Euro government bond funds before and after the Euro debt crisis: Evidence from security-level holdings

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Abstract

This study is the first to evaluate the performance of Euro government bond mutual funds with characteristic-based benchmarks. This analysis is based on the security-level holdings of the most afflicted countries in the Euro sovereign debt crisis, i.e., the so-called periphery countries of Southern Europe, including Greece, Italy, Portugal, and Spain (GIPS). The combined contribution of bond selection and timing casts doubt on the value of active management relative to its costs. The results also show a further increase in the strong home bias detected in the years preceding the crisis, especially in the most relevant GIPS fund industries. This stronger bias results in worse bond selection abilities and assorted timing skills across the GIPS markets.

JEL classification: G11; G23

Keywords: Characteristic-based benchmarks; Euro debt crisis; Government bond mutual funds; Performance; Portfolio holdings.
1. Introduction

Bond mutual funds are a very important asset for global investors. As of September 2017, the bond fund total net assets (TNA) of €8,619 billion represented 21.5% of all worldwide mutual fund TNA, which is only lower than the 43.5% shared by equity mutual funds (Investment Company Institute, 2017). However, few studies have been conducted on the performance of these institutional portfolios in relation to their economic significance. Blake et al. (1993) and Elton et al. (1995) are some of the first and most commonly cited papers on this topic, providing underperformance patterns that are highly similar to those found in the extensive previous literature on equity mutual funds (e.g., Jensen, 1968; Lehman and Modest, 1987; Ippolito, 1989). This underperforming evidence is still present in more recent research on bond mutual funds, such as Ferson et al. (2006), Huij and Derwall (2008), Gutiérrez et al. (2009), and Ayadi and Kryzanowski (2011).

This research gap in relation to the equity fund literature is even more evident in the European mutual fund market, where Silva et al. (2003) is the first study on a widespread sample of European bond mutual funds. Dietze et al. (2009), Grose et al. (2014), Cuthbertson et al. (2016) and Leite and Cortez (2017) are some examples of this scarce literature on the performance evaluation of European bond mutual funds. This lack of attention is not justified by the economic relevance of the European bond fund industry, which accounts for 91.1% of the U.S. bond fund TNA, the largest and the most analysed bond fund market in the world (Investment Company Institute, 2017).

However, most of the performance findings on bond funds previously reported in the literature are not based on holdings-based measures even though this approach has been shown to better evaluate the management skills of equity mutual funds (e.g., Daniel et al., 1997; Kothari and Warner, 2001; Jiang et al., 2007; Elton et al. 2012; Ferson and Mo, 2016). In fact, only Cici and Gibson (2012) and Huang and Wang (2014) have analysed portfolio
holdings at the individual security level in order to study the performance of bond mutual
funds. Cici and Gibson (2012) use the empirical decomposition of equity fund returns
proposed by Wermers (2000) and find no evidence of management abilities for a sample of
U.S. corporate bond funds. They conclude that the costs of active management are larger than
the benefits on average. Huang and Wang (2014) use the holdings-based measure of Jiang et
al. (2007) to examine the market timing ability of a sample of U.S. government bond fund
managers. They find positive timing evidence at the one-month horizon under an
unconditional approach. In addition to these previous findings, Moneta (2015) follows Daniel
et al. (1997) and Kacperczyk et al. (2008) to decompose bond fund returns and costs using
asset class weights rather than security-level holdings. This study finds that U.S. bond fund
managers are able to earn back their fees and costs, thereby providing the first evidence of the
value of active management in bond mutual funds. The choice of asset class weights is mainly
justified by Moneta (2015), as individual bond data are less available and accurate than equity
information, especially for illiquid corporate bonds (Cici et al., 2011). However, the use of
security-level holdings when bond data are available seems to improve the accuracy of the
performance evaluation of bond mutual funds (Comer, 2005).

Our paper is the first study to evaluate the holdings of several government bond mutual
fund markets in the Euro zone at the individual security level. This economic region
represents a unique setting because Euro government bonds share a single currency, but
issuers are different governments with different sovereign risks, which is a key difference
from U.S. government bonds. Thus, our study makes important contributions that allow for a
better understanding of the costs and benefits of active bond fund management of the scarcely
explored Euro bond fund industry, i.e., we decompose the performance components based on
security-level holdings to compare the costs with the value of the active management skills of
a set of Euro bond fund managers. To do so, we analyse a set of the Euro countries most
afflicted by the sovereign debt crisis, that is, the so-called periphery countries of Southern Europe such as Greece, Italy, Portugal and Spain (GIPS). This sample will allow us to study the effects of the recent Euro sovereign debt crisis on bond fund performance in a homogeneous management context. That is, managers of the Euro government bond funds registered in GIPS have faced investment decisions involved in a quite similar storm of home sovereign risks, thereby providing comparable management concerns that might be very different from funds in other countries. The extension of our analysis to other Euro bond markets could increase the economic significance of the sample but with a much larger heterogeneity in the reasons for performance components.

We focus on a Euro government bond fund sample rather than U.S. government bond funds for several reasons. First, to date, holdings-based measures at the individual security level have not been applied to Euro government bonds despite the economic relevance of these assets. To the best of our knowledge, the work by Huang and Wang (2014) is the only application of holdings-based measures to government bond mutual funds; however, they focus only on the timing decisions of U.S. Treasury mutual fund managers because timing is the main activity by which these managers can obtain superior performance due to the high correlation of the returns of individual securities issued by the U.S. Treasury. According to Huang and Wang (2014), these managers are mainly concerned with the factors that affect timing activities to maintain the target portfolio duration, such as the interest rate risk or rolling-over positions. This statement makes sense in the case of U.S. government bond funds, but it is highly incomplete for our sample of Euro government bond funds.

1 The economic relevance of the bond mutual fund industry is assorted across GIPS. In the last decade, Spain and Italy have ranked very relevant positions in Euro bond mutual fund market in terms of TNA and number of funds. On the other hand, Greece and Portugal played a quite similar and residual role in the Euro bond mutual fund industry. Both the TNA and number of bond funds registered in Portugal and Greece represented less than 5% of the GIPS bond fund market (Investment Company Institute, 2017).

2 The government bonds issued by GIPS show the significantly highest average correlation in the Euro zone yield spreads over the 10-year German government bonds for our sample period, 2004-2014. Ireland has not been included in our sample because the Irish sovereign risk shows a significantly lower average correlation with GIPS, thereby affecting the homogeneity of the managing context of our sample. This finding is even more significant from the beginning of the Euro sovereign debt crisis in 2009.
selection activities should play a relevant role in the value of the active management of Euro
government bond funds because of the existence of other market risks, such as the credit risk
associated with the Euro government bond issuers, especially under sovereign debt crisis
conditions. As a result, our performance evaluation of Euro government bond funds follows
the approach to U.S. corporate bond funds developed by Cici and Gibson (2012); this
approach requires measuring the returns obtained by the fund due to bond-selection,
characteristic-timing and the long-term investment style rather than the mere timing skills, as
in Huang and Wang (2014) for U.S. Treasury funds. Thus, our study contains an innovative
security-level holdings approach to Euro government bond funds that is based on the
empirical decomposition of equity fund returns proposed by Wermers (2000).

Second, our comprehensive and accurate database allows us to benchmark each security
held by the quarterly portfolios reported by the funds. We follow the characteristic-based
benchmarking methodology initially proposed for stocks by Daniel et al. (1997). Our
benchmarking method is based on Cici and Gibson (2012), who apply characteristic-based
benchmarks using duration and credit rating as two major factors to explain the cross-section
of corporate bond returns (Gebhardt et al., 2005). This approach also makes sense in our study
because of the striking differences found in the sovereign risk premia in the Euro government
bond market (e.g., Arghyrou and Kontonikas, 2012; Bernoth et al., 2012; Bi, 2012).

Finally, the time horizon considered by our database allows for the first comprehensive
analysis of the effects of the European sovereign debt crisis on the performance attributions of
government bond mutual funds in the Euro members most affected by the crisis. The detailed
composition of the portfolios held by our fund sample should give evidence on how the crisis
affected the management patterns of these Euro government bond funds and their

3 Lane (2012) performs a comprehensive diagnosis of the European sovereign debt crisis.
consequences in terms of performance records, thereby making a unique contribution to the literature.

Our paper also explores more deeply the early stage of the debate over active bond fund management. Our research is the first to employ individual portfolio holdings to deepen the understanding of the costs and benefits of active fund management in the Euro government bond markets. Thus, we aim to answer the question of whether fund managers can both select and time Euro government bonds to outperform their characteristic-based benchmarks. Furthermore, we also aim to answer the question on the value of active management in Euro government bonds relative to its costs. The answers to these questions should be of interest to fund managers, retail investors, financial advisors or senior executives in the fund management industry.

The results cast doubt on the value of active management relative to its costs. We find a further increase in the strong home bias to sovereign debt detected in the years preceding the Euro debt crisis, especially in the most relevant GIPS fund industries. This stronger bias results in worse bond selection abilities and assorted timing skills across the GIPS markets.

The remainder of this paper is organised as follows. Section 2 describes the data. Section 3.1 describes the characteristic-based benchmarks used in our analysis. Section 3.2 presents the results of the fund return decomposition. Section 3.3 deepens our understanding of the effects of the Euro sovereign debt crisis on the management patterns and performance of Euro government bond funds. Section 4 concludes.
2. Data

Morningstar provides fund holdings from January 2004 to December 2014 for 87 mutual funds with domicile in GIPS that are classified by Morningstar as Euro government bond funds. According to Morningstar categories, Euro government bond funds primarily invest in government or government-backed agency securities denominated or hedged into euros. Furthermore, we exclude those funds that are only permitted to invest in home sovereign bonds due to their style designation. Some relevant issues must be considered in the analysis of this investment category. While U.S. Treasury bond fund managers are actually market timers that engage in rollover positions to keep the target portfolio duration (Huang and Wang, 2014), Euro government bond fund managers must also be concerned with other market risks rather than mere changes in the interest rate. Thus, both bond selection and strategic style may also contribute to the performance of our sample.

Our database includes all both surviving and terminated Euro government bond funds registered in GIPS; thus, our sample is free of survivorship bias. We work with the publicly reported holdings provided by Morningstar for each fund at the end of each quarter. Although some funds voluntarily disclose holdings more frequently than quarterly, these portfolios show an irregular distribution that may be affected by the reporting bias addressed by Elton et al. (2010) for private data providers. From Morningstar, we also obtain additional information such as gross returns, net returns, TNA and both the management and custodial annual fees charged by our fund sample.

The holdings-based performance measures used in our paper require 1-year back portfolio holdings; thus, our performance evaluation period began in January 2005. Chen et al. (2010) report different share classes with a similar holdings composition but different fees and loads. We follow the approach developed by Moneta (2015) to aggregate all observations of these multiple share class funds into one figure.

Although the Euro government debt markets are less liquid than U.S. Treasury debt market in proxy terms of trading and outstanding volume, the potential stale pricing problem of bond fund assets (Chen et al., 2010) should not be a generalised concern for the analysis of Euro sovereign bonds with an average daily trading volume higher than €70 billion and an average daily turnover higher than 1.5% in some relevant Euro markets (Association for Financial Markets in Europe, 2016).
al. (2010) and Moneta (2015) exclude bond funds with less than $5 million in TNA to overcome the incubation outperformance bias documented by Evans (2010). However, this size requirement can severely reduce the number of funds included in our sample because of the extreme differences between the size of U.S. and GIPS bond funds (Investment Company Institute, 2017). We adapt this size requirement to the GIPS bond fund industry, excluding all funds with less than €1 million in TNA. Finally, for inclusion in our sample, we require that a fund must have available data to evaluate at least 2 quarters of holdings-based performance measures. This condition aims to exclude funds with a nearby inception or termination date. Thus, our final sample consists of 68 Euro government bond funds registered in GIPS, 1,348 quarterly portfolio reports and more than 39,745 holding observations.

Table 1 shows the fund sample statistics. From 2004 to 2014, the total number of Euro government bond funds in our sample remained highly stable. However, this table also highlights the research concern that holding observations are not consistently time diversified across GIPS countries with the only exception being Spain. This finding could question the time accuracy of the results for some GIPS countries but not the results of our GIPS sample as a whole. The descriptive statistics also show that the average fund size recovers intensely pre-crisis figures in the later years, whereas the cross-sectional statistics show an important fund market concentration in Greece, Italy and Spain where few large bond funds compete against a higher number of small-sized bond funds. Our fund sample holds on average more than 86% of portfolio assets in Euro government debt securities. These public debt assets include sovereign debt, sub-sovereign debt issued by regional/local governments, agency debt issued by public companies and institutions that are government-backed, and debt issued by supranational institutions.
Table 1
Fund Sample Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of funds</th>
<th>Assets in € millions</th>
<th>Portfolio (%) in Euro government securities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GREECE ITALY PORTUGAL SPAIN</td>
<td>Mean</td>
<td>Q1</td>
</tr>
<tr>
<td>2004</td>
<td>1 2 - 23</td>
<td>110.8</td>
<td>16.5</td>
</tr>
<tr>
<td>2005</td>
<td>3 8 - 23</td>
<td>252.9</td>
<td>18.8</td>
</tr>
<tr>
<td>2006</td>
<td>4 10 - 21</td>
<td>189.4</td>
<td>12.4</td>
</tr>
<tr>
<td>2007</td>
<td>2 9 - 23</td>
<td>136.8</td>
<td>15.6</td>
</tr>
<tr>
<td>2008</td>
<td>2 6 - 21</td>
<td>103.0</td>
<td>19.1</td>
</tr>
<tr>
<td>2009</td>
<td>1 8 - 26</td>
<td>84.2</td>
<td>15.0</td>
</tr>
<tr>
<td>2010</td>
<td>- 7 1 - 27</td>
<td>50.7</td>
<td>11.1</td>
</tr>
<tr>
<td>2011</td>
<td>- 7 2 - 27</td>
<td>43.2</td>
<td>8.9</td>
</tr>
<tr>
<td>2012</td>
<td>3 4 2 - 20</td>
<td>51.6</td>
<td>13.2</td>
</tr>
<tr>
<td>2013</td>
<td>3 3 1 - 19</td>
<td>76.1</td>
<td>22.4</td>
</tr>
<tr>
<td>2014</td>
<td>3 1 1 - 19</td>
<td>103.3</td>
<td>32.6</td>
</tr>
<tr>
<td>2004-14</td>
<td>6 21 2 - 39</td>
<td>109.3</td>
<td>16.9</td>
</tr>
</tbody>
</table>

Table 1 shows the descriptive statistics for our sample of Euro government bond funds registered in GIPS at the end of each year. The left-hand part provides the total number of funds. The central part shows cross-sectional statistics for fund assets. The right-hand part reports the mean percentage of quarterly portfolio holdings identified as Euro government securities and the portfolio percentage in Euro government securities completely identified in terms of issuer, time-to-maturity and return records. The figures are also aggregated for the funds registered in each GIPS country for the whole period 2004-2014.

From Datastream, we identify the issuer, maturity date, and monthly return records for 99.64% of these assets along our study period. We work with the Total Return Index provided by Datastream, which includes the coupon payments, as well as the appreciation or depreciation in the market price of the security. This price is the latest price obtained from the market. For some markets, this price is the current real-time price; for others, it is the previous night's closing price. It is always a mid-price, that is, the average of the bid and ask quotes. Finally, we analyse the characteristics of the corporate securities held by our fund sample from the publicly reported prospectuses. We detect those corporate issues that are government-backed. These issues present credit ratings that are similar to the institution that grants the guarantee for the coupons and principal repayment of the series; thus, these holdings should be considered Euro government assets. For instance, this practice is common...
in Spain for some securitisation vehicles, e.g., the so-called FTPYME (asset-backed securitisation funds to finance loans for small- and medium-sized enterprises).

Table 2 shows the descriptive statistics for the Euro government debt securities held by our fund sample. The time-to-maturity distribution of these securities shows an important maturity diversification along the period 2004-2014. The Euro government debt by issuer characteristics shows that Euro sovereign securities form the major asset class held by our sample. This finding is consistent over the entire study period. Sub-sovereign assets and government-backed agency assets show assorted figures with an upper limit of approximately 12%. Finally, supranational debt plays the most residual role in the Euro government debt composition of our fund sample.

Table 2
Euro Government Debt Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>#Securities</th>
<th>0-1</th>
<th>(1, 3]</th>
<th>(3, 5]</th>
<th>(5, 7]</th>
<th>(7,10]</th>
<th>≥10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>132</td>
<td>19</td>
<td>28</td>
<td>19</td>
<td>11</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>2005</td>
<td>281</td>
<td>32</td>
<td>61</td>
<td>52</td>
<td>20</td>
<td>43</td>
<td>73</td>
</tr>
<tr>
<td>2006</td>
<td>325</td>
<td>61</td>
<td>63</td>
<td>42</td>
<td>35</td>
<td>38</td>
<td>86</td>
</tr>
<tr>
<td>2007</td>
<td>293</td>
<td>42</td>
<td>54</td>
<td>40</td>
<td>27</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>2008</td>
<td>248</td>
<td>43</td>
<td>45</td>
<td>34</td>
<td>22</td>
<td>44</td>
<td>60</td>
</tr>
<tr>
<td>2009</td>
<td>335</td>
<td>35</td>
<td>87</td>
<td>69</td>
<td>36</td>
<td>46</td>
<td>62</td>
</tr>
<tr>
<td>2010</td>
<td>278</td>
<td>38</td>
<td>81</td>
<td>56</td>
<td>17</td>
<td>32</td>
<td>54</td>
</tr>
<tr>
<td>2011</td>
<td>261</td>
<td>56</td>
<td>64</td>
<td>45</td>
<td>15</td>
<td>31</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>224</td>
<td>48</td>
<td>55</td>
<td>37</td>
<td>20</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>2013</td>
<td>237</td>
<td>50</td>
<td>50</td>
<td>40</td>
<td>23</td>
<td>29</td>
<td>45</td>
</tr>
<tr>
<td>2014</td>
<td>232</td>
<td>38</td>
<td>40</td>
<td>45</td>
<td>32</td>
<td>37</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>04-14</th>
<th>1138</th>
</tr>
</thead>
</table>

Table 2 shows the descriptive statistics for the securities held by our sample at the end of each year. The left-hand part shows the number of Euro government securities and their distribution into time-to-maturity bands (in years). The right-hand part shows the Euro government debt composition (%) by issuer type, i.e., sovereign debt, sub-sovereign debt, government-backed agency debt and supranational debt.

We analyse the Euro government debt composition across issuer countries and years for the set of funds registered in each GIPS country. Table 3 reports this information and the number of funds that hold these assets. We find 14 target countries held by our sample together with the supranational securities that are multi-government-backed by the European Union. For the sake of brevity, Table 3 only reports the top three weights of each issuer
country for a selection of four years along our sample period. The statistics show a strong home bias in the country allocation because most of the Euro government bond funds registered in each GIPS country primarily invest in home government debt securities. This preliminary finding is especially conclusive in Spain both in terms of portfolio weights and number of funds. The sample statistics reported in Table 1 show that all funds registered in Spain are mostly invested in Spanish government bonds. Thus, the average portfolio weights and the number of funds that invest in other Euro government bonds are much lower than for Spanish government debt. This result is consistent for the entire study period, but it is clearer from 2008. Although this conclusion should be taken with caution in other GIPS countries due to the few Euro government bond funds registered each year, Table 3 highlights the time-consistent portfolio concentration of our GIPS sample on home issuer countries rather than the sovereign risk diversification allowed by the investment category of these funds, defined by Morningstar as Euro government bond funds.

Table 3
Euro Government Debt Composition by Country and Fund

<table>
<thead>
<tr>
<th>Country</th>
<th>2004 Weight (#funds)</th>
<th>2008 Weight (#funds)</th>
<th>2012 Weight (#funds)</th>
<th>2014 Weight (#funds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>73.62% (1)</td>
<td>75.71% (2)</td>
<td>93.58% (2)</td>
<td>72.04% (2)</td>
</tr>
<tr>
<td>E.U.</td>
<td>2.04% (2)</td>
<td></td>
<td>25.04% (1)</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td>21.16% (1)</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td>16.34% (1)</td>
</tr>
<tr>
<td>Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E.U.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>6.62% (2)</td>
<td>8.47% (4)</td>
<td>10.52% (3)</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n.a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>63.54% (23)</td>
<td>90.76% (21)</td>
<td>84.35% (21)</td>
<td>79.44% (19)</td>
</tr>
<tr>
<td>Italy</td>
<td>28.80% (3)</td>
<td>6.33% (1)</td>
<td>13.78% (3)</td>
<td>34.35% (1)</td>
</tr>
<tr>
<td>Germany</td>
<td>10.26% (3)</td>
<td>6.19% (3)</td>
<td>12.58% (3)</td>
<td>17.15% (5)</td>
</tr>
</tbody>
</table>

Table 3 shows the top three average portfolio weights in Euro government bonds by issuer country at the end of 2004, 2008, 2012 and 2014. The value in parentheses reports the number of funds that average these portfolio weights. These statistics are shown for the funds registered in each GIPS country.
3. Bond Fund Performance

First, we define the characteristic-based benchmarks to evaluate the performance of each bond held by a fund. Second, we follow Cici and Gibson (2012) to decompose the holdings returns of bond funds into 3 components: 1) bond-selection ability; 2) characteristic-timing ability; and 3) average style. Third, we follow Kacperczyk et al. (2008) to decompose the difference between the reported returns and the holdings returns (return gap) into the following three additional components: 4) transaction costs, 5) management fees, and 6) the residual net return gap. Finally, we test for the effect of the Euro sovereign debt crisis on the management patterns of our fund sample and their consequences for this return decomposition.

3.1. Characteristic-based Benchmarks

We evaluate the performance of each bond held by a fund relative to a benchmark portfolio of bonds with similar credit ratings and life-to-maturity terms. The aggregation of all these characteristic-based benchmarks for every bond held by a fund should clearly reflect the investment objectives of the fund concerned. For instance, a fund that is almost entirely invested in long-term Italian sovereign bonds will match its portfolio holdings to long-term Italian sovereign bond benchmarks rather than to other benchmarks. Thus, both the objectives and the characteristic-based benchmarks of this concentrated fund will be different from other funds with a diversified portfolio of sovereign bonds issued by several Euro countries. However, the performance will be properly evaluated in both funds referring to each characteristic-based benchmark for every bond held by each fund irrespective of their global objectives. This benchmarking methodology is very similar to that developed by Cici and Gibson (2012) based on the credit ratings and durations of corporate bonds. Gebhardt et al. (2005) find that these two characteristics explain the cross-section of corporate bond returns. Our benchmarking method uses maturity terms rather than durations because the characteristic-based benchmarks provided by Datastream are categorised by issuer country
and life-to-maturity. This classification is quite similar to the maturity-based benchmarks designed by the dominant providers of Euro zone sovereign debt indices (Drenovak et al., 2014). However, Boquist et al. (1975) were early in showing that life-to-maturity may not be an appropriate measure for evaluating bond interest rate sensitivity. Two default-free bonds can have the same maturity but very different durations, and the two measures may not be significantly related. However, this is not the case in our study and therefore this substitution is not particularly important in our approach due to the significant and positive correlation between the maturity bands and duration terms of the securities held by our fund sample.\(^6\) Thus, these maturity-based benchmarks seem to be appropriate in our security-level holdings approach.

To match the characteristic-based benchmark for a given bond during a given quarter, we first identify the issuer of that public bond. As a result, we classify the bond as sovereign, sub-sovereign, government-backed agency or supranational debt. In the case of a Euro sovereign bond, the issuer country is the proxy of the credit rating of that bond. Afterwards, the identification of the life-to-maturity value for each Euro sovereign bond allows the benchmark of each bond to be characterised over two dimensions: the credit rating and life-to-maturity. From Datastream, we obtain the Total Return Index values for the Euro sovereign benchmarks characterised by issuer country and life-to-maturity. We use the all-bond index series which include all traded bonds, irrespective of liquidity, thereby covering the complete asset category.\(^7\) The maturity bands for each country and index are 1-3 years, 3-5 years, 5-7 years, 7-10 years and +10 years. We work with the all-bond index series and maturity bands for the following Euro members: Austria, Belgium, France, Germany, Ireland, Italy, the

\(^6\) The difference in years between maturity and duration is not relevant either, especially in maturity bands lower than 10 years, where this difference averages about 0.5 years. Details are available upon request.

\(^7\) The Thomson Reuters Government Bond Indices are calculated by Datastream, based on the formulation recommended by the European Federation of Financial Analysts Societies (EFFAS). Further details about the construction of these benchmarks are shown in https://financial.thomsonreuters.com/en/products/data-analytics/market-data/indices/bond-indices.html
Netherlands, Portugal, and Spain. Furthermore, we also obtain the Total Return Index values for the characteristic-based benchmarks matched to supranational debt where the securities are multi-government-backed. For example, a 6-year supranational bond backed by the European Monetary Union should be matched to the EMU Datastream all-bond index for a 5-7 year maturity band.

Sub-sovereign securities are generally not government-backed. Thus, the credit rating of these securities may be different from the credit rating of the sovereign debt securities issued by the same country. For example, the credit rating of the securities issued by some regional and local governments may actually be very different from the credit rating of the central government. Therefore, the sub-sovereign bonds must not be matched to Euro sovereign benchmarks. To construct the characteristic-based benchmark for a given sub-sovereign security during a given quarter, we construct weighted normal portfolios that include all of the sub-sovereign securities held by our fund sample at that quarter and sorted by similar maturity bands than sovereign debt benchmarks. That is, these customised benchmarks include all of the sub-sovereign bonds which all managers have chosen that quarter, weighted as the managers have weighted them in their portfolios. According to Christopherson (1998), these normal portfolios would be representative of the universe of sub-sovereign securities that constitute the managers’ normal habitat in this asset class at that quarter, thereby helping to improve the understanding of the managers’ unique risk exposures in such an asset. These sub-sovereign customised benchmarks are obtained for the different Euro countries held by our sample portfolio. For example, we match a sub-sovereign security issued by a Spanish regional government to the normal benchmark portfolio of all Spanish sub-sovereign

---

8 The sovereign debt benchmarks for Luxembourg and Finland are not provided by Datastream. Thus, the sovereign debt issued by Luxembourg is matched to the benchmarks provided for Germany. The sovereign debt issued by Finland is matched to the benchmarks provided for the Netherlands. These proxies are based on the similarities between the credit default risk premia of these countries. Further details about this choice are available upon request.
securities with a similar life-to-maturity term. A similar customised benchmarking methodology is applied to government-backed agency securities.\(^9\)

It should be noted that our benchmarking procedure controls for only two characteristic dimensions of bonds, i.e., the credit rating and the life-to-maturity. However, there is a growing literature on the relationship between sovereign bond returns and other bond characteristics, such as liquidity (e.g., Amihud and Mendelson, 1991). Research on Euro sovereign debt shows that liquidity differences play a minor role in the time-series of Euro sovereign yield spreads (e.g., Codogno et al., 2003; Geyer et al., 2004; Favero et al., 2010). Similarly, Beber et al. (2009) find that credit risk and liquidity are positively correlated across Euro sovereign issuers and provide evidence that liquidity is much less important than credit quality in explaining Euro sovereign yields. Nevertheless, our study addresses this potential effect of liquidity on public debt returns by considering the customised characteristic-based benchmarks for both sub-sovereign and government-backed agency debt that include less liquid securities than Euro sovereign issues.\(^{10}\)

3.2. Fund Return Decomposition

Holdings returns are defined as the buy-and-hold returns before any trading costs or expenses on the fund’s most recently disclosed holdings. These holdings-based returns are obtained from the following 3 return components initially developed by Daniel et al. (1997): The Characteristic Selectivity (CS) measure, the Characteristic Timing (CT) measure, and the Average Style (AS) measure. The sum of the CS, CT and AS return components is considered a proxy for the gross return of the fund.

\(^9\) We construct customised normal portfolios that are similar to the sub-sovereign and government-backed agency benchmarks to match the sovereign debt issued by Greece, Slovenia and Slovakia because Datastream does not provide all-bond characteristic-based benchmarks for the sovereign debt of these countries. In addition, we also construct customised normal benchmarks to match the Euro government debt of each country with a life-to-maturity band lower than 1 year.

\(^{10}\) From January 2004 to December 2014, the outstanding assets of Euro sub-sovereign and government-backed agency debt average 7.58% of the outstanding assets of Euro sovereign debt (National Central Bank of Spain, Banco de España, 2016).
First, the Bond Selection (BS) measure captures the bond selectivity component, defined as the ability to select bonds that will perform better than other bonds with similar characteristics. The methodology for obtaining BS is similar to the CS measure used for stocks by Daniel et al. (1997). We then compute BS during quarter $t$ as follows:

$$BS_t = \sum_{b=1}^{N} \left( w_{b,t-1} R_{b,t} - R_{b,t-1}^P \right)$$  

(1)

where $N$ is the number of bonds held by the fund at the end of quarter $t$; $w_{b,t-1}$ is the portfolio weight of bond $b$ at the end of quarter $t-1$; $R_{b,t}$ is the quarter $t$ buy-and-hold return of bond $b$; and $R_{b,t-1}^P$ is the quarter $t$ buy-and-hold return of the characteristic-based benchmark portfolio that is matched to bond $b$ at the end of quarter $t-1$ along the dimensions of the credit rating and life-to-maturity. A positive (negative) BS for bond $b$ denotes that the bond has outperformed (underperformed) the return obtained by the appropriate benchmark over quarter $t$.

Second, CT captures the ability of the fund manager to time bond characteristics. This measure identifies the contribution to fund returns from changes in portfolio characteristic weights that occurred over the prior year. Thus, this measure allows for a direct test of whether shifts in the characteristic portfolio weights forecast future returns. The CT component during quarter $t$ is calculated as follows:

$$CT_t = \sum_{b=1}^{N} \left( w_{b,t-1} R_{t} - w_{b,t-5} R_{t}^P \right)$$  

(2)

Expression (2) subtracts the quarter $t$ return of the quarter $t-5$ matching characteristic-based benchmark for bond $b$ from the quarter $t$ return of the quarter $t-1$ matching characteristic-based benchmark for bond $b$. The portfolio weight of bond $b$ at quarter $t-5$ multiplies the quarter $t$ return of the characteristic-based benchmark that is matched to bond $b$ during quarter $t-5$. The portfolio weight of bond $b$ at quarter $t-1$ multiplies the quarter $t$ return
of the characteristic-based benchmark that is matched to bond $b$ during quarter $t-1$. A positive CT for bond $b$ denotes that a fund manager increases the portfolio characteristic weights that subsequently perform better.

Finally, AS captures the returns obtained by a fund due to that fund’s tendency to hold bonds with certain characteristics. For example, one fund may hold long-term bonds issued by the best rated Euro members, whereas other funds may hold intermediate-term bonds issued by the sovereign debt crisis-afflicted countries of Southern Europe. Both styles generate significantly differing returns. The quarter $t$ return component of the AS measure is computed as follows:

$$A_{S_t} = \sum_{b=1}^{N} w_{b,t-5} R_{t}^{P_{b,t-5}}$$

(3)

Each bond held at quarter $t-5$ is matched with its characteristic-based benchmark of quarter $t-5$. The quarter $t$ return of this benchmark is then multiplied by the quarter $t-5$ portfolio weight. Lagging weights and benchmarks by one year allow the returns due to timing the portfolio characteristics to be eliminated. According to Wermers (2000), this AS measure may differ from the return on a broad bond market index for two major reasons. First, the AS measure may contain a compensation for the fund weightings on covariance-based risk factors differently from the index portfolio’s weightings. Second, the AS measure may show a return premium for the fund weighting on non-covariance-based characteristic factors.

On the other hand, the return gap is defined as the difference between the quarterly net returns actually reported by the funds and the buy-and-hold quarterly returns. This gap is expected to be positively (negatively) related to the hidden benefits (costs) of a mutual fund. According to the return gap decomposition by Kacperczyk et al. (2008), transaction costs and management fees are the major components that explain the difference between the reported
fund returns and holdings returns. Cici and Gibson (2012) show that much of the unexplained
part of this return gap is also due to the performance of short-term trades that occur after the
most recent portfolio report, i.e., the more intra-quarter trading gains (losses) there are, the
greater the positive (negative) impact on this return gap. Thus, the return gap may be sensitive
to the amount and performance of these intra-quarter trades.

In addition to this intra-quarter bond trading, another potential contributor to the
residual return gap is the performance of portfolio holdings that are not accurately identified
in terms of issuer, time-to-maturity and return data. Returning to Table 1, the contribution to
our residual return gap should be explained by 13.65% of portfolio assets other than the Euro
government bonds held by our fund sample from 2004 to 2014. Additionally, Kacperczyk et
al. (2008) show other negative investor externalities, such as window dressing (Lakonishok et
al., 1991) and tournament behaviour (Brown et al., 1996; Chevalier and Ellison, 1997), to
explain hidden costs that may affect this gap.

Table 4 shows the results. Following Cici and Gibson (2012), every fund with return
data in a quarter is used to compute the return measures for that particular period. The
reported returns are obtained by averaging across all funds every quarter. These return
measures are compounded into annual returns. Panel A shows that the average holdings return
of our complete GIPS sample was 3.61% over the period of 2005-2014, 153 basis points (bp)
less than the average return obtained by the EMU Total All Lives Datastream Government
Index.11 According to Cici and Gibson’s (2012) interpretation of the characteristic-based
performance measures, this large negative differential is not significantly attributable to
negative bond selection abilities (1 bp), whereas characteristic timing shows significant and
positive results of 55 bp. This combined security selection and characteristic timing
contribution to the performance by year of Euro government bond holdings is larger than the

11 Yearly details of fund return decomposition in Table 4 and Table 5 are not shown for the sake of brevity but
are available upon request.
evidence provided by Cici and Gibson (2012) for a sample of U.S. corporate bond funds over the 1996-2006 period. Thus, the major source of the negative return differential of our fund sample in comparison to the index is attributable to funds that follow styles with bond characteristics that are associated with lower average returns than the index. Panel B shows assorted results after splitting up these performance components into the funds registered in each GIPS country. On the one hand, Italy and Spain show quite similar results to the main findings for the whole sample, especially Spain. On the other hand, the good results obtained by Greek and Portuguese funds could be biased due to the time concentration of fund observations previously addressed in Table 1, e.g., only two Portuguese funds are analysed from 2011. Finally, Panel C shows the return decomposition for each issuer type. The results show that the performance records of our sample are mainly driven by sovereign debt. This finding makes sense according to the Euro government debt composition reported in Table 2. Panel C of Table 4 shows quite consistent results than Panel A in terms of the combined contribution of both security selection and characteristic timing to the performance for each issuer type.

The right-hand section of Table 4 reports that the average return gap is 78 bp for the period of 2005-2014. According to Cici and Gibson (2012), this return gap, which is smaller than the previous evidence on U.S. bond funds, can indicate low levels of short-term active trading of Euro government bond funds. Management and custodial fees account for 85 bp, which explain the major part of this return gap. If we consider the combined contribution of bond selection and characteristic timing (56 bp), this finding calls into question the value of the active management skills of Euro government bond funds registered in GIPS. However, Panel B shows that the combined contribution of bond selection and timing skills of Greek and Portuguese funds are higher than expenses, especially in Greece, even though presenting the most expensive funds in GIPS. However, these results must be taken with caution due to
the time concentration of fund observations previously addressed in Table 1. Finally, the scarce residual return gap (-8 bp) obtained from 2005 to 2014 in GIPS provides evidence that the hidden benefits and externalities not detected by our characteristic-based performance model based on quarterly portfolios are not significantly different from transaction costs. However, this evidence seems to be very different across GIPS countries, especially in Italy, which has a negative net return gap of 88 bp.

The comparison between the results provided by Table 4 and Table 5 provides evidence on the size effect on the return decomposition because the reported returns in Table 5 are weighted by the funds’ total net assets as of the beginning of each quarter. The negative differential between the EMU government bond index and the holdings returns of our sample is 13 bp larger when the fund size is considered, and once again, this large negative differential is not significantly attributable to selection abilities. Additionally, the results show that characteristic timing is 9 bp worse than the result provided by Table 4, thereby providing evidence that timing is negatively related to fund size. However, this result is not consistent across the different GIPS countries. The lower return gap when the fund size is considered can also indicate a negative relationship between the fund size and the level of short-term active management. This gap is mainly explained by the size-decreasing management and custodial fees. Furthermore, the previous doubts about the value of the active management remain present when the size is considered.
Table 4
Fund Return Decomposition

Panel A: Equally weighted statistics, 2005-2014

<table>
<thead>
<tr>
<th></th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-14</td>
<td>5.14%</td>
<td>3.61%</td>
<td>0.01%</td>
<td>0.55%**</td>
<td>3.04%**</td>
<td>2.82%</td>
<td>0.78%</td>
<td>0.85%</td>
<td>-0.08%</td>
</tr>
</tbody>
</table>

Panel B: Equally weighted statistics for funds registered in each GIPS country, 2005-2014

<table>
<thead>
<tr>
<th>Country</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece†</td>
<td>4.88%</td>
<td>0.15%</td>
<td>2.23%**</td>
<td>2.45%</td>
<td>3.61%</td>
<td>1.23%</td>
<td>0.98%</td>
</tr>
<tr>
<td>Italy</td>
<td>3.31%</td>
<td>-0.10%</td>
<td>3.31%**</td>
<td>2.48%</td>
<td>-0.17%</td>
<td>0.71%</td>
<td>-0.88%</td>
</tr>
<tr>
<td>Portugal†</td>
<td>9.43%</td>
<td>-0.51%</td>
<td>1.42%</td>
<td>8.47%**</td>
<td>7.83%</td>
<td>1.52%</td>
<td>0.71%</td>
</tr>
<tr>
<td>Spain</td>
<td>3.48%</td>
<td>-0.01%</td>
<td>0.57%**</td>
<td>2.90%</td>
<td>2.53%</td>
<td>0.93%</td>
<td>0.88%</td>
</tr>
</tbody>
</table>

Panel C: Equally weighted statistics for each issuer type, 2005-2014

<table>
<thead>
<tr>
<th>Issuer Type</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sovereign</td>
<td>3.15%</td>
<td>-0.02%</td>
<td>0.56%**</td>
<td>2.61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-sovereign</td>
<td>0.26%</td>
<td>0.01%</td>
<td>-0.05%</td>
<td>0.30%**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency</td>
<td>0.13%</td>
<td>0.02%</td>
<td>0.02%</td>
<td>0.09%**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supranational</td>
<td>0.06%</td>
<td>0.00%</td>
<td>0.02%**</td>
<td>0.03%**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The left-hand part of Table 4 decomposes the returns for our sample of Euro government bonds registered in GIPS. Panel A shows this return decomposition across the entire 2005-2014 period. The return record obtained by the EMU Total All Lives Datastream Government Index is also provided in Panel A. Panel B shows this return decomposition across the entire 2005-2014 period for the funds registered in each GIPS country. Panel C shows this return decomposition across the entire 2005-2014 period for each issuer type considered in our analysis. The performance measures reported here are equally weighted and are compound into annual returns. These performance measures include the Holdings Return (the buy-and-hold annualised return of the most recently reported portfolio), BS (bond selection measure), CT (characteristic timing measure), and AS (average style measure). The right-hand part of this table shows the return gap and its components. Statistics are reported for the entire 2005-2014 period in Panel A. Panel B shows these statistics for the funds registered in each GIPS country along our sample period 2005-2014. All these statistics reported here are equally weighted and are compounded into annual returns. The return gap is the difference between the holdings return and the net return reported by the fund. The expense ratio includes the annual management and custodial fees reported by Morningstar. The net return gap is the difference between the return gap and the expense ratio. The net return gap includes the transaction costs and the hidden benefits and costs that are not measured by the initial return decomposition, i.e., the net return gap reports the return gap not explained by the expense ratios.

† (‡) No Euro government bond fund operates in Greece (Portugal) from 2010 to 2011 (from 2005 to 2009) as classified by Morningstar. ** and *** denote significance at the 1% and 5% levels of BS, CT and AS, respectively.

Table 5
Fund Return Decomposition Weighted by TNA


<table>
<thead>
<tr>
<th></th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-14</td>
<td>5.14%</td>
<td>3.48%</td>
<td>-0.04%</td>
<td>0.46%**</td>
<td>3.04%**</td>
<td>2.82%</td>
<td>0.64%</td>
<td>0.76%</td>
<td>-0.12%</td>
</tr>
</tbody>
</table>

Panel B: TNA-weighted statistics for funds registered in each GIPS country, 2005-2014

<table>
<thead>
<tr>
<th>Country</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece†</td>
<td>3.65%</td>
<td>-0.20%</td>
<td>2.79%**</td>
<td>1.05%</td>
<td>2.81%</td>
<td>0.83%</td>
<td>0.71%</td>
</tr>
<tr>
<td>Italy</td>
<td>3.11%</td>
<td>-0.08%</td>
<td>0.09%</td>
<td>3.10%**</td>
<td>3.15%</td>
<td>-0.03%</td>
<td>0.68%</td>
</tr>
<tr>
<td>Portugal†</td>
<td>3.83%</td>
<td>-0.33%</td>
<td>0.57%</td>
<td>3.59%**</td>
<td>3.44%</td>
<td>0.38%</td>
<td>0.27%</td>
</tr>
<tr>
<td>Spain</td>
<td>3.28%</td>
<td>-0.03%</td>
<td>0.46%**</td>
<td>2.85%**</td>
<td>2.47%</td>
<td>0.80%</td>
<td>0.76%</td>
</tr>
</tbody>
</table>

Panel C: TNA-weighted statistics for each issuer type, 2005-2014

<table>
<thead>
<tr>
<th>Issuer Type</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sovereign</td>
<td>2.97%</td>
<td>-0.07%</td>
<td>0.42%**</td>
<td>2.61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-sovereign</td>
<td>0.17%</td>
<td>0.00%</td>
<td>-0.03%</td>
<td>0.21%**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency</td>
<td>0.19%</td>
<td>0.03%**</td>
<td>0.04%</td>
<td>0.12%**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supranational</td>
<td>0.14%</td>
<td>0.01%</td>
<td>0.03%**</td>
<td>0.10%**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The computing and explanation of Table 5 is similar to Table 4, but the statistics reported here are weighted by the funds’ TNA as of the beginning of each quarter.
3.3. *Euro Sovereign Debt Crisis*

The general consensus is that the Euro sovereign debt crisis was precipitated at the end of 2009 by the global financial downturn that affected economies throughout 2008-2009. The most turbulent period of the Euro debt crisis could be determined to be between early 2010 and mid-2012, i.e., until the European Central Bank calmed financial markets by announcing unlimited support to save the Euro (the Dragui effect). In this part of the empirical analysis, we aim to evaluate how the Euro sovereign debt crisis has affected the management patterns and their consequences for the performance records of our fund sample.

First, we divide the sample period into two different sub-periods. The pre-crisis period comprises the years from 2005 to 2009, that is, the years preceding the important doubts about the creditworthiness of the Euro. We consider a second period that comprises the period from July 2012 to 2014, that is, after the Dragui effect on the financial markets. Thus, we avoid assorted and confusing management decisions during the most critical phase of the Euro sovereign debt crisis to better evaluate the consequences of this period for Euro government bond funds.

Second, we focus on the credit rating as the main characteristic dimension of Euro government bond funds to detect the consequences of the Euro sovereign debt crisis for the management patterns of our fund sample. The issuer country is used as a proxy of the credit rating of the bond, similar to the benchmarking approach addressed in section 3.1. Furthermore, we analyse how credit ratings were shared by our fund sample; that is, we use the well-known market concentration Herfindahl index to evaluate the distribution of the credit ratings proxied by issuer countries across Euro government bond funds. The rising interest in this measure is to test for the significant effects of the Euro debt crisis on the distribution of the credit ratings allocated by Euro government bond funds.

---

12 From Mario Draghi’s famous speech on July 26, 2012 at the U.K. Trade and Investment Global Investment Conference: “The ECB is ready to do whatever it takes to preserve the Euro, and believe me, it will be enough”.
A direct comparison between the two previously defined pre-crisis and post-Draghi periods is a straightforward method of evaluating significant differences in the credit rating allocation of Euro government bond funds. The overall interpretation of these differences produces some significant findings on the consequences of the Euro sovereign debt crisis for the management patterns and performance of Euro government bond funds.

Table 6

<table>
<thead>
<tr>
<th>FUNDS REGISTERED IN GREECE†</th>
<th>FUNDS REGISTERED IN ITALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>74.13%</td>
</tr>
<tr>
<td>Italy</td>
<td>0.58%</td>
</tr>
<tr>
<td>Spain</td>
<td>0.00%</td>
</tr>
<tr>
<td>Portugal</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FUNDS REGISTERED IN PORTUGAL††</th>
<th>FUNDS REGISTERED IN SPAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td>n.a.</td>
</tr>
<tr>
<td>Spain</td>
<td>n.a.</td>
</tr>
<tr>
<td>Italy</td>
<td>n.a.</td>
</tr>
<tr>
<td>Greece</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 6 shows the average portfolio weight in Euro government bonds by GIPS issuer country over the 2005-2009 period and the 2012/3q-2014 period. The difference between these portfolio weights in the analysed periods and its significance are also reported in the table. These measures are split up for the funds registered in each GIPS country. †† †† No Euro government bond fund operates in Greece (Portugal) from 2010 to 2011 (from 2005 to 2009) as classified by Morningstar. ** and * denote significance in the difference at the 1% and 5% levels, respectively.

Table 7

<table>
<thead>
<tr>
<th>FUNDS REGISTERED IN GREECE†</th>
<th>FUNDS REGISTERED IN ITALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>81.04%</td>
</tr>
<tr>
<td>Italy</td>
<td>23.26%</td>
</tr>
<tr>
<td>Spain</td>
<td>-</td>
</tr>
<tr>
<td>Portugal</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FUNDS REGISTERED IN PORTUGAL††</th>
<th>FUNDS REGISTERED IN SPAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td>n.a.</td>
</tr>
<tr>
<td>Spain</td>
<td>n.a.</td>
</tr>
<tr>
<td>Italy</td>
<td>n.a.</td>
</tr>
<tr>
<td>Greece</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 7 shows the average Herfindahl index in Euro government bonds by GIPS issuer country over the 2005-2009 period and the 2012/3q-2014 period, where an index value equals 100% denotes that all bonds issued by a GIPS country are held by only one fund, whereas an index value close to 0% denotes that the bonds issued by a country are similarly shared by all of the funds included in the analysis. The difference between the Herfindahl index values in the analysed periods and its significance are also reported in the table. These measures are split up for the funds registered in each GIPS country. †† †† No Euro government bond fund operates in Greece (Portugal) from 2010 to 2011 (from 2005 to 2009) as classified by Morningstar. ** and * denote significance in the difference at the 1% and 5% levels, respectively.
Table 6 shows a reinforcement of the strong home bias detected in the Euro government bond funds registered in GIPS during the years preceding the Euro sovereign debt crisis. This reinforcement is especially significant for the largest GIPS fund markets, i.e., Italy and Spain. This stronger home bias is even more evident after finding the generally negative trend of the portfolio weights allocated to the rest of Euro sovereign debt crisis-afflicted countries. In fact, Greek public debt securities are no longer in the portfolios reported by the Italian and Spanish funds during the 2012/3q-2014 period. Even the Portuguese government debt disappears in the funds registered in Spain in the post-crisis period. This finding is consistent with the lack of an investment grade assessment of Portuguese and Greek public debt, contrary to the investment grade ratings for Spain and Italy. Thus, many Euro bond fund managers could exclude Portuguese and Greek public debt from their portfolios due to their worse ratings, thereby negatively affecting the liquidity of these public securities.

Table 7 shows that Spain is the only GIPS market where home government debt is widely held by the funds registered in that market. This widespread allocation was consistent before and after the Euro debt crisis. Thus, both tables provide a significant reinforcement of the home bias in GIPS countries after the crisis, which is especially extended in all the Euro government bond funds registered in Spain.

Furthermore, Table 8 provides evidence that the significant increase in Euro government debt in the portfolio weights during the 2012/3q-2014 period was mainly caused by Euro sovereign debt. The combined interpretation of both Table 6 and Table 8 reports that the funds included in our sample invest significantly more in home sovereign debt after the most critical phase of the Euro debt crisis. That is, the stronger home bias compared to the years preceding the crisis is explained much more by the increase in sovereign debt rather than other debt classes. This finding may be partially explained by the increasing issues of Excessive Deficit Procedures (EDP) sovereign debt in the main GIPS economies (Italy and
Spain) together with the role played by home-registered mutual funds as one of the main buyers of this EDP debt.

Table 9 provides additional evidence of the significant increase in the relevance of sovereign and sub-sovereign debt during the 2012/3q-2014 period. The results support that Euro sovereign and sub-sovereign debt are significantly more widely held by Euro government funds after the crisis whereas agency and supranational debt are more concentrated in fewer funds than in the 2005-2009 period, especially supranational debt backed by the E.U. The combined interpretation of the previous tables supports the evidence that a larger number of Euro government bond funds invest significantly more in Euro sovereign and sub-sovereign debt than in the years preceding the debt crisis.

Table 8
Portfolio (%) in Euro Government Assets by Issuer Type: 2005-2009 vs. 2012/3q-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Sovereign</th>
<th>Sub-sovereign</th>
<th>Agency</th>
<th>Supranational</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-09</td>
<td>71.21%</td>
<td>4.52%</td>
<td>5.17%</td>
<td>0.59%</td>
</tr>
<tr>
<td>12-14</td>
<td>78.48%</td>
<td>7.95%</td>
<td>4.80%</td>
<td>1.59%</td>
</tr>
<tr>
<td>Difference</td>
<td>7.28%**</td>
<td>3.43%*</td>
<td>-0.37%</td>
<td>1.00%**</td>
</tr>
</tbody>
</table>

Table 8 shows the portfolio weights (in percentage) of the Euro government debt by issuer type held by our fund sample over the 2005-2009 period and the 2012/3q-2014 period. The difference between these measures in the analysed periods and its significance are also reported in the table. ** and * denote significance in the difference at the 1% and 5% levels, respectively.

Table 9
Herfindahl Index by Issuer Type: 2005-2009 vs. 2012/3q-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Sovereign</th>
<th>Sub-sovereign</th>
<th>Agency</th>
<th>Supranational</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-09</td>
<td>13.92%</td>
<td>45.99%</td>
<td>17.14%</td>
<td>63.60%</td>
</tr>
<tr>
<td>12-14</td>
<td>6.67%</td>
<td>29.58%</td>
<td>26.52%</td>
<td>89.64%</td>
</tr>
<tr>
<td>Difference</td>
<td>-7.24%*</td>
<td>-16.41%*</td>
<td>9.38%</td>
<td>26.04%**</td>
</tr>
</tbody>
</table>

Table 9 shows the average Herfindahl index in Euro government bonds by issuer type over the 2005-2009 period and the 2012/3q-2014 period, where an index value equals 100% denotes that the bond class is held by only one fund, whereas an index value close to 0% denotes that the bond class is similarly shared by all of the funds included in the analysis. The difference between the Herfindahl values in the analysed periods and its significance are also reported in the table. ** and * denote significance in the difference at the 1% and 5% levels, respectively.
Finally, Table 10 shows the consequences of these significant management changes for the performance results of Euro government bond funds in GIPS. The Euro government index return provides evidence that Euro government debt performs better from July 2012. Panel A shows that Euro government bond funds also perform better now than in the years preceding the crisis, with this return increasing 69 bp higher than the return increase reported by the index. However, the holdings returns of our fund sample still average 75 bp less than the average return obtained by the index from July 2012 to December 2014. Panel B also reports the increasing performance after the crisis for each GIPS country with available data\textsuperscript{13} but with very different intensity, especially in the largest GIPS fund industries, i.e., Italy and Spain. The comparison of the return decomposition between the 2005-2009 period and the 2012/3q-2014 period shows that Euro government bond funds have significantly worse selection skills after the Euro sovereign debt crisis whereas both the characteristic timing and the style measures have improved significantly during the same period. However, these results show assorted patterns depending on the GIPS country. The main contradiction is present in the timing performance component of the Euro government bond funds registered in Italy which show a significant decrease in their timing skills. Furthermore, we should call into question the value of the active management skills of the bond funds included in our sample after the crisis because the combined contribution of the bond selection and the characteristic timing is lower than the expense ratio across the GIPS sample even though the costs are cheaper after the crisis. The only exception reported by Greece should be taken with caution due to the time concentration of funds registered in Greece previously reported in Table 1. Panel C provides evidence that both the decrease in selection skills and the increase in the timing and style abilities are mainly driven by the decisions on Euro Sovereign debt.

\textsuperscript{13} No analysis is possible for Portugal due to the lack of existence of any Euro government bond fund registered in Portugal from 2005 to 2009.
Finally, the right-hand section of Panel A shows that the return gap is 24 bp higher after the debt crisis. Considering that the expense ratio has decreased 20 bp during the same period, the results provide evidence of an important increase in the net return gap during the 2012/3q-2014 period. However, Panel B shows that this increase is only driven by the most important GIPS fund industry in our sample, such as Spain, whereas the rest of GIPS markets show a decrease in the net return gap. Up to this point, the evidence in Spain is consistent with the hypothesis that transaction costs together with hidden trading and investor externalities that are not detected by our model affect more negatively the return records than in the preceding years of the crisis, whereas the opposite conclusion could be inferred from Italy and Greece.

In summary, more Euro government bond funds registered in GIPS invest significantly more in home government debt after the debt crisis, especially in sovereign debt. Thus, the crisis has strengthened the strong home bias previously detected in the Euro government fund markets registered in GIPS. These changing management patterns of Euro government bond funds have resulted in worse selection skills and better style allocations, as well as assorted timing abilities across GIPS markets. Furthermore, transaction costs, hidden trading and investor externalities seem to play an assorted role in the performance across the GIPS sample after July 2012.

14 We find quite similar evidence when the performance components are weighted by the funds’ TNA. Details of this size effect are not shown for the sake of brevity but are available upon request.
Table 10

<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-09</td>
<td>4.14%</td>
<td>2.70%</td>
<td>-0.21%*</td>
<td>0.36%</td>
<td>2.13%**</td>
<td>0.20%</td>
<td>0.61%</td>
<td>0.94%</td>
<td>-0.33%</td>
</tr>
<tr>
<td>12-14</td>
<td>9.11%</td>
<td>8.36%</td>
<td>-0.38%**</td>
<td>0.94%**</td>
<td>7.78%**</td>
<td>7.46%</td>
<td>0.85%</td>
<td>0.74%</td>
<td>0.11%</td>
</tr>
<tr>
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<td>4.97%</td>
<td>5.66%</td>
<td>-0.59%**</td>
<td>0.58%</td>
<td>5.65%**</td>
<td>5.37%</td>
<td>0.24%</td>
<td>-0.20%</td>
<td>0.44%</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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</thead>
<tbody>
<tr>
<td>GREECE</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>05-09</td>
<td>4.14%</td>
<td>2.33%</td>
<td>1.09%</td>
<td>0.44%</td>
<td>0.79%</td>
<td>0.24%</td>
<td>2.09%</td>
<td>1.08%</td>
<td>1.01%</td>
</tr>
<tr>
<td>12-14</td>
<td>9.11%</td>
<td>14.85%</td>
<td>-1.59%</td>
<td>5.45%</td>
<td>10.76%</td>
<td>16.44%</td>
<td>-1.42%</td>
<td>0.86%</td>
<td>-2.28%</td>
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<td>4.97%</td>
<td>12.52%</td>
<td>-2.68%</td>
<td>5.01%</td>
<td>9.97%</td>
<td>16.21%</td>
<td>-3.51%</td>
<td>-0.22%</td>
<td>-3.29%</td>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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<tbody>
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</tr>
<tr>
<td>05-09</td>
<td>4.14%</td>
<td>3.35%</td>
<td>0.42%</td>
<td>0.08%</td>
<td>2.83%**</td>
<td>3.23%</td>
<td>0.12%</td>
<td>0.84%</td>
<td>-0.72%</td>
</tr>
<tr>
<td>12-14</td>
<td>9.11%</td>
<td>4.77%</td>
<td>-0.37% *</td>
<td>-1.42%</td>
<td>6.64%**</td>
<td>5.10%</td>
<td>-0.31%</td>
<td>0.42%</td>
<td>-0.74%</td>
</tr>
<tr>
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<td>4.97%</td>
<td>1.42%</td>
<td>-0.79%</td>
<td>-1.50%</td>
<td>3.81%*</td>
<td>1.87%</td>
<td>-0.43%</td>
<td>-0.41%</td>
<td>-0.02%</td>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
<th>BS (%)</th>
<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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<tbody>
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<tr>
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<td>4.14%</td>
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<td>n.a.</td>
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<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
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<td>11.33%</td>
<td>-0.02%</td>
<td>1.83%</td>
<td>9.40%**</td>
<td>9.23%</td>
<td>1.96%</td>
<td>0.70%</td>
<td>1.26%</td>
</tr>
<tr>
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<td>12.52%</td>
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<td>9.97%</td>
<td>16.21%</td>
<td>-3.51%</td>
<td>-0.22%</td>
<td>-3.29%</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
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<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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<tr>
<td>05-09</td>
<td>4.14%</td>
<td>2.58%</td>
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<td>0.41%*</td>
<td>2.07%**</td>
<td>1.96%</td>
<td>0.61%</td>
<td>0.95%</td>
<td>-0.34%</td>
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<td>12-14</td>
<td>9.11%</td>
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<td>0.95%**</td>
<td>7.64%**</td>
<td>7.08%</td>
<td>1.17%</td>
<td>0.79%</td>
<td>0.38%</td>
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<td>5.57%**</td>
<td>5.12%</td>
<td>0.56%</td>
<td>-0.16%</td>
<td>0.72%</td>
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<table>
<thead>
<tr>
<th>Year</th>
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<th>Holdings Return (%)</th>
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<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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<tr>
<td>05-09</td>
<td>2.50%</td>
<td>0.19%**</td>
<td>0.31%</td>
<td>1.99%**</td>
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<tr>
<td>12-14</td>
<td>6.91%</td>
<td>-0.38%**</td>
<td>0.87%</td>
<td>6.39%**</td>
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<td>0.56%</td>
<td>4.41%**</td>
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<thead>
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<th>Year</th>
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<th>AS (%)</th>
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<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
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<td>0.10%**</td>
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</tr>
<tr>
<td>12-14</td>
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<td>0.02%</td>
<td>0.02%</td>
<td>0.98%**</td>
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<td>0.03%</td>
<td>0.01%</td>
<td>0.88%**</td>
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<thead>
<tr>
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<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
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<tbody>
<tr>
<td>AGENCY</td>
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</tr>
<tr>
<td>05-09</td>
<td>0.04%</td>
<td>0.02%</td>
<td>0.02%</td>
<td>0.01%</td>
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</tr>
<tr>
<td>12-14</td>
<td>0.29%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.27%**</td>
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</tr>
<tr>
<td>Differ.</td>
<td>0.25%</td>
<td>0.00%</td>
<td>-0.01%</td>
<td>0.27%**</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Index Return (%)</th>
<th>Holdings Return (%)</th>
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<th>CT (%)</th>
<th>AS (%)</th>
<th>Reported Net Return (%)</th>
<th>Return Gap (%)</th>
<th>Expense Ratio (%)</th>
<th>Net return Gap (%)</th>
</tr>
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<tbody>
<tr>
<td>SUPRANATIONAL</td>
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</tr>
<tr>
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<td>0.06%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.04%*</td>
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<tr>
<td>12-14</td>
<td>0.07%</td>
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<td>-0.05%</td>
<td>0.02%</td>
<td>0.04%</td>
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</tbody>
</table>

Table 10 is interpreted similarly to Table 4. Panel A shows the return decomposition over the 2005-2009 period and the 2012/3q-2014 period. The difference between these measures in the analysed periods and its significance are reported in the last row. These measures are also split up for both the funds registered in each GIPS country (Panel B) and each issuer type (Panel C).

* (**) No Euro government bond fund operates in Greece (Portugal) from 2010 to 2011 (from 2005 to 2009) as classified by Morningstar. * and ** denote significance at the 1% and 5% levels of BS, CT and AS, respectively.
4. Conclusions

This study is the first to examine Euro government bond fund performance based on security-level holdings, thereby improving the accuracy of the performance results previously addressed by the financial literature. This analysis is focused on the most afflicted countries in the Euro sovereign debt crisis, i.e., the so-called periphery countries of Southern Europe such as Greece, Italy, Portugal, and Spain (GIPS). The evidence supports the notion that fund managers generally have positive characteristic timing skills for the period 2005-2014. However, the results also prove an inability of managers to select Euro government securities that significantly outperform other bonds with similar characteristics. The magnitude of the combined return contribution of both bond selection and characteristic timing is lower than the management and custodial fees charged by our sample, thereby casting doubt on the value of the active management of the Euro government bond mutual funds registered in GIPS. These findings are mainly driven by the investment decisions on sovereign debt of the funds registered in the most relevant markets in our GIPS sample, such as Italy and Spain.

Moreover, this is the first study to assess the effect of the Euro sovereign debt crisis on performance components using characteristic-based benchmarks. We find evidence of an increase of the strong home bias detected in the years preceding the crisis, especially in the most relevant GIPS bond fund industries. This reinforcement of the home bias results generally in better style allocations and worse bond selections but assorted timing abilities across GIPS markets. We also find that the contribution of active management is generally lower than the expense ratio across the GIPS sample even though the cheaper costs after the crisis. Finally, transaction costs, hidden trading and investor externalities seem to play an assorted role in the performance of our sample after the end of the Euro sovereign debt crisis.

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