
OFI	24	0.8874	0.0173	0.8553	0.9244	0.8865	0.8757	0.8957	0.3753	-0.0650	0	<0.001
Total		0.6813	0.0180	0.6553	0.7181	0.6814	0.6665	0.6989	0.3699	-0.9652		

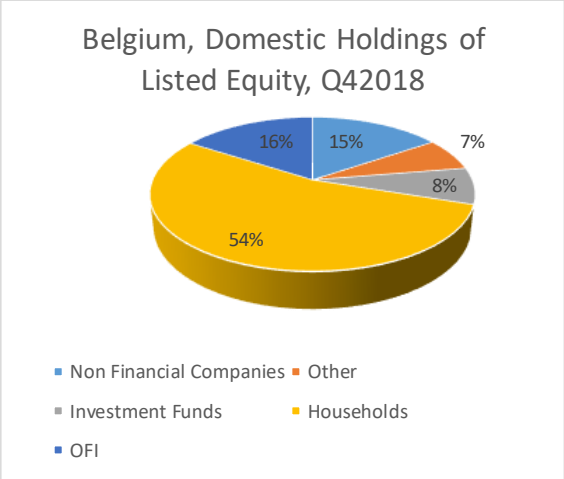




Belgium

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.4915	0.0791	0.3923	0.6718	0.4558	0.4404	0.5445	1.0892	0.3432	0	<0.001
MFI	24	0.3558	0.1529	0.1235	0.5573	0.3718	0.2253	0.5154	-0.1373	-1.3940	231	0.2400
IF	24	0.0761	0.0133	0.0556	0.1029	0.0726	0.0673	0.0863	0.5859	-0.4550	0	<0.001
IC	24	0.2409	0.0452	0.1604	0.3233	0.2400	0.2095	0.2644	0.1896	-0.6644	23	<0.001
HH	24	0.4738	0.0176	0.4504	0.5016	0.4676	0.4581	0.4916	0.3569	-1.5584	0	<0.001
GOV	24	0.0387	0.0259	0.0032	0.0903	0.0413	0.0171	0.0578	0.2379	-1.0591	0	<0.001
OFI	24	0.7163	0.0389	0.6498	0.7833	0.7182	0.6892	0.7423	0.1372	-0.8520	0	<0.001
Total		0.3308	0.0214	0.3008	0.3721	0.3306	0.3127	0.3491	0.2737	-0.9502		





Cyprus

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
Non Fir	24	0.0997	0.0865	0.0058	0.2542	0.1200	0.0114	0.1780	0.1768	-1.6446	250	0.4330
Monetа	24	0.7526	0.1444	0.1926	0.9270	0.7432	0.7152	0.8298	-2.4678	9.7834	0	<0.001
Investr	24	0.0423	0.0185	0.0214	0.0862	0.0377	0.0270	0.0503	1.0974	0.5268	253	0.4700
Insuran	24	0.4870	0.1196	0.1797	0.5842	0.5207	0.4946	0.5529	-2.1083	3.3030	0	<0.001
Househ	24	0.0206	0.0111	0.0087	0.0647	0.0175	0.0148	0.0226	2.9211	######	72	<0.001
OFI	24	0.0350	0.0215	0.0010	0.0693	0.0422	0.0136	0.0496	-0.2685	-1.2835	193	0.0500
Total	24	0.0454	0.0186	0.0157	0.0712	0.0533	0.0266	0.0601	-0.3659	-1.5483		

Graphs omitted due to potential confidentiality issues.

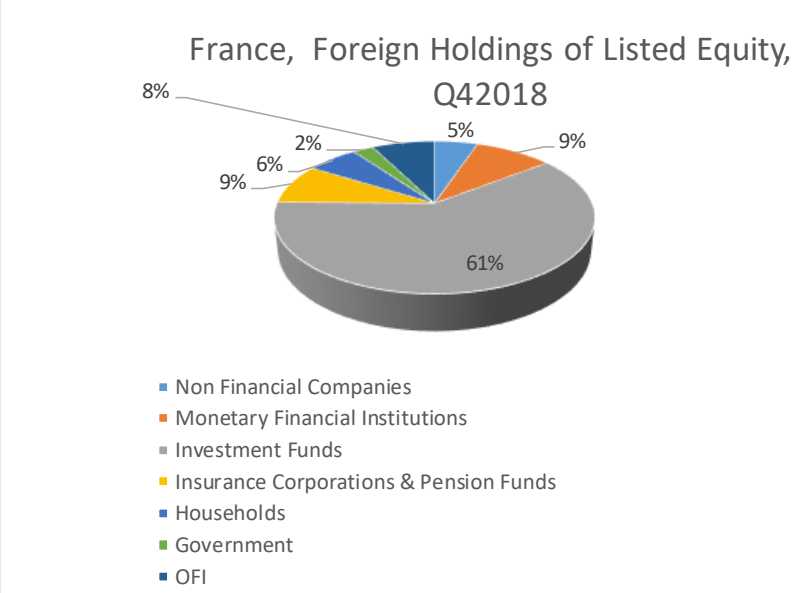
Estonia

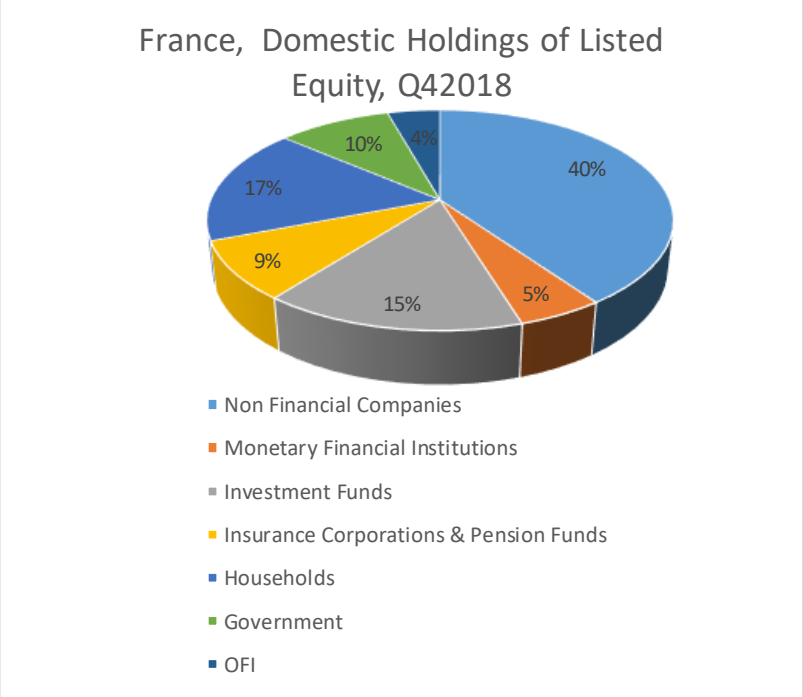
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.8181	0.1065	0.5787	0.8896	0.8625	0.8390	0.8741	-1.8244	1.6183	79	<0.001
MFI	24	0.7951	0.1846	0.1657	0.9433	0.8638	0.7650	0.9138	-2.1475	5.1209	100	<0.001
IF	24	0.0373	0.0185	0.0000	0.0581	0.0425	0.0353	0.0493	-1.3111	0.6435	0	<0.001
IC	24	0.8457	0.0618	0.7633	0.9709	0.8507	0.7792	0.8664	0.5755	0.1269	0	<0.001
HH	24	0.6269	0.0195	0.5901	0.6622	0.6325	0.6126	0.6413	-0.1578	-0.7335	189	0.0410
GOV	24	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000			0	<0.001
OFI	24	0.7226	0.0594	0.6372	0.8136	0.7047	0.6778	0.7899	0.2597	-1.4893	148	0.0040
Total		0.6108	0.0191	0.5727	0.6515	0.6119	0.6004	0.6209	0.0097	0.1052		

Graphs due to potential confidentiality issues.

France

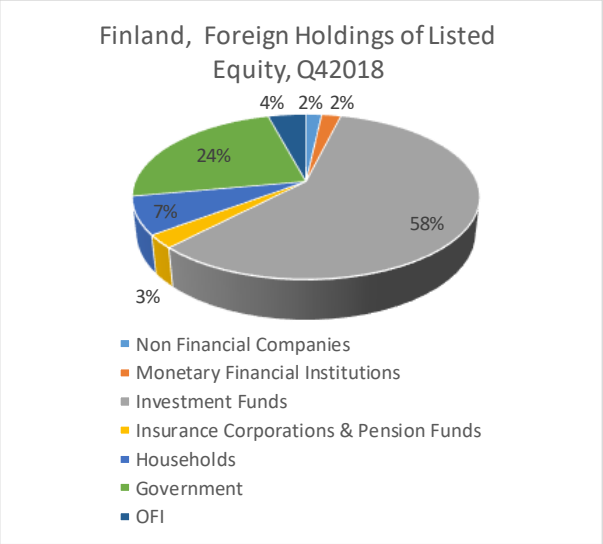
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9551	0.0086	0.9421	0.9699	0.9534	0.9479	0.9625	0.1592	-1.4043	0	<0.001
MFI	24	0.5723	0.0535	0.4697	0.6788	0.5632	0.5345	0.6190	0.0655	-0.8408	0	<0.001
IF	24	0.4268	0.0195	0.3942	0.4620	0.4227	0.4146	0.4425	0.3649	-0.8141	0	<0.001
IC	24	0.7518	0.0162	0.7255	0.7824	0.7467	0.7390	0.7669	0.2894	-1.1400	126	0.0010
HH	24	0.8961	0.0037	0.8884	0.9032	0.8964	0.8937	0.8985	-0.2599	-0.2637	0	<0.001
GOV	24	0.9080	0.0123	0.8897	0.9267	0.9077	0.8975	0.9185	-0.0209	-1.3414	0	<0.001
OFI	24	0.5910	0.0710	0.4242	0.7186	0.6041	0.5473	0.6418	-0.3231	-0.2003	9	<0.001
Total		0.6108	0.0191	0.5727	0.6515	0.6119	0.6004	0.6209	0.0097	0.1052		

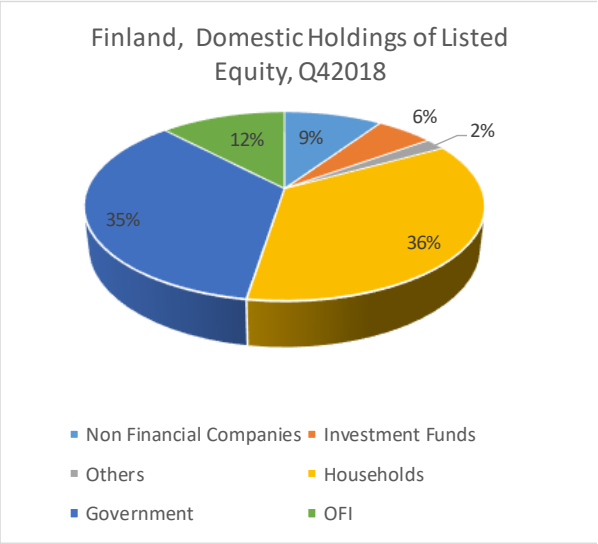




Finland

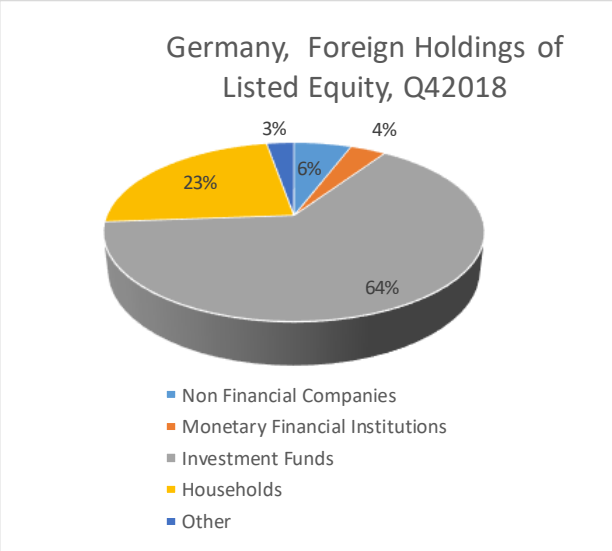
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9101	0.0122	0.8892	0.9383	0.9110	0.9028	0.9167	0.2914	0.0836	0	<0.001
MFI	24	0.6274	0.6209	-0.0561	2.7769	0.6002	0.1175	0.8618	1.8516	5.4217	274	0.7730
IF	24	0.1657	0.0090	0.1499	0.1892	0.1640	0.1595	0.1707	0.5854	0.8580	0	<0.001
IC	24	0.5405	0.0522	0.4623	0.6262	0.5374	0.4941	0.5829	0.4173	-1.1333	86	<0.001
HH	24	0.8757	0.0238	0.8511	0.9096	0.8632	0.8573	0.9061	0.5666	-1.6096	0	<0.001
GOV	24	0.7122	0.0389	0.6327	0.7706	0.7140	0.7023	0.7384	-0.5471	-0.1926	20	<0.001
OFI	24	0.5145	0.1766	0.3525	0.8542	0.4461	0.3959	0.4981	1.3157	0.0550	9	<0.001
Total		0.6200	0.0280	0.5936	0.6781	0.6124	0.6035	0.6162	1.2757	0.0954		

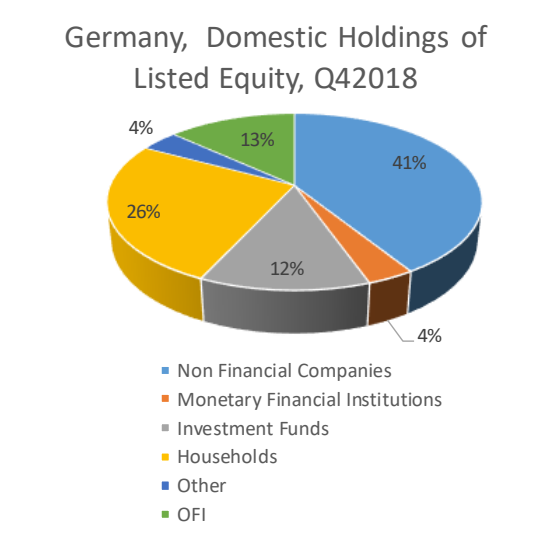




Germany

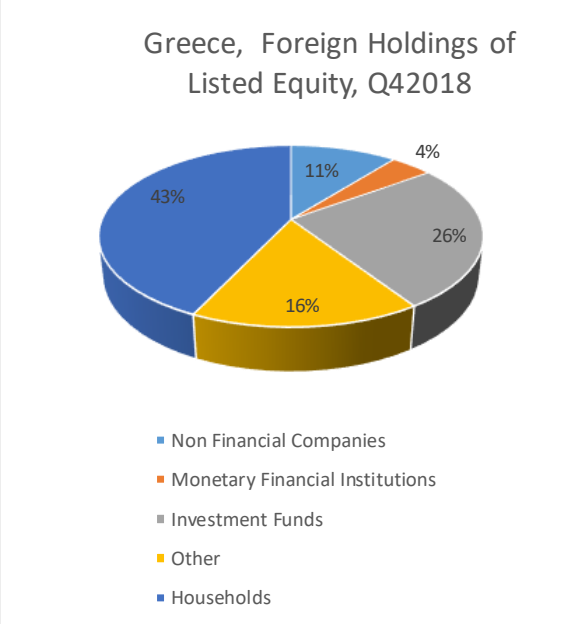
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9052	0.0122	0.8711	0.9206	0.9066	0.9004	0.9120	-1.3863	2.1132	0	<0.001
MFI	24	0.6132	0.0455	0.5506	0.7208	0.6062	0.5790	0.6315	0.7642	0.0402	269	0.6950
IF	24	0.2434	0.0249	0.1914	0.2941	0.2491	0.2382	0.2543	-0.4746	0.3817	0	<0.001
IC	24	0.6768	0.1989	0.3029	0.8809	0.7427	0.4820	0.8408	-0.6388	-1.1850	192	0.0510
HH	24	0.6708	0.0291	0.6104	0.7058	0.6805	0.6581	0.6921	-1.0101	-0.2149	37	<0.001
GOV	24	0.8848	0.0601	0.7716	0.9431	0.9165	0.8332	0.9369	-0.6395	-1.2287	0	<0.001
OFI	24	0.9493	0.0159	0.9269	0.9844	0.9454	0.9386	0.9655	0.5262	-0.6167	0	<0.001
Total		0.6108	0.0191	0.5727	0.6515	0.6119	0.6004	0.6209	0.0097	0.1052		

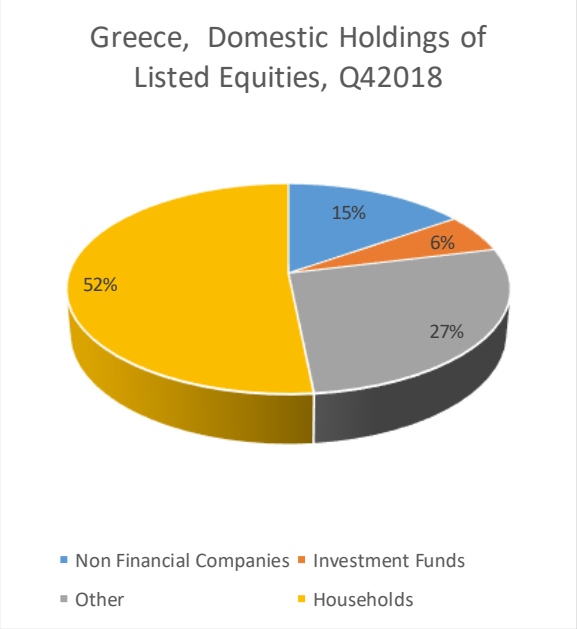




Greece

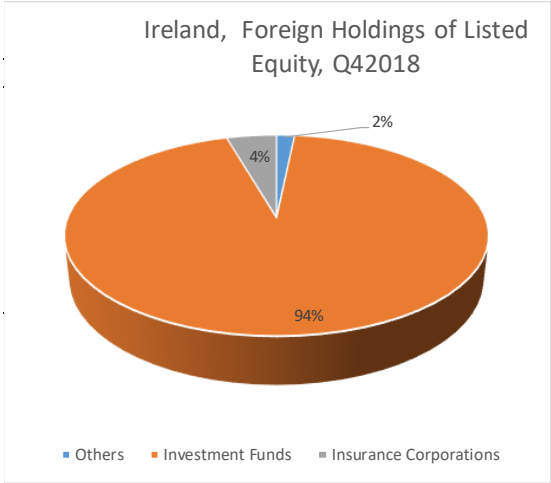
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9361	0.0241	0.9017	0.9778	0.9359	0.9149	0.9610	0.1993	-1.2152	112	<0.001
MFI	24	0.6369	0.3467	0.1357	0.9760	0.8328	0.2451	0.9355	-0.5344	-1.6677	227	0.2080
IF	24	0.6762	0.0660	0.5288	0.7570	0.7000	0.6559	0.7224	-1.1286	0.2382	18	<0.001
IC	24	0.7873	0.0509	0.6906	0.8927	0.7822	0.7547	0.8155	0.3163	-0.0832	74	<0.001
HH	24	0.8991	0.0456	0.7758	0.9349	0.9221	0.8962	0.9275	-1.8299	2.4919	227	0.2080
GOV	24	0.9948	0.0028	0.9911	1.0000	0.9945	0.9927	0.9958	0.8787	-0.1299	0	<0.001
OFI	24	0.8628	0.1020	0.6760	0.9990	0.8619	0.8174	0.9618	-0.3907	-0.8693	257	0.5230
Total		0.8814	0.0680	0.6925	0.9324	0.9148	0.8726	0.9237	-1.7612	2.2127		

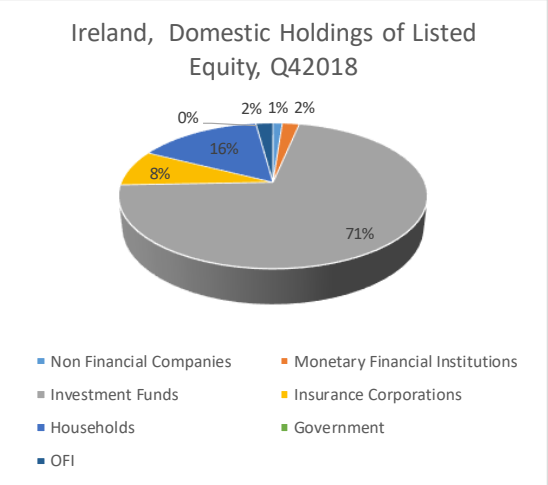




Ireland

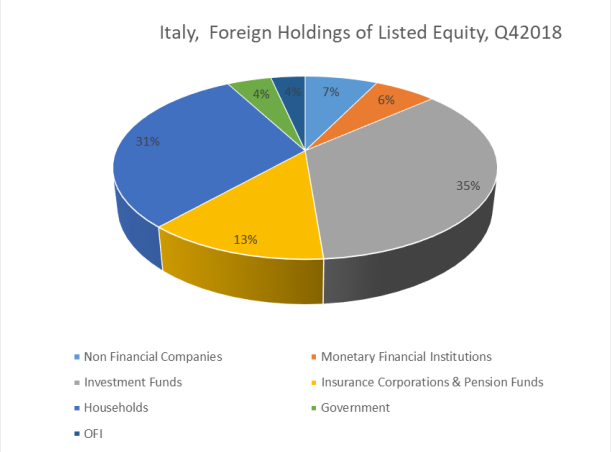
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.5094	0.0867	0.3632	0.6425	0.5003	0.4436	0.5912	-0.1437	-1.3067	0	<0.001
MFI	24	0.0805	0.0652	-0.0111	0.2507	0.0627	0.0453	0.0963	1.1501	1.0860	72	<0.001
IF	24	0.0130	0.0024	0.0081	0.0172	0.0137	0.0114	0.0146	-0.4055	-0.3842	5	<0.001
IC	24	0.0820	0.0592	0.0359	0.2215	0.0519	0.0408	0.0970	1.4525	0.8679	0	<0.001
HH	24	0.4354	0.0701	0.2635	0.5054	0.4540	0.4270	0.4763	-1.6382	2.0153	0	<0.001
GOV	24	0.2883	0.2737	0.0187	0.6280	0.2524	0.0233	0.5690	0.0667	-2.0873	55	<0.001
OFI	24	0.2047	0.1515	0.0434	0.4731	0.1340	0.0761	0.3180	0.7331	-1.0235	0	<0.001
Total		0.0201	0.0022	0.0152	0.0243	0.0204	0.0185	0.0217	-0.4373	-0.0913		

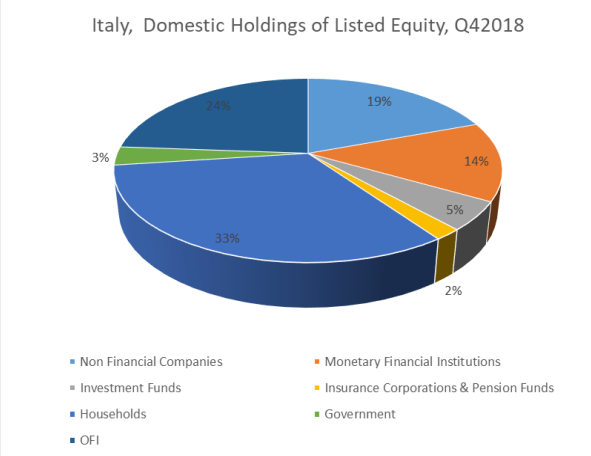




Italy

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9206	0.0341	0.8543	0.9724	0.9177	0.8947	0.9514	0.0131	-1.1155	0	<0.001
MFI	24	0.7564	0.0497	0.6919	0.8456	0.7609	0.7079	0.7900	0.2746	-1.2787	75	<0.001
IF	24	0.2024	0.0331	0.1620	0.2572	0.1879	0.1754	0.2365	0.2118	-1.7629	0	<0.001
IC	24	0.3060	0.0564	0.2390	0.4076	0.2827	0.2604	0.3543	0.4785	-1.2078	0	<0.001
HH	24	0.7468	0.0373	0.6850	0.8171	0.7421	0.7243	0.7749	0.1325	-0.5981	83	<0.001
GOV	24	0.5501	0.0651	0.4447	0.6563	0.5453	0.4950	0.6039	0.1182	-1.3443	8	<0.001
OFI	24	0.9414	0.0067	0.9288	0.9552	0.9406	0.9377	0.9464	0.0361	-0.4412	0	<0.001
Total		0.6899	0.0367	0.6372	0.7634	0.6850	0.6614	0.7186	0.5300	-0.5723		





Latvia

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.5986	0.2752	0.3105	0.9411	0.4956	0.3288	0.9315	0.2911	-1.8250	140	0.0020
MFI	24	0.0787	0.0610	0.0030	0.2227	0.0718	0.0447	0.0932	0.9139	0.6422	14	<0.001
IF	24	0.0465	0.0595	0.0092	0.1758	0.0176	0.0110	0.0336	1.5145	0.5005	0	<0.001
IC	24	0.6860	0.4558	0.0000	1.0000	1.0000	0.1550	1.0000	-0.7861	-1.4692	192	0.0440
HH	24	0.3607	0.1645	0.1934	0.6541	0.2803	0.2430	0.5824	0.8856	-1.1022	285	0.9510
GOV	24	1.0000	0.0002	0.9994	1.0000	1.0000	1.0000	1.0000	-3.2386	9.3403	0	<0.001
OFI	24	0.3463	0.2764	0.0139	0.9633	0.2414	0.2110	0.4584	1.1554	0.7712	245	0.3750
Total		0.4129	0.2363	0.1843	0.8019	0.2861	0.2177	0.6566	0.5968	-1.5386		

Charts omitted due to potential confidentiality breaches.

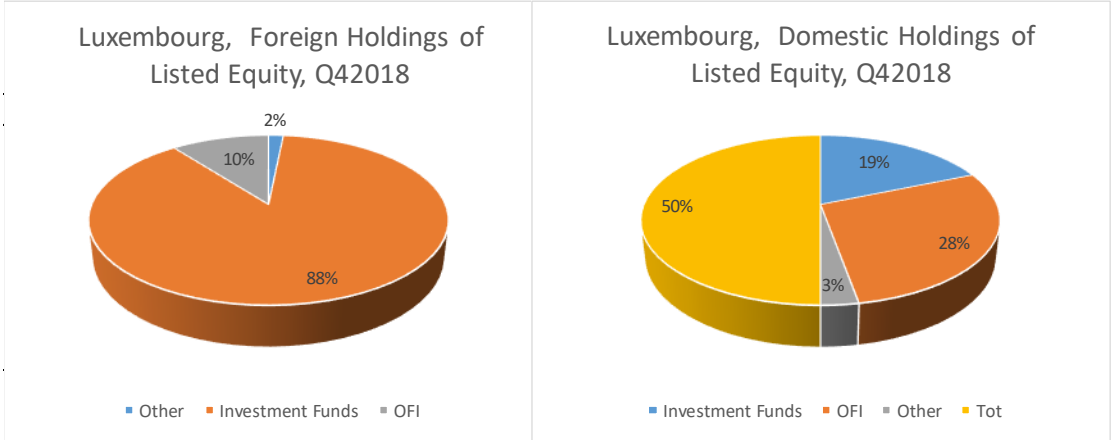
Lithuania

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.9620	0.0169	0.9342	0.9871	0.9571	0.9475	0.9753	0.2927	-1.1736	1	<0.001
MFI	24	0.5401	0.3043	0.0809	0.9423	0.6551	0.1523	0.7836	-0.4402	-1.3055	54	<0.001
IF	24	0.2704	0.0995	0.0965	0.4765	0.2615	0.2146	0.3126	0.2865	0.0497	0	<0.001
IC	24	0.5513	0.1187	0.3398	0.7696	0.5670	0.5043	0.6126	-0.1393	-0.3287	0	<0.001
HH	24	0.7883	0.0282	0.7209	0.8408	0.7844	0.7701	0.7956	0.2766	0.8494	0	<0.001
GOV	24	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000			0	<0.001
OFI	24	0.8226	0.0353	0.7574	0.8891	0.8220	0.7989	0.8344	0.3457	-0.2515	10	<0.001
Total		0.9021	0.0168	0.8816	0.9364	0.8967	0.8891	0.9114	0.6967	-0.5873		

Charts omitted due to potential confidentiality breaches.

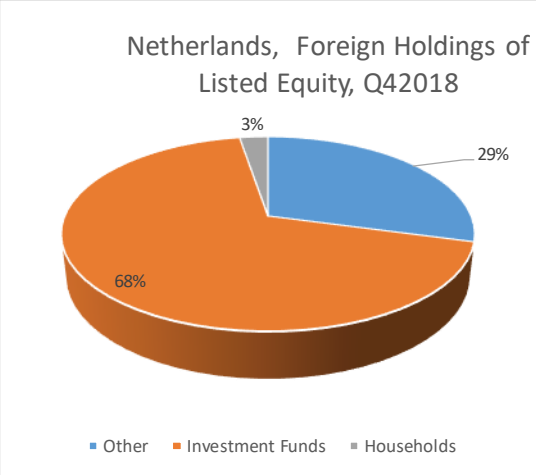
Luxembourg

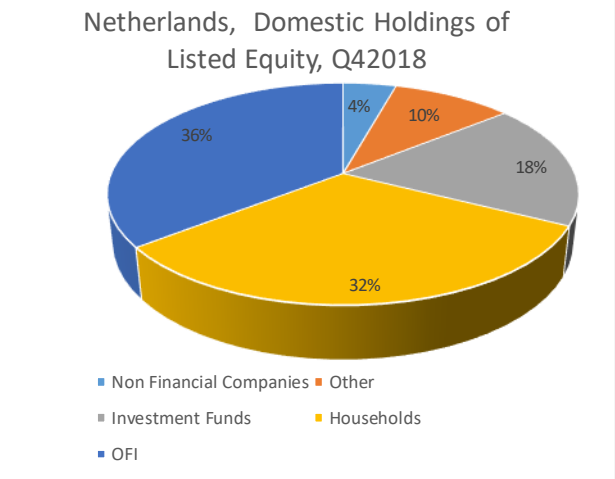
	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.7369	0.4290	0.0117	1.0000	1.0000	0.5943	1.0000	-1.1753	-0.6050	41	<0.001
MFI	24	0.2594	0.1759	0.0646	0.6028	0.2233	0.1117	0.3775	0.6080	-1.0701	0	<0.001
IF	24	0.0037	0.0005	0.0030	0.0050	0.0034	0.0033	0.0041	0.7810	-0.3280	0	<0.001
IC	24	0.0122	0.0115	0.0046	0.0435	0.0066	0.0058	0.0149	1.8273	2.2910	147	0.0040
HH	24	0.1203	0.0183	0.0800	0.1521	0.1244	0.1116	0.1336	-0.6368	-0.0927	0	<0.001
GOV	24	0.1214	0.1523	0.0351	0.5254	0.0685	0.0591	0.0833	2.3629	4.0467	3	<0.001
OFI	24	0.0881	0.0530	0.0464	0.2450	0.0652	0.0548	0.0865	1.6611	2.0714	0	<0.001
Total		0.0142	0.0076	0.0086	0.0430	0.0116	0.0098	0.0147	2.6262	8.5070		



The Netherlands

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.6240	0.4252	0.0132	0.9996	0.8916	0.0132	0.9567	-0.7054	-1.4567	168	0.0130
MFI	24	0.0230	0.0440	-0.0029	0.1627	0.0038	######	0.0177	2.2728	4.6697	62	<0.001
IF	24	0.0201	0.0043	0.0169	0.0343	0.0185	0.0177	0.0197	2.3464	5.3074	0	<0.001
IC	24	0.2657	0.0387	0.2209	0.3545	0.2480	0.2333	0.2961	0.7455	-0.5852	0	<0.001
HH	24	0.6086	0.0290	0.5656	0.6721	0.5980	0.5924	0.6105	1.0588	0.0986	0	<0.001
GOV	24	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000			0	<0.001
OFI	24	0.6387	0.3903	0.0024	0.9890	0.9226	0.2892	0.9570	-0.6670	-1.3495	96	<0.001
Total		0.0861	0.0162	0.0606	0.1071	0.0950	0.0698	0.0999	-0.4863	-1.4891		





Slovenia

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
NFC	24	0.8393	0.0340	0.7743	0.9213	0.8370	0.8223	0.8495	0.8403	1.6130	0	<0.001
MFI	24	0.2661	0.1053	0.0807	0.5455	0.2449	0.2144	0.2861	1.2104	1.9503	96	<0.001
IF	24	0.0786	0.0448	0.0343	0.1677	0.0580	0.0456	0.1130	0.9852	-0.5656	0	<0.001
IC	24	0.6493	0.0761	0.5615	0.7965	0.6333	0.5918	0.6872	0.7981	-0.7486	0	<0.001
HH	24	0.8566	0.0128	0.8306	0.8838	0.8567	0.8479	0.8633	0.3002	-0.0069	196	0.0580
GOV	24	0.9963	0.0030	0.9918	1.0000	0.9958	0.9935	0.9991	-0.1218	-1.7772	0	<0.001
OFI	24	0.9675	0.0072	0.9555	0.9798	0.9662	0.9619	0.9725	0.3713	-1.0056	100	<0.001
Total		0.6637	0.0352	0.6199	0.7478	0.6540	0.6403	0.6709	1.3073	0.9265		

Spain

	N	Mean	Std. De	Min	Max	Median	1st Qua	3rd Qua	Skewnes	Kurtosis	T. Stat	P-value
Non Fin	24	0.7832	0.0298	0.7290	0.8343	0.7795	0.7690	0.8024	0.2318	-0.5743	21	<0.001
Monetz	24	0.3776	0.0527	0.2958	0.5764	0.3702	0.3469	0.3901	2.4419	8.7157	0	<0.001
Investm	24	0.2875	0.0338	0.2065	0.3424	0.2850	0.2726	0.3122	-0.3674	0.5124	0	<0.001
Insuran	24	0.4951	0.0445	0.4013	0.5456	0.5159	0.4674	0.5266	-0.9253	-0.3942	0	<0.001
Househ	24	0.9476	0.0071	0.9314	0.9567	0.9486	0.9437	0.9523	-0.7836	-0.2021	0	<0.001
Govern	24	1.0000	0.0001	0.9997	1.0000	1.0000	1.0000	1.0000	-2.8385	8.4943	0	<0.001
OFI	24	0.5198	0.1380	0.3275	0.7039	0.5726	0.3611	0.6315	-0.3547	-1.6841	21	<0.001
Total		0.7026	0.0310	0.6572	0.7576	0.6922	0.6777	0.7374	0.4912	-1.2204