Diversification and manager autonomy in fund families: implications for investors

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Abstract

This paper aims to investigate the consequences for investors of investing in a single fund family. In essence, we focus on the correlation among portfolio holdings of funds with effects in terms of under-diversification for mutual fund investors, especially, if they invest in the same fund family. We also explore the fund manager autonomy in portfolio holding allocation within families and determine the characteristics of those fund families with higher autonomy. Our results show that a higher correlation among funds not only implies that families offer a lower diversification to investors; it also has a negative effect on their performance. However, investors' performance benefits from a higher manager autonomy. Consequently, investors who select a single fund family could obtain higher returns in smaller fund families with considerable experience that do not belong to a bank holding group, as in the former, diversification and manager autonomy are higher.

JEL classification: G11, G23

Keywords:

Mutual fund; fund family; manager decision; portfolio overlap, fund manager autonomy.

1. Introduction

The development of the mutual fund industry has resulted in a large number of individual investors who participate in financial markets, delegating their portfolio management to fund managers who have become the main type of institutional investors (Chen and Qin, 2017). This is demonstrated by the €15.6 billion of Net Assets managed by 60,000 funds in the European Mutual Fund Industry (European Fund and Asset Management Association, EFAMA, 2018).

As documented over the years, portfolio diversification is one of the main benefits obtained from mutual funds by unsophisticated investors (Markowitz, 1952; Sharpe, 1964; Statman, 2004; and Goetzmann and Kumar, 2008, among others). However, Moreno and Rodríguez (2013) argue that mutual funds are not always well diversified. Therefore, investors should hold more than one mutual fund in order to reduce the idiosyncratic risk in a portfolio of funds.

In selecting mutual funds, researchers find that individual investors first seem to pick a fund family, and then they select the funds in which they invest. This mental process implies the concentration of their investments in a single mutual fund family (Capon et al., 1996; Massa, 2003). In order to reinforce the idea of investment in a single fund family, Gerken et al. (2018) find that investors who have previously invested in a particular family are significantly more likely to choose a fund from that same family when they decide to invest in mutual funds again. This can be explained by the fact that investors are able to move their money in and out of funds within a family at a lower cost (Clare et al., 2014). Therefore, as shown in literature, when building their diversified portfolio of funds, investors seem to pick funds within fund family they are familiar with.

Deepening into the behaviour of fund families, Elton et al. (2007) find that mutual fund returns within a family tend to be highly correlated, and they argue that the increased correlation is primarily due to common stocks in portfolio holdings. Chen et al. (2004) also show that the fund performance is related to the fund family. According to Elton et al. (2007), fund managers within the same family have access to the same information, both external and internal research analyses, what results in similar portfolio holdings. In addition, the potential existence of guidelines from the family's top-management (i.e. investment directors) also generates similar portfolios and implies a reduction of the autonomy of managers (Kacperczyk and Seru, 2012).

Given the previous setting, the main objective of this study is to investigate whether investing in different funds ensures diversification for individual investors, regardless of whether the funds belong to the same family, or whether they should seek diversification across funds from different families. However, within a mutual fund family there may be funds with different characteristics such as size, age, number of stocks in the portfolio and fees. In contrast to previous literature, we do not only study whether the funds which belong to the same family are more correlated than funds in different families, we also examine the characteristics of the most correlated fund pairs. Our aim is to study whether the level of diversification between funds is significantly higher in some families than in others and the characteristics of these more diversified families. Therefore, we try to identify families in which investors would be less affected by under-diversification, if they decided to concentrate their funds in the same family. In addition, we evaluate the influence of diversification and fund manager autonomy in a family on the returns of an investor who selects this family.

Focusing on the decision-making process of mutual funds, different factors influence the decisions made by mutual fund managers. On the one hand, these factors are inherent to managers, such as: their past experience (Menkhoff et al., 2006; Kempf et al., 2017); their cognitive bias (Cuthbertson et al., 2016), their own intuition (Brown and Davies, 2017) and their level of familiarity with the stocks (Pool et al., 2015). On the other hand, fund managers are influenced by external factors such as public information and social interaction (Pool et al., 2015; Chuprinin et al., 2019), analyst recommendations (Brown et al., 2014), competition or co-operation with other managers (Kempf and Ruenzi, 2008; Simutin, 2013; Evans et al., 2019); redemption from investors, (Chen et al., 2010); the incentives for promotion within families (Kempf and Ruenzi, 2008; Mason et al., 2016); the family management strategy, which may involve a centralised or decentralised decision making process (Kacperczyk and Seru, 2012) and the monitoring relationship within companies (Sevcenko and Ethiraj, 2018).

Therefore, numerous factors influence a fund manager's decisions. However, there are more common factors for managers who are in the same family than for managers in different families which causes managers in the same family to hold more similar portfolio holdings. Sevcenko and Ethiraj

(2018) also suggest that the existence of a monitoring relationship in the mutual fund companies allows new managers to know the company-specific skills.

Concerning the level of portfolio holding differentiation between funds within a family, previous literature reveals different positions. There are authors who consider the importance of maximising the use of all family resources (Siggelkow, 2003). Therefore, all the managers of family could make better decisions based on the available information, even if this means making similar decisions and reducing the level of diversification within the family. Researchers have started to focus on studies at the family level in the mutual fund industry, considering the existence of coordination between decisions within families where a fund family seeks to take advantage of its resources and maximise its value (Mamaysky and Spiegel, 2002; Siggelkow, 2003; Khorana and Servaes, 2004; Elton et al., 2007; Evans et al., 2019). Gerken et al. (2018) document the high importance of family reputation when investors select a family that is determined by the performance of all the funds within a family. Casavecchia and Ge (2019) also note that fund managers who are part of more focused families, with a higher level of specialisation, possess better stock-picking skills. However, Massa (2003) and Khorana and Servaes (2012) note that it is important that investors perceive each fund as a differentiated product for families to increase their family market share. In this line, Mamaysky and Spiegel (2002) consider that individual investors take advantage of research relating to the family when the portfolio of new funds differ as much as possible from existing funds in the fund family.

Although considerable effort has been devoted to examining the portfolio differentiation within families and its influence on the family market share, the economic and diversification implications for fund investors that concentrate their investment in one fund family remain more unknown.

Firstly, this paper analyses the correlation between portfolio holdings within the same family and between different families in order to conclude the diversification implications for investors who concentrate all of their fund investments in a single family. We address this correlation with the portfolio overlap measure. Our hypothesis is based on the idea that the higher the level of portfolio overlap between two funds, the higher the correlation between both funds and the lower the level of diversification for an investor who decides to invest in those two funds. We confirm a higher fund

overlap within a family as documented in Elton et al. (2007). Therefore, individual investors can achieve better diversification if they do not focus on a single family and distribute their fund investments across different families. We also identify the characteristics of fund pairs with a high correlation.

This paper analyses Euro equity mutual funds domiciled in Spain from December 1999 to June 2018. The Spanish mutual fund market represents a unique setting for our research objectives for several reasons. First, the Spanish mutual fund industry is more concentrated than other European countries as documented in previous studies (Ferreira and Ramos, 2009; Ferreira et al, 2013). Note that the top 10 and top 5 fund management companies manage more than 75% and 40% of the total fund assets in the Spanish market (Inverco, 2018) as opposed to other fund industries such as the UK. The UK mutual fund market remains relatively unconcentrated; the top 10 and top 5 management companies represents the 45% and the 26% of the total fund assets (The Investment Association, 2018). Second, the Spanish market is highly dependent on the banking and insurance sectors (Cambón and Losada, 2014; Golez and Marin, 2015). In fact, 87% of Spanish mutual funds are managed by non-independent groups (81% by banking groups and 6% by insurance groups), while this percentage is lower in other European countries such as France (23%); UK (25%); Portugal (38%); Italy (50%) and Germany (69%).[1] Third, the Spanish fund industry deserves our attention because of its importance in the Euro Zone; this industry is ranked 5th in the Euro area in terms of number of registered mutual funds (EFAMA, 2018). Fourth, the sample period coincides with the intense restructuring process of the Spanish financial sector in recent years, which led to several mergers and acquisitions of mutual fund management companies. In addition, there is a significant effect of the management company in attracting money inflows into the mutual funds (Sánchez-González et al., 2017) in this mutual fund market. This could amplify former conclusions on the selection of funds and permanency in the same family observed in the US market (Massa, 2003; Clare et al., 2014; Gerken et al., 2018).

Secondly, the paper analyses the characteristics of families with a lower potential diversification for investors due to a higher correlation between the portfolio holdings of their funds.

[1] See, e.g. the facts and figures of the 12th edition of *An Overview of the Asset Management Industry* of EFAMA.

The type of fund family may also play an important role due to the high degree of concentration in the Spanish mutual fund market and the existence of a higher number of bank-owned fund management companies than in other European markets (EFAMA, 2018b). We find that larger families, which belong to a bank holding group and which do not have a considerable experience in the mutual fund market, show the highest portfolio overlap. Nevertheless, we do not only investigate the characteristics of the fund families with the highest portfolio overlap, we also deepen in the analysis of fund manager autonomy in portfolio holding allocations of stock sectors within families and its consequences on individual investor performance. Our results show that manager autonomy is higher in smaller fund families with wider experience that do not belong to a bank holding group.

Thirdly, we study whether the similitude of portfolio holdings within family and thereby whether the family diversification, as well as manager autonomy within families is a determinant of the performance of investors who select a single family for all their fund investments. We find that a higher diversification and a higher autonomy of managers within families are positive factors for investors' performance.

Therefore, the findings seem to reveal that investors who concentrate all funds in the same family could obtain higher returns in smaller fund families with wide experience that do not belong to a bank holding group, because in these families the diversification and manager autonomy are higher. These results have several implications for investors given that they delegate more than 40% of investment money to the five largest fund families that belong to bank holding groups. The findings of this study also have several implications for fund managers, fund families and financial advisors. Managers who work in management companies with a lower level of manager's autonomy in decision-making are less likely to stand out from others in this same company. Our study is also of interest for fund families because of the relation between past performance and future fund flows (Sirri and Tufano, 1998). Finally, financial advisors or senior executives in the fund management industry could be interested in this study to guide their supervision towards the insurance of investor protection, good practices and efficiency in this market.

The remainder of this paper is organised as follows. Section 2 describes the data. Section 3 presents the results of the portfolio overlap of fund pairs. Section 4 presents the results of the portfolio

overlap within a fund family. Section 5 presents the influence of portfolio overlap and fund manager autonomy on the individual investors' returns. Section 6 concludes.

2. Data and methodology

2.1. Data

We study the correlation of portfolio holdings between fund pairs in the same family and different families and its influence on individual investors' performance and diversification in the Spanish equity mutual fund industry from December 1999 to June 2018. The review of previous literature reveals that there are several authors who have studied holdings concentration. Elton et al. (2007) examine the extent of overlap in stock holdings for US mutual funds from 1998 to 2002 and Pool et al. (2015) study portfolio overlap of actively managed US equity funds whose managers live in the same city from 1996 to 2010. More recently, Evans et al. (2019) study common ownership/portfolio overlap in US mutual funds over the 1990-2015 period.

However, our paper is the first study to evaluate the extent of overlap between fund portfolio holdings in the Spanish industry. We select the funds included in the Euro equity official category and require that the fund be in the sample at least two years continuously. The Spanish Securities Exchange Commissions (CNMV) establishes a classification of mutual funds according to the types of assets included in the portfolios. Euro equity funds must invest more than 75% of their portfolio holdings in equities, and at least 60% of the total equity exposure must be issued by companies of the Euro area. Our sample is free of survivorship bias as it includes both, funds that have already disappeared and surviving funds. Our final sample includes 276 Euro equity mutual funds managed by 108 management companies (that is fund families), of which 63 companies manage more than one fund.

The monthly portfolio holdings of mutual funds included in our sample were obtained from the CNMV and Morningstar. CNMV provided monthly portfolio from 1999 to 2006 for research purposes. After 2006, they provide quarterly holdings. Therefore, we complete these official reports with monthly information from Morningstar when it is available. We match both databases using the ISIN code of mutual funds and stocks and analyse a total of 24,561 portfolio holdings.

CNMV also provides information about the characteristics of mutual funds and of fund families such as the inception date of funds, the fees, the monthly past annual gross and net return, and the fund family to which they belong. We also obtain the monthly size of each fund family as the sum of the total net assets of all fund categories within the family in the industry. Additionally, based on its governance structure, we examine whether or not a family depends on a banking or insurance company as opposed to independent fund families. Finally, stock information is obtained from Datastream.

Table 1 reports the summary statistics of our sample at different date points. It is noteworthy that the number of funds and the number of families decrease over time. According to Climent (2013), this effect is related to the severe merging process caused by the strong reorganisation of the banking system in the Spanish market in recent years. We also note that the percentage of families which do not belong to a banking or insurance group increases slightly over the sample period. We also observe that the average total net assets of funds (*Fund_size*) and the average family size (*Family_size*) are lower in December 2011 with respect to December 2005, which comes as no surprise given the global financial crisis. However, the trend of average fund size has recovered during the last years, reaching in June 2018 higher average size since December 2011. This recovery may be encouraged by low interest rates offered by bank deposits that have been replaced by mutual funds for many investors in recent years and the increase in investors' confidence in professional investment advice. We can conclude that for Spanish equity funds from December 1999 to June 2018, the number of funds and families have decreased, however, they are larger in sizes.

Table 1: Summary Statistics of the sample

This table shows summary statistics for our sample at four date points: Dec1999, Dec2005, Dec2011 and Jun2018. Panel A reports summary statistics of the mutual fund sample and Panel B reports information for fund families. *#Funds:* is the number of funds in our sample. *Fund_size:* is the monthly total net assets of funds in million euros. *Fund_age:* is the age of funds in years, we obtain the fund's age from its inception date. *Fund_#stocks*: is the number of distinct stocks held by the monthly portfolio holdings. *Fund_fees*: is the funds' monthly management and deposit fee. *Fund_return*: is the funds' annual past gross return. *#Families*: is number of fund families in our sample, we distinguish between families that belong to a banking or insurance group *(bank)* and families that are independent (*non-bank*). *Family_size:* is the monthly total net assets of all funds managed by fund families in the Spanish industry in million euros. *Family_age:* is the age of fund families in years, obtained from the inception date of the oldest fund in the family.

Panel A: Summary statistics of the mutual fund sample					
		Dec1999	Dec2005	Dec2011	Jun2018
#Funds		139	165	126	89
Fund_size	Mean	84.68	76.78	35.01	148.63
	Q1	116.56	102.58	36.00	180.92
	Q5	7.68	8.88	4.78	18.68
Fund_age	Mean	4.14	8.04	13.15	17.77
	Q1	8.38	11.66	17.50	24.00
	Q5	1.32	4.53	8.79	12.64
Fund_#stocks	Mean	49.71	47.30	42.89	48.30
	Q1	59.00	57.00	53.00	58.00
	Q5	34.00	35.00	32.00	34.00
Fund_fees	Mean	0.17%	0.15%	0.16%	0.15%
	Q1	0.21%	0.19%	0.19%	0.18%
	Q5	0.12%	0.12%	0.14%	0.12%
Fund_return	Mean	10.78%	24.52%	-14.84%	3.95%
	Q1	15.81%	27.06%	-12.06%	8.37%
	Q5	3.47%	21.59%	-17.31%	-0.97%

Panel B: Summary statistics of the fund family sample					
		Dec1999	Dec2005	Dec2011	Jun2018
#Families		72	69	56	51
#Bank families		59 (81.94%)	56 (77.78%)	45 (62.50%)	36 (50.00%)
#Non-bank families		13 (18.06%)	13 (18.06%)	11 (15.28%)	15 (20.83%)
Family_size	Mean	1,947.82	2,858.46	2,283.66	5,167.97
	Q1	1,709.23	2,226.71	2,641.46	4,951.42
	Q5	81.36	9.88	5.78	19.68
Family_age	Mean	9.40	15.88	21.13	26.88
	Q1	12.07	18.87	25.53	31.58
	Q5	8.34	14.28	20.19	25.29

The value of monthly fees shown in Table 1 does not undergo a significant change and the average number of stocks decreases slightly. Based on the past 12-month gross return, we can see that it is lower in December 2011 due to the economic crisis compared to the other three date points.

2.2. Methodology

The first objective of the paper is to analyse the correlation between two funds within the same family and the correlation across families and hence, investor diversification. We approach this correlation as the portfolio overlap between fund pairs. According to Elton et al. (2007) and Pool et al. (2015), we measure the pairwise overlap as the sum of minimum fraction in each stock *k* held by both funds in month *t*.[2]

$$Portfolio\ overlap_{i,j,t} = \sum_{k \epsilon \Psi_{i,j,t}} min(w_{i,k,t}; w_{j,k,t;}) \times 100 \quad (1)$$

where $Portfolio\ overlap_{i,j,t}$ is the portfolio overlap between funds *i* and *j* in month *t;* $w_{i,k,t}$ is the portfolio weight of stock *k* in the fund *i* in month *t;* $w_{j,k,t}$ is the portfolio weight of stock *k* in the fund *j* in month *t;* and $\Psi_{i,j,t}$ is the set of all stocks held by fund *i* and fund *j* in month *t*. The higher the portfolio overlap between two funds, the higher the correlation between two funds and the lower the diversification level for an investor who decides to invest in those two funds.

We also obtain the correlation between two funds at the industry and sector levels. Every stock is classified by sector and by industry according to FTSE Russel Industry Classification Benchmark (ICB) obtained from Datastream. To measure the portfolio overlap at the sector or at the industry levels, in Equation 1 *k* becomes the sector or the industry.

3. Does the fund family have influence on the similarity of fund holdings?

Table 2 shows the average portfolio overlap at stock level between any two funds in the sample is 30.50% during the sample period. Similarly, Elton et al. (2007) find that up to 34% of total net assets are held in common stocks for funds with the same investment objective. However, we observe that the annual average portfolio overlap decreases from 32.17% to 23.20% during the sample period. Regarding the sector and industry levels, Table 2 also reveals that the average overlaps are 58.89% and 66.14%, respectively, which as expected, are considerably higher than at the stock level. The

[2] For robustness purposes, we also obtain the portfolio overlap according to the measure used in Delpini et al. (2019) and Fricke and Fricke (2021) (see Appendix 1 for more details).

results reveal that the decreases in portfolio overlaps are lower at the sector and industry levels than at the stock level.[3]

Table 2: Overall results of the portfolio overlap at the fund pair level

Panel A, Panel B and Panel C report the results of portfolio overlap at the stock level, at the sector level and at the industry level, respectively. This table shows, for each year, the overall average portfolio overlap and the number of fund pairs within the same fund family and the number of fund pairs in different families, as well as their average overlap. In this table, we present a yearly report of the number of funds during the sample period, unlike in Table 1 where we present the total number only at three specific points during the sample period. The last column shows the results of the mean difference test between both specific averages with the *p*-value in parentheses. We apply the mean difference test for unpaired samples with different variance (in all cases the null hypothesis is rejected in the test of equal variance).[4] In all columns, the annual average is obtained with the monthly portfolio overlap data. The study period starts in December 1999 and ends in June 2018. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Stock						
Year	Portfolio overlap	#fund pairs (*same fund family*)	#fund pairs (*different fund family*)	Portfolio overlap (*same fund family*)	Portfolio overlap (*different fund family*)	Mean-difference test
2000	32.17%	282	11,520	44.35%	31.88%	12.47%*** (0.000)
2001	30.95%	341	13,827	37.98%	30.76%	7.22%*** (0.000)
2002	30.20%	354	14,261	36.73%	30.05%	6.68%*** (0.000)
2003	32.23%	340	15,175	39.02%	32.08%	6.93%*** (0.000)
2004	33.57%	337	13,592	41.54%	33.37%	8.17%*** (0.000)
2005	33.07%	391	14,415	40.21%	32.87%	7.34%*** (0.000)
2006	31.27%	421	15,621	37.18%	31.11%	6.07%*** (0.000)
2007	29.27%	474	16,648	35.43%	29.03%	6.40%*** (0.000)
2008	30.70%	468	16,032	35.22%	30.49%	4.73%*** (0.000)
2009	29.27%	422	14,054	35.64%	29.02%	6.61%*** (0.000)
2010	27.61%	255	10,917	34.46%	27.39%	7.06%*** (0.000)
2011	27.74%	236	9,864	34.92%	27.53%	7.39%*** (0.000)
2012	26.86%	193	7,712	34.51%	26.64%	7.88%*** (0.000)
2013	26.14%	166	6,289	33.09%	25.95%	7.14%*** (0.000)
2014	26.57%	97	4,619	31.79%	26.45%	5.33%*** (0.000)
2015	27.05%	104	5,203	31.79%	26.93%	4.85%*** (0.000)
2016	25.10%	93	4,737	27.66%	25.04%	2.61%*** (0.000)
2017	23.12%	75	4,260	28.71%	22.96%	5.75%*** (0.000)
2018	23.20%	65	4,061	28.73%	23.08%	5.65%*** (0.000)
Dec1999-Jun2018	30.50%	994	32,982	37.36%	30.31%	7.05%*** (0.000)
Panel B: Sector						
Dec1999-Jun2018	58.89%	994	32,982	64.18%	58.75%	5.43%*** (0.000)
Panel C: Industry						
Dec1999-Jun2018	66.14%	994	32,982	70.92%	66.61%	4.91%*** (0.000)

[3] The annual results of portfolio overlap at the sector and at the industry levels are available upon request.

[4] For robustness purposes, we also apply the Kruskal-Wallis nonparametric test to examine the existence of differences between the portfolio overlap of fund pairs from the same family and from different families, as in Tables 4 and 6. The results show the same statistical significance.

Following Elton et al. (2007), we differentiate between the fund pairs where both funds belong to the same management company (that is in the same fund family) and the fund pairs in different families. These authors initially argue two positions. On the one hand, these authors consider that the portfolio overlap of fund pairs in the same family could be lower than across families, suggesting that a fund family has incentives to offer non-correlated portfolio holdings to prevent investors from going outside of the family to seek a higher diversification between funds, following Khorana and Servaes (2004). On the other hand, Elton et al. (2007) also contemplate that there are reasons to expect that the portfolio overlap may be higher within fund families than outside of them due to the access to the same information or the extent of a family management strategy. In addition, Chen et al. (2004) and Cici et al. (2018) show that most mutual funds operate as part of fund families; the latter make strategic decisions that have an influence on the operation and performance of their funds.

We analyse 994 fund pairs with 167,848 portfolio overlap observations where both funds are in the same fund family and 32,982 fund pairs with 1,549,658 portfolio overlap observations where both funds are in different fund families. We compare the portfolio overlap between both groups and our first null hypothesis tested is:

$1H_0$: There are no significant differences between the portfolio overlap of fund pairs within the same fund family and fund pairs in different families.

Table 2 shows that, from December 1999 to June 2018, the average portfolio overlap of fund pairs within the same fund family and the average of fund pairs in different families at stock level are 37.36% and 30.31%, respectively. This finding reveals a difference between both groups equal to 7.05%, which is statistically significant at the 1% level. This finding is consistent with financial literature (Elton et al., 2007; Pool et al., 2015). We also find a statistically significant difference between the overlap of fund pairs within the same family and the overlap of fund pairs in different families when we measure the overlap at sector and industry levels. The results obtained when focusing on the industry and the sector increase the robustness of our conclusions, given that by using the stock for stock comparison, we omit a potential overlap in sector or industry that can occur when stocks are different.

We apply a panel data model to determine the characteristics of fund pairs with higher portfolio overlap at the stock level, specifically; we estimate the following model.[5]

$$Portfolio\ overlap_{i,j,t} = f\,(Fund\_size_{i,j,t};\ Fund\_age_{i,j,t};\ Fund\_\#stocks_{i,j,t};\ Fund\_fees_{i,j,t};$$

$$Fund\_return_{i,j,t};\ Fund\_family_{i,j,t};\ \varepsilon_{i,j,t}\ ) \qquad (2)$$

where the dependent variable is the $Portfolio\ overlap_{i,j,t}$ between funds *i* and *j* in month *t* at the stock level and the independent variables are dummy variables. In order to define these dummy variables, we calculate the percentile rank of each characteristic for all the funds in our sample every month *t*[6] (*Fund_size*; *Fund_age*; *Fund_#stocks*; *Fund_fees*; *Fund_return*), and we determine the quintile into which funds *i* and *j* are. For each characteristic, we include four dummy variables: *Same* takes a value equal to 1 when, in month *t,* funds *i* and *j* are in the same quintile and 0 otherwise. *BothQ1* takes a value equal to 1 when, in month *t,* funds *i* and *j* are in the top quintile. *BothQ5* takes a value equal to 1 when, in month *t,* funds *i* and *j* are in the bottom quintile. *Opposite* is equal to 1 when in month *t,* either fund *i* or fund *j* is in the top quintile and in the other is in the bottom quintile. As a robustness test for the results in Table 2, the model also controls for whether or not a pair of funds belong to the same fund family. $Fund\_family_{i,j,t}$ is equal to 1 when funds *i* and *j* in month *t* are in the same fund family and 0, otherwise.

Fund_size: is measured as the total net assets. According to Kacperczyk and Seru (2007), larger funds enjoy a greater reputation and pay higher wages, employing managers who are more skilled. Therefore, our hypothesis is based on the idea that managers of larger funds may have common information because they have more resources to access this information, and consequently, the portfolio overlap would be higher in fund pairs where both funds are among the largest.

Fund_age: is determined from mutual fund inception. Some authors argue that young funds are at a disadvantage as they might suffer from lack of market experience (Agnesens, 2013, Ben and Hellara, 2011). Chevalier and Ellison (1997) show that young funds behave differently from old funds

[5] Random effects (RE) and fixed effects (FE) models were initially performed. However, the Hausman's test indicates the RE model as the preferred method of estimation.

[6] In order to deal with possible endogeneity concerns, we also define Equations 2, 4 and 6 with independent variables lagged by one month.

with respect to the flow-performance relationship. Thus, the incentives of fund manager to alter the riskiness of portfolio is also different in both fund groups. In this line, we suggest that the fund age may influence the investment style and the management decisions by mutual fund managers.

Fund_fees: we include the management and the deposit fees of each fund. According to the previous literature, the effect of fund fees on managerial ability and fund behaviour is not clear. Prather et al. (2004) find a positive impact of fees on performance if these expenses are to support research. Gil-Bazo and Ruiz-Verdú (2009) find that fund performance worsens with increasing fund management fees, while Chen et al. (2004) argue that there is no relationship between management fees and fund performance. We suggest that fund fees may be related to a greater research effort and, therefore, managers of funds with higher fees have a higher level of information that leads them to make similar decisions in their portfolio holdings.

Fund_#stocks: we obtain the number of stocks from portfolio holdings. Our intuition is based on the idea that the similarity of number of stocks held may be related to the portfolio overlap in a fund pair. Kacperczyk et al. (2005) find that managers of more diversified funds (that is with higher number of different stocks) hold a portfolio that closely resembles the total market portfolio. However, concentrated funds, which are the funds with a lower number of stocks, follow distinct investment styles. In accordance with these authors, we think that the portfolio overlap may be higher for the fund pairs in which both funds have a high number of stocks.

Fund_return: is the past annual gross return. Fund managers may have different reactions to extreme results. In addition, Wei et al. (2014) find that funds that often trade differently in the industry generate superior performance. These authors suggest that these funds possess superior private information. In addition, previous literature document that fund managers may have different reactions to extreme results. Some of managers' funds with the highest past performance may close positions, influenced by the disposition effect (Cici, 2012), however, others of those managers may maintain their positions with the perspective of holding the same rank in the market. With respect to managers of funds with the lowest past return, some of them may start to make different decisions or may follow a strategy of risk shifting based on a desire to improve their outcome in order to avoid withdrawals of funds by investors (Chen et al., 2010) and because their reputations and salaries may depend on their

performance record (Massa et al., 2009). However, others may continue to make similar decisions influenced by their cognitive biases or top-management strategies. In addition, the top-management could replace these managers, given that there is an inverse relationship between the likelihood of managerial replacement and past fund performance (Khorana, 1996).

Table 3 shows the results of Equation 2.[7] The coefficient of the dummy variable *Fund_family* is positive and statistically significant; this result gives robustness to the finding of Table 2, showing that the portfolio overlap is higher for fund pairs within the same family than for fund pairs in different families. This result is in line with the findings of Elton et al. (2007) and Pool et al. (2015) who argue that this is due to shared analysts and other shared stock-selection resources.

Focusing on the fund characteristics, we find that when two funds have very different sizes, or both are among the smallest funds; their portfolio overlap is significantly lower. In this line, Pool et al. (2015) also find that the overlap between funds that have different sizes is lower, statistically significant at the 1% level. However, we also find that in a pair where both funds are the largest, the portfolio overlap is significantly higher. These results are in line with our hypothesis that managers of large funds may have common skills and access to a common higher level of information.

According to the age variable, we find a significantly lower portfolio overlap amongst fund pairs in which both funds have very different ages. These results are in line with our hypothesis that fund managers alter the riskiness of portfolio holdings at different levels depending on the fund age. We also find that portfolio overlap is significantly higher in fund pairs with similar ages, but when these funds are not amongst neither the youngest nor the oldest funds. The oldest funds, which have sufficient experience in the market, could develop their own portfolio holding strategy allocation. While the youngest funds, which face the challenge of getting market share, have incentives to offer differentiated portfolios as much as possible from those existing funds according to Mamaysky and Spiegel (2002) and Khorana and Servaes (2012).

[7] The findings are robust when Equation 2 is defined with independent variables lagged by one month, and results are available upon request.

Table 3: Portfolio overlap and characteristics of mutual funds

This table shows the results obtained from Equation 2 from December 1999 to June 2018. Equation 2 is estimated using RE with robust errors model. Where the dependent variable is the *Portfolio Overlap*$_{i,j,t}$ at the stock level and the independent variables are dummy variables. We calculate the percentile rank of each fund-month in each characteristic (*Fund_size*, *Fund_age*, *Fund_#stocks*, *Fund_fees* and *Fund_return*) and we determine the quintile into which mutual funds are. For these characteristics, the model includes four dummy variables: *Same* takes a value equal to 1 when fund *i* and *j* in month *t* are in the same quintile. *BothQ1* takes a value equal to 1 when funds *i* and *j* in month *t* are in the top quintile. *BothQ5* takes a value equal to 1 when fund *i* and *j* in month *t* are in the bottom quintile. Opposite is equal to 1 when in month *t*, either fund *i* or fund *j* is in the top quintile and in the other is in the bottom quintile. *Fund_family*$_{i,j,t}$ is equal to 1 when, in month *t*, funds *i* and *j* are in the same fund family. The *p*-value is reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

		Coefficient	
	Constant	0.282***	(0.000)
Fund_size	Same	-0.002	(0.170)
	BothQ1	0.022***	(0.000)
	BothQ5	-0.015***	(0.000)
	Opposite	-0.004**	(0.022)
Fund_age	Same	0.003**	(0.031)
	BothQ1	-0.033***	(0.000)
	BothQ5	-0.019***	(0.000)
	Opposite	0.002	(0.392)
Fund_#stocks	Same	0.012***	(0.000)
	BothQ1	0.008***	(0.000)
	BothQ5	-0.019***	(0.000)
	Opposite	-0.015***	(0.000)
Fund_fees	Same	0.004***	(0.000)
	BothQ1	0.013***	(0.000)
	BothQ5	-0.014***	(0.000)
	Opposite	-0.001	(0.963)
Fund_return	Same	0.010***	(0.000)
	BothQ1	-0.007***	(0.000)
	BothQ5	-0.002	(0.140)
	Opposite	-0.009***	(0.000)
Fund_family		0.058***	(0.000)
#Observations		1,374,463	
Wald		1,918.52***	(0.000)
R-squared		9.89%	
VIF		1.20	

Table 3 also shows that the portfolio overlap is significantly higher (lower) in fund pairs that have the highest (lowest) number of stocks held in portfolio holdings and the highest (lowest) fees. With regard to the number of stocks variable, the result is line with the conclusion of Kacperczyk et al. (2005) who argue that managers of more diversified funds hold portfolios that look like the total market portfolio and more concentrated funds follow distinct investment styles.

With respect to the fees variable, the results could be explained by the relationship between fund fees and a greater research effort. Thus, managers of funds with higher fees have a higher level of matching information that leads them to make similar decisions.

In relation to the past annual gross return, we find that the portfolio overlap is higher in fund pairs that have similar past annual gross returns, but we do not observe this result in cases where fund pairs have the highest or lowest past annual gross return. These results could confirm our hypothesis that fund managers' reactions to an extreme performance may be different and consequently, the portfolio overlap between their funds is lower.

4. Portfolio holding similarities within a fund family

Our results show a higher correlation between fund pairs within the same family. In this section, we focus on portfolio holding similarities within a fund family. Previous literature reveals evidence that the top-management strategies are not the same in all families, thus, we may think that neither is the correlation between their funds. Evans et al. (2019) contribute to the literature on heterogeneity in management strategies between families, reconciling evidence of the coexistence of cooperative families and competitive families in the US mutual fund industry. In this line, we examine whether there are families that have a significantly higher portfolio overlap between their funds in order to study the existence of heterogeneity between families regarding the family portfolio overlap. Therefore, in this section, we test the following null hypothesis:

$2H_0$: There are no significant differences between the portfolio overlap of different fund families.

We calculate the monthly family portfolio overlap as the average portfolio overlap of fund pairs within this fund family.

$$Family\ portfolio\ overlap_{f,t} = \overline{Portfolio\ Overlap_{i,j,t}}\ x\ 100 \quad (3)$$

where $Family\ portfolio\ overlap_{f,t}$ is the portfolio overlap within fund family *f* in month *t* and $Portfolio\ Overlap_{i,j,t}$ is the portfolio overlap between funds *i* and *j* in month *t* when both funds belong to the same fund family *f*.

Table 4: Family portfolio overlap

Panel A, Panel B and Panel C report the results of portfolio overlap at the stock level, at the sector level and at the industry level, respectively. This table shows the average family portfolio overlap and the average family portfolio overlaps weighted by total net assets in Euro equity category and weighted by number of Euro equity funds. The average overlap of families that are in the top tercile *(T1*) and the average overlap of families that are in the bottom tercile (*T3*). The last column shows the result of a mean-difference test between *T1* and *T3* with the *p*-value in parentheses. We apply the mean-difference test for paired samples.[8] In all columns, the annual average is obtained with the monthly portfolio overlap data. The study period starts in December 1999 and ends in June 2018. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Stock							
Year	Family Overlap	Family overlap (*TNA-weighted*)	Family overlap (*#funds-weighted*)	Family Overlap (*T1*)	Family Overlap (*T3*)	Mean-difference test (*T1-T3*)	
2000	39.06%	43.67%	41.30%	70.07%	13.50%	56.57%***	(0.000)
2001	36.59%	39.94%	37.39%	62.98%	15.04%	47.95%***	(0.000)
2002	34.98%	39.57%	35.64%	62.14%	12.55%	49.59%***	(0.000)
2003	36.05%	38.35%	36.93%	62.78%	14.78%	48.00%***	(0.000)
2004	38.13%	40.63%	39.10%	63.20%	18.13%	45.07%***	(0.000)
2005	34.19%	36.37%	36.78%	55.77%	16.82%	38.95%***	(0.000)
2006	32.29%	34.19%	34.55%	53.63%	15.19%	38.44%***	(0.000)
2007	30.71%	31.49%	32.39%	50.77%	15.53%	35.24%***	(0.000)
2008	30.19%	32.09%	33.66%	51.52%	16.08%	35.44%***	(0.000)
2009	30.94%	32.86%	33.62%	45.26%	18.65%	26.61%***	(0.000)
2010	27.73%	32.60%	32.61%	47.89%	19.14%	28.75%***	(0.000)
2011	28.18%	32.58%	34.41%	50.34%	19.95%	30.39%***	(0.000)
2012	32.88%	31.06%	33.08%	47.21%	16.81%	30.40%***	(0.000)
2013	37.19%	31.45%	32.11%	47.55%	15.80%	31.75%***	(0.000)
2014	35.47%	31.34%	30.92%	48.45%	15.10%	33.36%***	(0.000)
2015	35.23%	32.84%	31.21%	52.22%	15.14%	37.08%***	(0.000)
2016	38.12%	30.65%	27.57%	48.59%	14.20%	34.39%***	(0.000)
2017	35.49%	31.86%	28.30%	50.26%	13.71%	36.55%***	(0.000)
2018	33.83%	30.62%	28.63%	50.26%	13.97%	36.29%***	(0.000)
Dec1999-Jun2018	33.31%	34.57%	33.87%	55.55%	15.67%	39.89%***	(0.000)
Panel B: Sector							
Dec1999-Jun2018	62.46%	61.61%	62.73%	76.79%	49.63%	27.17%***	(0.000)
Panel C: Industry							
Dec1999-Jun2018	70.70%	69.84%	70.73%	83.52%	58.20%	25.32%***	(0.000)

Table 4 shows the results of family portfolio overlap from December 1999 to June 2018. We find that the average family portfolio overlap in the Spanish industry is equal to 33.31% at the stock level and it is 62.46% and 70.70% at the sector and industry levels, respectively.[9] The findings also reveal that the family overlap at stock level decreases over time. We also obtain the family overlap weighted by the total net assets in Euro equity category and the family overlap weighted by the number of funds managed in this category. The findings at stock level show the weighted averages are higher

[8] The Kruskal-Wallis nonparametric test shows the same statistical significance.

[9] The annual results of portfolio overlap at the sector and at the industry levels are available upon request.

than the equal-weighted average overlap which reveals evidence that the largest families with the highest number of funds have a higher family portfolio overlap. To test our null hypothesis, we split families into terciles according to their family overlap. We find that the average family portfolio overlap at stock level of fund families which are in the top tercile (*T1*) and the average of those which are in the bottom tercile (*T3*) are 55.55% and 15.67%, respectively, with a difference equal to 39.89% that is statistically significant at the 1% level. Therefore, we reject the null hypothesis that all fund families have the same portfolio overlap between their funds. We obtain similar results when we measure the portfolio overlap at sector and industry levels.

Once we find that there are families with a significantly higher portfolio overlap, we apply a panel data model to examine the family characteristics that enhance portfolio overlap.[10]

$$Family\ portfolio\ overlap_{f,t} = f\,(Bank_{f,t};\ Family\_size_{f,t};\ Family\_age_{f,t};\ Family\_\%EuroEquity_{f,t};\ \varepsilon_{i,j,t}\ ) \quad (4)$$

where $Family\ portfolio\ overlap_{f,t}$ is the portfolio overlap within fund family *f* in month *t* at stock level. $Bank_{f,t}$ takes a value equal to 1 when a fund family depends on a banking or insurance company according to its governance structure. $Family\_size_{f,t}$ is the log-normal of total size of fund family *f* in month *t*. $Family\_age_{f,t}$ is the age of fund family *f* obtained from the inception date of the oldest fund in the family. $Family\_\%EuroEquity_{f,t}$ is the percentage of the assets under management in the Euro equity category with respect to the total assets under management in the industry within fund family *f* in month *t*.

[10] Our panel data shows autocorrelation and heteroscedasticiy. Hence, we require a methodology that corrects the standard errors of the panel in order to solve these issues. Prais-Winsten, Generalised Least Squares (GLS), FE and RE with robust standard errors models take into account autocorrelation and heteroscedasticity. Regarding, the FE and RE, the Hausman test indicates that the FE model is the preferred specification. However, the time-invariant independent variables will be ignored by the FE estimator (in Equations 4 and 6 the *Bank* variable is a time-invariant regresor), while the RE model can estimate the coefficients associated with these variables. In this case, RE model may be viable alternatives to FE model (Hill et al., 2020).To verify the robustness of our results, we estimate Equations 4 and 6 using Prais-Winsten, GLS, FE and RE with robust standard errors.

Bank: Sahlman (1990) and Barry (1994), cited by Tykvová (2006), show that private independent fund companies typically concentrate in particular industries and establish networks in this industry within company. Therefore, we believe that there may be a higher family portfolio overlap within the independent fund families for a high degree of specialisation.

Family_size: is measured as the total assets under management within a family. According to Indro et al. (1999), mutual funds have an optimal size and their performance is deteriorated when they exceed this size. Chen et al. (2004) also assert that the size of a fund erodes the performance of the latter. However, Zhao (2004) argues that mutual fund families obtain benefits by charging fees to investors in all funds and therefore, they have incentives to take action with the objective of increasing the investor inflows and therefore of maximising the total assets under management. In addition, based on these findings, we consider that fund families have incentives to offer new funds although these funds are similar to existing funds in order to increase the total assets under management, while avoiding holdings very large funds. The result of the influence of family size on family portfolio overlap is interesting for individual investors because of the strong degree of market concentration in the Spanish market.

We also include the interaction between *Bank* and *Family_size* in order to distinguish larger fund families which belong to a banking group from the remaining families. We consider that within these families, the managers can have access to a high number of internal and external information reports because in this way the entire fund family benefits from the resources. In addition, based on the results of Table 4, which show that the TNA-weighted average is higher than the equal-weighted average overlap, we could expect the coefficient of this interaction to be positive and significant because the largest families belong to banking groups. Furthermore, for robustness, our hypothesis is based on the idea that when we focus on the ownership of their own stocks by bank holding groups, the overlap is greater in fund families belonging to this bank holding group than in other families belonging to other banking groups. In this line, Massa and Rehman, (2008) provide evidence that the

ownership of an asset management company can have a significant impact on the portfolio holdings of funds.[11]

Family_age: we consider that families start with fewer resources and less ability to control the information of a large number of stocks and thus, our hypothesis is that the family portfolio overlap may be higher in families with a short experience in the fund market.

Family_EuroEquity: we also include the weight of the euro equity funds category within each family. Following the resources-based theory of the companies (see e.g. Silverman, 1999 cited by Casavecchia and Ge, 2019), the fund families with a greater focus on a certain category could possess more institutional advantages from experience and learning. In this line, Van Nieuwerburgh and Veldkamp (2010) argue that the private information acquisition through specialized learning results in a higher degree of asset concentration. Kacperczyk et al. (2005) also show that a higher degree of industry concentration is a measure of informational advantages. Therefore, we consider that the weight of the euro equity funds category within a fund family may influence the family portfolio overlap. Specifically, our hypothesis is that the overlap may be higher in families with a higher weight in this category.

Table 5 shows the results of Equation 4 using Prais-Winsten, GLS, FE and RE with robust errors, thereby providing robustness to the results.[12] The findings reveal evidence that the family portfolio overlap is higher in families which do not belong to a banking or insurance company, in line with the conclusions of Sahlman (1990) and Barry (1994) about the higher degree of specialisation of private independent fund management companies. However, when we include the interaction between the dummy variable *Bank* and the variable *Family_size*, we find a higher family overlap in the larger banking families; these are the families which belong to larger bank holding groups. These results

[11] Previous literature has documented several factors and reasons that influence the bank-affiliated funds' decisions to increase their holdings of the parent banks' stocks. Golez and Marin (2015) document that fund managers serve the interest of the owners of asset management firms (the banks) with the aim to support their stock prices, specially, at the time of large price drops. Gil-Bazo et al. (2020) show that the bank-affiliated funds supported the prices of bonds issued by their parent banks during the Global Financial Crisis, GFC, (2008) and the European sovereign debt crisis (2011). Gómez-Bezares and Przychodzen (2018) argue that the significant positive tendency to buy the parent banks' equity for their bank-affiliated funds is motivated by both external pressure and individual taste.

[12] The findings are robust when Equation 4 is defined with independent variables lagged by one month, and results are available upon request.

confirm our null hypothesis that these larger families may have interest in offering new funds, even when these new funds have similar portfolio holdings as existing funds. With this practice, the fund families would prefer to avoid very large funds in cases where size erodes performance. In addition, large banking groups usually have the stock of their banks listed in stock exchange. When we focus on the overlap in portfolios of stocks of bank holding groups, we find a statistically significant overlap in the family which belongs to this specific group than in the rest of the families which belong to other banking groups.[13]

Table 5: The fund family characteristics that enhance portfolio overlap

This table shows the results obtained from Equation 4 from December 1999 to June 2018. Equation 4 is estimated using Prais-Winsten, GLS, FE and RE with robust errors models. Where the dependent variable is *Family portfolio overlap*$_{f,t}$ that is the portfolio overlap within fund family *f* in month *t* at the stock level and the independent variables are: *Bank*$_{f,t}$ that takes a value equal to 1 when a fund family depends on a banking or insurance company regarding its governance structure. *Family_size*$_{f,t}$ is the log-normal of the total size of fund family *f* in month *t*. *Bank*$_{f,t}$ *x Family_size*$_{f,t}$ is the interaction between the dummy variable *Bank*$_{f,t}$ and the variable *Family_size*$_{f,t}$. *Family_age*$_{f,t}$ is the age of fund family *f* in month *t* obtained from the inception date of the oldest fund in the family. *Family_%EuroEquity*$_{f,t}$ is the percentage of the assets under management in the Euro equity category with respect to the total size of fund family *f* in month *t.* The *p*-value is reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Prais-Winsten	GLS	Prais-Winsten	GLS	FE	RE
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	0.113***	-0.025	0.729***	0.479***	0.190***	0.112***
	(0.000)	(0.627)	(0.000)	(0.000)	(0.001)	(0.003)
Bank	-0.123***	-0.076***	-0.828***	-0.684***		-0.126**
	(0.000)	(0.000)	(0.000)	(0.000)		(0.016)
Family_size	0.026***	0.033***	-0.024**	-0.007	-0.064**	-0.061**
	(0.000)	(0.000)	(0.034)	(0.468)	(0.034)	(0.035)
Bank x Family_size			0.056***	0.478***	0.097**	0.099**
			(0.000)	(0.000)	(0.026)	(0.013)
Family_age	-0.004***	-0.005***	-0.004***	-0.005***	-0.005**	-0.006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.045)	(0.037)
Family_%EuroEquity	0.040**	0.074***	0.062***	0.074***	0.272**	0.280*
	(0.039)	(0.006)	(0.001)	(0.003)	(0.012)	(0.082)
R-squared	23.74%		24.34%		8.17%	8.14%
Wald	118.18***	93.33***	169.88***	119.26***	124.52***	124.70***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman Test					26.12***	
					(0.000)	
#Observations	5,667	5,667	5,667	5,667	5,667	5,667

[13] In the first, second and third largest fund families according to total net asset under management in the Spanish industry which belong to a bank holding group, we find that the family overlap in their bank holding group stock is equal to 4.23%, 4.56% and 2%, respectively. In all cases, the overlap is statistically significantly higher than in the rest of families belonging to other groups.

Table 5 also shows that the family overlap is higher in younger families, which may have fewer resources, and less ability to control information. Finally, the results show that the family portfolio overlap is higher in the families with a higher weight in the euro equity category. In line with previous studies on the fund family specialization (Kacperczyk et al., 2005; Van Nieuwerburgh and Veldkamp, 2010; Casavecchia and Ge, 2019), the top management of these families may allocate more resources in this category from which all of the family managers could benefit.

5. Performance of investors who choose only one fund family to form their portfolio

Previous literature reveals evidence that individual investors usually concentrate all of their fund investment in a single fund family. Our objective is to test whether this initial selection of fund family plays an important role in investors' performance. We hypothesize that the level of overlap of the funds and manager autonomy in the portfolio holding allocation within a fund family could influence that performance. First, we approach the fund manager autonomy within families. We suggest that individual investors could obtain benefits from a higher level of management autonomy in a setting in which fund managers freely pick stocks within each sector. Second, we examine the determinants of performance for individual investors who select a sole fund family depending on the manager autonomy and the portfolio overlap of that family.

5.1. Fund manager autonomy in the portfolio holding allocation

Several studies have focused on behaviours within fund families (Chen et al., 2004; Elton et al., 2007; Cici et al., 2018). They argue that most mutual funds operate as part of fund families which make strategic decisions that have an influence on the operations and performance of their own funds. However, these authors are implicitly considering the existence of coordination between decisions within fund families, focusing on the top management of a fund family, but neglecting the decisions at the individual level of fund managers (Kempf and Ruenzi, 2008). Fund managers make differential decisions that may provide a significantly different result (positive or negative) to investors allowing the managers to promote themselves and stand out from others whether the return is significantly

positive. In this sense, Agarwal et al. (2009) indicate that managerial incentives depend on fund performance. Mason et al. (2016) also argue that fund managers' positions, reputations and salaries depend on their performance records.

Our hypothesis is based on the idea that the managers' decisions can be explained by both the influence of family top-management and the autonomy of fund managers. Kacperczyk and Seru (2012) consider the coexistence of two different family organisational structures: centralised and decentralised. They show that decentralised funds offer greater autonomy to their managers, as well as incentives and flexibility to produce more valuable information and thus, more benefits for investors than the centralised decision-making process. In this sub-section, we first study whether the fund manager autonomy is the same in all fund families, being the null hypothesis:

$3H_0$: There are no significant differences in autonomy of managers between different fund families.

In line with Elton et al. (2007) who argue that a common family approach could result in similar exposures to various industries, we consider the portfolio overlap at the sector level as the approach of the general investment outline of a family. Then, within this investment strategy, managers can choose specific stocks that are held in portfolio holdings. Therefore, we measure the fund manager autonomy within a fund family as the average difference between the portfolio overlap at the industry level and the portfolio overlap at the stock level of all fund pairs that belong to the family.

$$Fund\ manager\ autonomy_{f,t} = \overline{Portfolio\ Overlap\ (industry)_{i,j,t} - Portfolio\ Overlap\ (stock)_{i,j,t}} \quad (5)$$

where $Fund\ manager\ autonomy_{f,t}$ is the autonomy level of fund managers within family *f* in month *t.* $Portfolio\ Overlap\ (industry)_{i,j,t}$ is the portfolio overlap at the industry level between funds *i* and *j* which belong to fund family *f* in month *t* and $Portfolio\ Overlap\ (stock)_{i,j,t}$ is the portfolio overlap at the stock level between funds *i* and *j* which belong to fund family *f* in month *t.* Therefore, the autonomy of the managers within the family will be greater, the greater the average difference between portfolio overlap at the industry level and at the stock level.

To examine whether the autonomy of managers is similar for all fund families, we split families into terciles according to this measure. Table 6 shows that we reject the null hypothesis in the

mean-difference test between the average autonomy of managers within families that are in the top tercile (*T1*) and the average of those are in the bottom tercile (*T3*). Therefore, our findings indicate that the autonomy of fund managers is significantly higher in some families than others. We also observe that both the average weighted by total net assets and the average weighted by number of funds are lower than the equal-weighted average. This result reveals the autonomy of managers is higher in smaller families that could be explained by the fact that smaller families have less resources to obtain both internal and external reports on specific stocks from which fund managers' decisions can be adressed.

Table 6: Fund manager autonomy within fund families

This table shows the average autonomy of managers within fund families, the average autonomy of managers weighted by total net assets in Euro equity category and weighted by number of Euro equity funds, the average autonomy of managers within families that are in the top tercile *(T1*) and the average autonomy of managers within families that are in the bottom tercile (*T3*), respectively. The last column shows the result of a mean-difference test between *T1* and *T3* with the *p*-value in parentheses. We apply the mean-difference test for paired samples.[14] In all columns, the annual data is obtained using the monthly data. The study period starts in December 1999 and ends in June 2018. The *p*-value is reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Year	Autonomy of managers	Autonomy of managers (*TNA-weighted*)	Autonomy of managers (*#funds-weighted*)	Autonomy of managers (*T1*)	Autonomy of managers (*T3*)	Mean-difference test (*T1-T3*)
2000	32.52%	31.51%	31.95%	51.54%	13.28%	38.26%*** (0.000)
2001	33.70%	31.93%	33.53%	49.98%	16.87%	33.10%*** (0.000)
2002	33.73%	30.70%	32.41%	52.38%	14.98%	37.40%*** (0.000)
2003	31.80%	30.88%	30.94%	47.80%	15.88%	31.92%*** (0.000)
2004	32.73%	31.91%	31.64%	47.96%	17.51%	30.45%*** (0.000)
2005	36.63%	33.97%	34.11%	50.74%	22.49%	28.24%*** (0.000)
2006	37.89%	35.18%	35.18%	54.93%	22.03%	32.90%*** (0.000)
2007	36.37%	36.87%	33.87%	56.71%	21.93%	34.79%*** (0.000)
2008	37.04%	37.10%	36.37%	55.55%	20.86%	34.69%*** (0.000)
2009	38.14%	32.10%	36.34%	52.79%	24.32%	28.47%*** (0.000)
2010	38.75%	33.70%	37.82%	53.21%	25.18%	28.03%*** (0.000)
2011	37.10%	32.69%	35.95%	52.61%	23.53%	29.08%*** (0.000)
2012	39.37%	33.07%	37.61%	54.41%	26.95%	27.45%*** (0.000)
2013	39.67%	34.15%	38.34%	55.74%	26.26%	29.48%*** (0.000)
2014	42.05%	38.96%	41.02%	56.27%	27.49%	28.78%*** (0.000)
2015	42.17%	40.91%	41.38%	56.51%	26.79%	29.72%*** (0.000)
2016	45.20%	42.82%	44.72%	58.19%	29.75%	28.44%*** (0.000)
2017	46.19%	42.49%	45.70%	60.34%	29.42%	30.92%*** (0.000)
2018	45.54%	43.24%	44.63%	60.08%	29.43%	30.65%*** (0.000)
Dec1999-Jun2018	38.02%	35.26%	36.80%	53.26%	21.64%	31.61%*** (0.000)

[14] The Kruskal-Wallis nonparametric test shows the same statistical significance.

Once we found that there are families with a significantly higher autonomy of managers than others, we apply a panel data model to detect the family characteristics that enhance the autonomy of fund managers. Specifically, we use the following model.

$$Autonomy\ of\ managers_{f,t} = f\ (Bank_{f,t}\ ;\ Family\_size_{f,t}\ ;\ Family\_age_{f,t}\ ;$$

$$Family\_\%EuroEquity_{f,t};\ \varepsilon_{i,j,t}\ ) \quad (6)$$

where $Autonomy\ of\ managers_{f,t}$ is the autonomy level of managers within fund family *f* in the portfolio holding allocation. $Bank_{f,t}$ takes a value equal to 1 when fund family *f* is dependent on a banking or insurance group in accordance with the governance structure. $Family\_size_{f,t}$ is the log-normal of total size of fund family *f* in month *t*. $Family\_age_{f,t}$ is the age of fund family *f* obtained from the inception date of the oldest fund in the family. $Family\_\%EuroEquity_{f,t}$ is the percentage of the assets under management in the Euro equity category with respect to the total size of fund family *f* in month *t*.

We suggest that in the large fund families that belong to a bank holding group, the top-management may have a greater influence on the selection of stocks within a specific sector, because the top-management may have a higher level of stock information obtained in other areas of analysis within the group. Jordan et al. (2012) find that the bank-affiliated institutional investors follow strongly to recommendations issued by their own analysts. In addition, large families have more resources and more analysts that could a significant influence on the trading decisions of fund managers. Therefore, our hypothesis is that there is less fund manager autonomy in the portfolio holding allocation within larger families which belong to bank holding groups.

Table 7 shows the results of Equation 6 with Prais-Winsten, GLS, FE and RE with robust errors, which are consistent.[15] The findings report evidence of a lower fund manager autonomy in the portfolio holding allocation within larger families which belong to a bank holding group.

Additionally, we also analyse the effect of family age on the manager autonomy. We believe that older fund families may have senior employers with more experience and longer tenure within the family and therefore, these fund managers could enjoy greater autonomy in their decisions of portfolio

[15] The findings are robust when Equation 6 is defined with independent variables lagged by one month, and results are available upon request.

holding allocation. The results shown in Table 7 also confirms our hypothesis about the relationship between the family age and the manager autonomy. We find that fund managers within older fund families have greater autonomy in the stock-picking within a specific sector.

Table 7: The fund family characteristics that enhance the fund manager autonomy

This table shows the results obtained from Equation 6 from December 1999 to June 2018. Equation 6 is estimated using Prais-Winsten, GLS, FE and RE with robust errors models. Where the dependent variable is $Autonomy\ of\ managers_{f,t}$ which is the autonomy level of managers within fund family *f* in month *t* at the stock level and the independent variables are: $Bank_{f,t}$ is equal to 1 if a fund family depends on the banking or insurance company according to its governance structure. $Family\_size_{f,t}$ is the log-normal of total size of fund family *f* in month *t.* $Bank_{f,t}$ *x* $Family\_size_{f,t}$ is the interaction between the dummy variable $Bank_{f,t}$ and the variable $Family\_size_{f,t}$. $Family\_age_{f,t}$ is the age of fund family *f* obtained from its start date in month *t.* $Family\_\%EuroEquity_{f,t}$ is the percentage of the value in the Euro equity category with respect to the total size of fund family *f* in month *t.* The *p*-value is reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Prais-Winsten	GLS	Prais-Winsten	GLS	FE	RE
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	0.525***	0.488***	0.261	0.218**	0.529***	0.273**
	(0.000)	(0.000)	(0.345)	(0.019)	(0.005)	(0.033)
Bank	0.129***	0.088***	0.431***	0.418***		0.108***
	(0.000)	(0.000)	(0.000)	(0.000)		(0.006)
Family_size	-0.025***	-0.023***	-0.004	-0.002	0.058**	0.053**
	(0.000)	(0.000)	(0.550)	(0.827)	(0.015)	(0.017)
Bank x Family_size			-0.024***	-0.025***	-0.084**	-0.086***
			(0.002)	(0.001)	(0.016)	(0.005)
Family_age	0.007***	0.007***	0.007***	0.007***	0.002**	0.003**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.017)	(0.013)
Family_%EuroEquity	0.023	0.068***	0.014	0.055**	0.100	-0.094
	(0.119)	(0.002)	(0.348)	(0.015)	(0.343)	(0.335)
R-squared	50.56%		50.55%		14.27%	14.22%
Wald	351.44***	197.97***	351.27***	187.85***	123.90***	119.90***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman Test						27.68***
						(0.000)
#Observations	5,667	5,667	5,667	5,667	5,667	5,667

5.2. The consequences for the individual investor's return

We find that there are fund families which show a statistically significantly higher family portfolio overlap, as do families with a statistically significantly higher fund manager autonomy. Our aim is to examine whether the portfolio holding similarities and the manager autonomy have a significant influence on investors' return. Elton et al. (2007) argue that investors are negatively affected when they pick a fund family with a high correlation between its funds. Kacperczyk and Seru (2012) show

that, compared with funds from families with a centralised decision-making process, funds from decentralised families offer greater autonomy to their managers, as well as incentives and flexibility to produce more valuable information and thus, resulting in more benefits for investors.

In this analysis, we apply the following model to examine whether the family portfolio overlap and the fund manager autonomy within a family influence the performance of the fund and thus, the results for investors who decide to invest in it: [16]

$$Excess\ Family\ return_{f,t} = \alpha + B_1\ Excess\ Family\ portfolio\ overlap_{f,t} +$$

$$+ B_2\ Excess\ Autonomy\ of\ managers_{f,t} + \varepsilon_{i,j,t} \quad (7)$$

where $Excess\ Family\ return_{f,t}$ is the difference between the average daily net return of all funds in fund family *f* and the average daily net return of the rest of funds that are in other families different from family *f* on day *t*. $Excess\ Family\ portfolio\ overlap_{f,t}$ is the difference between the average portfolio overlap of family *f* and the average portfolio overlap of all families and $Excess\ Autonomy\ of\ managers_{f,t}$ is the difference between the average autonomy of managers in family *f* and the average autonomy of managers from all families.

In Equation 7, the independent variables of each fund are included as the deviation from the average of all funds in our sample.[17] We apply this model with daily return data, and we consider the constant monthly portfolio overlap data on every day of the month.

Table 8 shows the results of Equation 7. The findings reveal that the excess portfolio overlap in a family with respect to all funds in our sample has a statistically significantly negative influence on investors' returns whereas, the excess fund manager autonomy has a significantly positive influence. Individual investors who concentrate their funds in a single family with a high family portfolio overlap have under-diversified their fund investment decisions, as we found in previous sections, and they obtained a lower return. However, investors seem to benefit from a lower similarity between fund portfolio holdings and a higher degree of fund manager autonomy in the portfolio

[16] The Hausman's test indicates the FE model as the preferred method of estimation.

[17] We obtain that the correlation coefficient between the variable $Excess\ Family\ portfolio\ overlap_{f,t}$ and $Excess\ Autonomy\ of\ managers_{f,t}$ is negative and low, specifically, this is equal to -0.012.

holding allocation within a family. Fund managers have more incentives and flexibility to add value to the fund management within families where is a higher level of autonomy in the portfolio holding allocation according to Kacperczyk and Seru (2012). Therefore, in view of the fact that individual investors concentrate their investment in a single family (Capon et al., 1996; Massa 2003; Clare et al., 2014; Gerken et al., 2018) we conclude that the initial selection of a fund family is a crucial decision for investors' performance.

Table 8: Family portfolio overlap, fund manager autonomy and investors' return

This table shows the results obtained from Equation 7 from December 1999 to June 2018. Equation 7 is estimated using FE with robust errors model. Where the variable is *Excess Family return*$_{f,t}$ is the difference between the average daily net return of all funds in fund family *f* and the average daily net return of the rest of funds that are in other families different from family *f* on day *t* and the independent variables are: *Excess family portfolio overlap*$_{f,t}$ is the excess of portfolio overlap of fund family *f* with respect to the average portfolio overlap of all funds on day *t* and *Excess Autonomy of managers*$_{f,t}$ is the difference between the average autonomy of managers in family *f* and the average autonomy of managers of all families. Net return data is provided daily and we consider that the monthly portfolio overlap data is constant during all the month. The *p*-value is reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Coefficient
Constant	-0.001***
	(0.001)
Excess Family portfolio overlap$_{f,t}$	-0.008**
	(0.027)
Excess Autonomy of managers$_{f,t}$	0.013**
	(0.044)
Hausman Test	6.24**
R-squared	6.37%
Wald	62.30***
	(0.000)

6. Conclusions

Earlier literature finds that individual investors concentrate their fund investment decisions in a single fund family and thus, the potential diversification and performance of investors are restricted to this selected fund family. This paper investigates whether the similitude between the portfolio holdings of funds, as well as the fund manager autonomy within a family is a determinant of performance for individual investors who select this fund family.

We find a higher similitude between portfolio holdings of funds in the same family than across families. Consequently, the potential diversification is lower for individual investors who concentrate all of their fund investments in a single family. Furthermore, the potential diversification is especially lower when investors invest in funds that belong to the same family and when these funds are large and of roughly the same size, hold roughly the same high number of stocks their portfolio, charge similarly high fees, are of similar ages and have similar past annual gross, but when these funds are not amongst neither the youngest nor the oldest funds and do not have the highest or lowest past annual gross return.

We find a greater correlation between funds within the same management company and, as a consequence, a lower diversification for investors who concentrate their funds in the same family. The results also show a significant difference between some fund families and others. Specifically, the similitude between portfolio holdings is higher in larger families which belong to a bank holding group and do not have wide experience in the fund market. These families could have incentives to offer two twin funds rather than one large one in order to prevent the fund size from eroding its performance, while taking full advantage of family-wide research. This type of research, in less experienced families, would be focused on fewer stocks.

These findings are interesting for individual investors because the five largest fund families that belong to a bank holding group manage more than 40% of the investment funds that individual investors delegate to professional investors in the Spanish mutual fund industry.

According to the economic implications for individual investors, we conclude that a higher similitude between portfolio holdings not only causes fund families to offer a lower diversification to individual investors, it also has a significantly negative economic effect on them. However, individual investors seem to benefit from a higher manager autonomy in portfolio holding allocation within stock sectors, which is a significant characteristic of smaller fund families with wide experience that do not belong to a bank holding group. Our findings reveal that investors could obtain higher returns investing in these families in which the potential diversification and fund manager autonomy are higher. These results are also interesting for the top management of mutual fund family because of the positive relation between past performance and future fund flows. Given that we find that diversification and

manager autonomy manager have a positive impact on the investors' performance, the top management of fund families could consider encouraging diversification of portfolios between funds within the same family as well as manager's autonomy in decision-making.

Nevertheless, although academics show that investors often concentrate all of their fund investments in the same family, we suggest that investors could improve their diversification level by selecting funds across families, given that the portfolio overlap between fund pairs in different families is lower. In this line, it would be interesting for future research to examine whether there are family pairs that have a significant similarity and to study the characteristics of these families.

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Appendix 1: Robustness analyses of the portfolio overlap

Following the studies of Delpini et al. (2019) and Fricke and Fricke (2021)[18], we obtain the portfolio overlap considering the portfolio diversification measured by the inverse of the Herfindahl–Hirschmann index. Note that this index measures the concentration level of a portfolio and its inverse can be regarded as the number of stocks in the portfolio.

We apply *cosine similarity* between funds *i* and *j* as follows:

$$Portfolio\ Similarity_{i,j,t} = \frac{\sum_{k=1}^{K} w_{i,k,t}\, w_{j,k,t}}{\sqrt{\sum_{k=1}^{K} (w_{i,k,t})^2}\sqrt{\sum_{k=1}^{K} (w_{j,k,t})^2}} \quad (1.1)$$

where $w_{i,k,t}$ is the portfolio weight of stock *k* in the fund *i* in month *t;* $w_{j,k,t}$ is the portfolio weight of stock *k* in the fund *j* in month *t. Portfolio Similarity*$_{j,t}$ is the value of portfolio similarity (portfolio overlap) between funds *i* and *j* in month *t* that depends on two factors: the number of common stocks and the the weights attached to common stocks.

Table 1.1 reports the average portfolio similarity obtained in Equation 1.1. This table shows higher similarity levels among portfolios than those reported by the portfolio overlap measure (Equation 1). Nevertheless, the Pearson correlation coefficient between both measures is statistically significant at 1% and equal to 89.19%, 94.41% and 90.93% for the portfolio overlap at the stock, sector and industry levels, respectively. Table 1.1 also shows a statistically significant higher similarity level in fund pairs within the same fund family than in fund pairs from different families. In addition, Figure 1.1 shows similar evolution of the portfolio overlap and the portfolio similarity.

For robustness purposes, we also apply the similarity measure to the fund family analyses.[19] The findings also lead us to reject the null hypothesis that all fund families have the same portfolio overlap between their funds. Finally, we obtain similar results on the characteristics of fund pairs with the highest portfolio overlap and the characteristics of fund families that enhance portfolio overlap among their funds.

[18] These authors examine the similarity level among portfolios as a determinant of mutual funds' vulnerabilities, and they consider diversification and overlap between portfolios as related notions.

[19] The Pearson correlation coefficient between the family portfolio overlap values obtained with the overlap measure and the similarity measure is equal to 84.42% (statistically significant at the 1% level).

Table 1.1: Overall results of the portfolio similarity at the fund pair level

Panel A, Panel B and Panel C report the results of portfolio similarity at the stock level, at the sector level and at the industry level, respectively. This table shows, for each year, the overall average portfolio overlap and the number of fund pairs within the same fund family and the number of fund pairs in different families, as well as their average overlap. In this table, we present a yearly report of the number of funds during the sample period, unlike in Table 1 where we present the total number only at three specific points during the sample period. The last column shows the results of the mean difference test between both specific averages with the *p*-value in parentheses. We apply the mean difference test for unpaired samples with different variance (in all cases the null hypothesis is rejected in the test of equal variance).[20] In all columns, the annual average is obtained with the monthly portfolio similarity data. The study period starts in December 1999 and ends in June 2018. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Stock						
Year	Portfolio similarity	#fund pairs (*same fund family*)	#fund pairs (*different fund family*)	Portfolio similarity (*same fund family*)	Portfolio similarity (*different fund family*)	Mean-difference test
2000	43.51%	282	11,520	54.89%	43.24%	11.65%*** (0.000)
2001	40.78%	341	13,827	44.79%	40.68%	4.11%*** (0.000)
2002	39.72%	354	14,261	44.21%	39.62%	4.59%*** (0.000)
2003	42.80%	340	15,175	48.98%	42.67%	6.32%*** (0.000)
2004	45.71%	337	13,592	52.40%	45.54%	6.85%*** (0.000)
2005	45.74%	391	14,415	52.48%	45.55%	6.93%*** (0.000)
2006	42.80%	421	15,621	47.06%	42.68%	4.37%*** (0.000)
2007	38.36%	474	16,648	43.00%	38.18%	4.82%*** (0.000)
2008	37.73%	468	16,032	39.23%	37.66%	1.57%*** (0.000)
2009	37.16%	422	14,054	41.78%	36.99%	4.79%*** (0.000)
2010	36.06%	255	10,917	42.13%	35.87%	6.26%*** (0.000)
2011	37.31%	236	9,864	45.98%	37.06%	8.92%*** (0.000)
2012	34.73%	193	7,712	46.81%	34.37%	12.44%*** (0.000)
2013	35.26%	166	6,289	42.92%	35.05%	7.87%*** (0.000)
2014	35.59%	97	4,619	44.09%	35.39%	8.69%*** (0.000)
2015	39.31%	104	5,203	45.05%	39.16%	5.89%*** (0.000)
2016	36.21%	93	4,737	40.60%	36.12%	4.48%*** (0.000)
2017	33.61%	75	4,260	41.38%	33.46%	7.92%*** (0.000)
2018	34.80%	65	4,061	43.38%	34.63%	8.74%*** (0.000)
Dec1999-Jun2018	40.94%	994	32,982	46.69%	40.79%	5.90%*** (0.000)
Panel B: Sector						
Dec1999-Jun2018	69.40%	994	32,982	74.71%	69.26%	5.46%*** (0.000)
Panel C: Industry						
Dec1999-Jun2018	75.60%	994	32,982	79.91%	75.48%	4.43%*** (0.000)

[20] The Kruskal-Wallis nonparametric test shows the same statistical significance.

Figure 1.1: Evolution of the portfolio overlap and the portfolio similarity at the fund pair level

This figure represents the evolution of the average portfolio overlap and portfolio similarity among Spanish euro equity funds from January 2000 to June 2018. The annual average is obtained with the monthly portfolio overlap data.