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TAX DEFERRAL AND MUTUAL FUND INFLOWS: EVIDENCE FROM A QUASI-NATURAL EXPERIMENT

by Giuseppe Cappelletti*, Giovanni Guazzarotti* and Pietro Tommasino*

Abstract

We propose a new method to identify the impact of a change in the tax burden on mutual fund inflows, exploiting a switch from an accrual-based to a realization-based tax regime. We use quasi-experimental data from Italy where, starting from July 2011, the tax regime for domestic mutual funds was changed from an accruals basis to a realization basis, while the taxation of foreign funds remained on a realization basis. We find that the reform has had a positive effect on net inflows of Italian funds (the treated group) with respect to foreign funds (the control group). The effect is both economically and statistically significant. Moreover, we find no evidence that the increase in the demand for Italian funds came at the expense of foreign funds.

JEL Classification: G20, G2, H2.
Keywords: mutual funds, net flows, taxation.

Contents

* Bank of Italy, Economic Research and International Relations.

1 Introduction[1]

Mutual funds are one of the biggest investment vehicles worldwide. In the US, their assets amount to about 37% of GDP and 11% of households' financial portfolios. Even in the euro area, where they are relatively less developed, their importance is far from negligible (they account for 13% of GDP and 7% of households' financial assets).

It is therefore important to understand how mutual funds investors behave. The considerable exant literature sheds light on several issues[2]. We know, for example, that investors tend to chase past fund performance (see e. g. Gruber, 1996 and Sirri and Tufano, 1998); avoid funds with high fees (Sirri and Tufano, 1998, Barber et al., 2005); and prefer funds which are more "visible", due to media coverage or to the size of the fund's family (Sirri and Tufano, 1998, Jain and Wu, 2000). There is also evidence that distribution channels matter: flows to funds distributed through captive brokers are less sensitive to expenses (Christoffersen et al., forthcoming)[3].

There is comparatively much less research on how investors take into account mutual funds' taxation, which is the topic of the present paper.

The effects of reduced taxation on asset demand are theoretically ambiguous (Stiglitz, 1969). A decrease in the tax rate on the returns of a given asset tends to increase its average net return (with a positive effect on the demand for the same asset), but also the variability of returns (which has the opposite effect).[4] The cross-effect of a change in taxation of a given asset on other assets' demand is also ambiguous (Sandmo, 1977).

In this paper, we study in particular the effects on funds' flows of a switch from an accrual-based to a realization-based tax regime. Under the first regime, the increase in the value of a share of the fund is taxed when the rise in value occurs. Under the second, it is

[1] The views expressed in the paper are those of the authors and do not necessarily reflect those of the Bank of Italy. We would like to thank Dimitris Christelis, Giorgio Gobbi, Marcin Kacperczyk, Alessandro Rota, and seminar participants at the Bank of Italy, the ECB, the Annual Congress of the European Economic Association and the Annual Congress of the Italian Public Economics Society for their useful comments and suggestions.

[2] For a survey, see Zheng (2008).

[3] By contrast, the distribution channel does not seem to influence the flow-performance relationship (Bergstresser et al., 2009).

[4] The Government will in fact bear an increased share of potential losses as well as potential gains.

taxed only when the share is sold. C*oeteris paribus*, taxation on a realization basis amounts to a reduction in the net discounted value of the tax burden, as the tax payment is deferred.

To measure the effect of the switch to realization-based taxation we exploit a reform enacted in Italy in July 2011. For our purpose, a crucial element of this reform is that it concerned only a subset of the funds available in the Italian market, namely those sponsored by asset management companies based in Italy. This allows us to use funds sponsored by foreign companies as a control group.

To give a preview of our results, we find that the regime change (which can be estimated as equivalent to a 1 percentage point reduction in the tax burden for the treated funds) has had a significant and positive impact on the ratio of monthly net inflows to assets of the treated funds, increasing them by about 2 percentage points.

Our paper adds to a small set of previous contributions, all concerned with the US market. The paper most closely related to ours is that by Bergstresser and Poterba (2002) which is, to our knowledge, the only one to address directly the relationship between a fund's tax burden and a fund's inflows. In particular, they regress the latter on the former and on several other factors that can influence investor behavior, using a repeated cross-section of US funds, and find that the relationship is negative and statistically significant. This suggests that investors are aware that funds returns are dented by taxes, and that tax considerations play a role in determining their choices. With respect to this seminal paper, the main difference in our analysis is that we exploit a quasi-experimental policy change instead of using a more standard regression-based approach. This should provide a more clear-cut identification of the relationship between taxation and fund flows.

Ivkovic and Weisbrenner (2009) compare the behavior of a sample of US investors holding shares of mutual funds in taxable accounts with that of investors holding mutual funds in non-taxable accounts. In the US, mutual funds' taxation is partly on a realization basis, therefore the investors in the first group have an incentive to defer sales of their funds' shares if the funds recorded positive returns. Ivkovic and Weisbrenner (2009) find that for investors holding mutual funds' shares in taxable accounts there is indeed a negative relationship between redemptions and performance, whereas this relationship is absent in the

case of tax-exempt investors. In the same vein, Johnson and Poterba (2008) find that gross fund inflows are lower-than-average immediately before the tax year-end and higher-than-average immediately after. Again, this is what one should expect given that postponing the investment by a few days allows a delay of the tax payment by (at least) one year, and therefore a non-negligible reduction of the present value of taxes. Like Ivkovic and Weisbrenner (2009), Johnson and Poterba (2008) find that this effect is absent for investors with tax-deferred accounts. These two papers demonstrate that, for a subset of investors (those holding a trading account), the possibility of tax deferral plays a role in the timing of their sale decisions. However, as neither of their samples is representative of the population of mutual funds investors, their results do not reveal much about the aggregate consequences of different taxation regimes, which is instead the focus of our analysis.

A partially related literature investigates whether mutual fund managers consider taxes in their choices. Barclay et al. (1998), Christoffersen et al. (2005) and Sialm and Starks (2012) show that funds with a clientele of mostly taxable investors have a higher propensity to realize losses and a lower propensity to distribute gains (another instance of the above-mentioned lock-in effect). By showing that mutual fund managers care about taxes, these contributions provide indirect evidence that mutual fund investors care about taxes too.

The possibility of tax deferral applies to several financial instruments and not just mutual funds. Turning to common stock investors, one should mention the notable studies by Barber and Odean (2004) and Ivkovic et al. (2005).[5]

The rest of the paper is structured as follows: Section 2 outlines the characteristics of the Italian mutual funds market, and describes in detail the quasi-natural experiment which is at the core of our analysis. Section 3 we describes the data. In Section 4 we discuss our empirical strategy and give our results. Section 5 concludes.

[5] These papers are also noteworthy as they pioneered the method of comparing tax-exempt and taxable trading accounts. Earlier contributions are discussed in Poterba (2002a and 2002b). See also Daunfeldt et al. (2010) and Sadmo (1985).

2 The Italian mutual funds market and the 2011 tax reform

Table 1 gives an overview of the Italian mutual funds market structure. As of 2011, Italian investors held open-end mutual funds shares valued at about €425 billion euros (12% of total households' financial assets or almost 30% of GDP). Italian mutual funds i.e. funds sponsored by asset management companies based in Italy, represent about 35% of this pie; the remaider is invested in foreign funds i.e. funds sponsored by companies based abroad. Foreign funds sponsored by companies incorporated abroad but owned by Italian intermediaries account in turn for 65% of all foreign funds. Many asset management companies, both Italian and foreign, are held by Italian banking groups (they account for about 80% of total net assets).[6]

Mutual funds are open both to households and to institutional investors. Based on the information that the Bank of Italy collects on the assets under deposit with Italian banks, it appears that the share held by households is roughly the same in Italian and foreign funds: in 2011 it was respectively 71.8% and 69.2% (Table 2).

Before the 2011 reform, Italian investors holding shares of an Italian mutual fund were subject to a substitute tax at a rate of 12.5%, levied on the yearly change in the value of the fund's portfolio (net of the value of subscriptions and redemptions; so-called "risultato di gestione"). The tax was paid by the fund itself once a year. No tax applied to investors upon collection of the income from the fund or redemption of fund shares. The tax regime for domestic mutual funds was therefore completely based on the *accruals method*. In case of negative returns, losses could be used to offset the funds' future gains (for up to four years).[7]

By contrast, if an Italian investor held shares of a foreign fund[8], the 12.5% tax rate had to be paid by the Italian investor upon receipt of the income from the distribution or sale of the fund's shares (*realization method*). In this case too, capital losses could be used by

[6] A yearly outlook on the developements of the Italian mutual fund industry can be found in the Bank of Italy's Annual Reports.

[7] Or they could be used to offset a positive result of other funds managed by the same company (see Savona, 2006).

[8] The regime applies to harmonized funds, i.e. those funds established and managed in accordance with the EU rules and regulations on Undertakings for Collective Investment in Transferable Securities (UCITS).

the investor to offset other capital gains for the next four years.

As argued in the previous section, these tax rules, and in particular the impossibility of tax deferral, implied *coeteris paribus* a higher tax burden with respect to a foreign fund, putting Italian funds at a disadvantage *vis à vis* their foreign competitors.

The new law was passed in January 2011 and took effect from the following July.[9] From that momoent onwards, the taxation of Italian funds changed from annual taxation levied on the accrued returns to a tax levied on the investor upon receipt of the income, eliminating any tax asymmetry with respect to foreign funds.

The gains of the reform in terms of reduced taxation depends on the expected distribution of the net returns of the investment and from the expected holding period. If one assumes that expected before-tax returns for Italian equity mutual funds are equal to the average over the 1990-2011 period (about 5,5% per year), and that the holding period is equal to that observed in the past (5 years) it turns out that the reform is equivalent to a reduction in the tax rate on yearly returns of about 1 percentage point, from 12.5 to 11.5%.[10]

3 The Dataset

We collected monthly data from supervisory reports to the Bank of Italy and the Morningstar database. In particular, we rely on information communicated by asset management companies to the Bank of Italy for purchases, redemptions and assets under management relative to Italian subscribers. This information is quite unique since it allows us to focus on Italian investors/taxpayers, excluding shares held by foreign investors.[11] Data on returns - before and after taxes - and on the investment specialization of each fund come instead

[9] Law n.10/2011.

[10] The computation is done using the method proposed by Poterba (2002a, 2004), which abstracts from uncertainty. Namely, we find the τ^* such that:

$$[1 + r(1 - \tau^*)]^T = (1 + r)^T - \tau \left[(1 + r)^T - 1\right]$$

where r is the average long-run rate of return, τ is the post-reform tax rate on realized capital gains, and T is the holding period.

[11] In principle all UCITS funds can be traded in Italy, but we consider only those whose shares are actually held by Italian investors.

from the Morningstar database.

Our initial dataset includes all the Italian funds and a wide sample of foreign funds (amounting to three quarters of all foreign funds' assets held by Italian residents). We consider open-end harmonized funds i.e. those established and managed in accordance with the EU rules and regulations.[12] For the sake of comparability, in most of the paper we follow the other studies discussed in the introduction and limit our analysis to equity funds, which represent about 20% of the whole Italian mutual funds market (however, in Section 4.1 we also show some sensitivity analyses in which the full sample is considered).

We also exclude funds with less than €1 million of assets under management and those that registered net flows greater in absolute value than 50 per cent of their net assets in a single month.[13] We also exclude sector and country funds. Their investment strategies focus on very specific asset classes, and they are usually subscribed by institutional investors that are subject to a distinctive tax regime. Indeed, corporations - as opposed to individuals - can choose to receive mutual funds' earnings gross of taxes and to pay taxes on their total net income, instead of being subject to the substitute taxation.

Our final sample consists of 116 Italian funds (the treatment group) and 259 foreign funds (the control group), divided among 52 different fund families and belonging to the following categories: European funds (of which 40 belonging to the treatment group and 68 to the control group), American funds (18 and 49), International funds (27 and 38), and Pacific or Emerging Markets funds (31 and 104). Italian funds tend to be bigger than foreign funds (in the sex months preceding the reform the former had assets amounting to €170 billion on average, against €126 billion for the foreign funds). On average, both returns and volatility were rather similar across the two groups. Summary statistics are reported in Tables 3 and 4.

As discussed above, the tax regimes of Italian and foreign funds differed until June and were aligned after that date, when Italian funds changed from an accrual-basis to a

[12] See footnote 7. Specifically we exclude exchange-traded, funds of funds and hedge funds. While only 85% of Italian funds are UCITS, foreign funds marketed to Italian investors are almost exclusively harmonized funds (UCITS).

[13] Funds on the verge of being liquidated could report huge outflows, which would skew the analysis.

realization-basis regime. On average, in the six months preceding the change in the tax regime, Italian funds suffered monthly net outflows of about 1.7%, against net inflows of about 0.8% for the foreign funds. In the six months after the reform, Italian funds net outflows decreased (to 1%), while foreign funds went from expansion to contraction, with monthly net outflows equal to about 0.5%.

These figures are consistent with a positive impact of the reform on Italian funds inflows of roughly 2 percentage points of the funds' assets per month if one assumes that, without the treatment, Italian fund inflows would have experienced a drop analogous to the one recorded by foreign funds. The rest of the paper aims at assessing whether this number withstands out to a more rigorous econometric analysis, and in particular whether it can be causally ascribed to the tax change or explained by other factors.

4 Empirical strategies and results

4.1 Difference-in-differences estimation

In this section, we employ the following empirical model:

$$Inflow_{it} = \alpha + \sum_k \beta_k \mathbf{1}_t^k + \gamma Treat_i + \delta Treat_i * Post_t + \eta X_{it} + \varepsilon_{it} \quad (1)$$

where $Inflow_{it}$ is inflows normalized by the fund's size for fund i at date t; $\left\{\mathbf{1}_t^k\right\}_k$ is a set of indicator functions equal to 1 if and only if $t = k$, and represent a full set of time dummies; the dummy $Treat_i$ is equal to 1 if i is an Italian fund and to 0 if it is a foreign fund; $Post_t$ is equal to 1 for all months from July to December 2011 (i.e. after the reform came into effect) and to 0 for the remaining periods; X_{it} is a set of controls.

In particular, we control for the mean and the standard deviation of gross returns (both computed as moving averages over the previous 12 months), the mutual fund investment objective and - as it is customary in the literature - the previous period net asset value. Our focus is on the coefficient δ of the interaction between the dummies $Treat_i$ and $Post_t$, which captures the effect of the tax reform on funds' flows for Italian funds, formally the

average treatment effect on the treated.

In our baseline estimation (Table 5, column 2) the impact of the treatment is positive and amounts to about 1,8 percentage points of the assets, on a monthly basis. Table 5 shows that the estimate is largely stable for different specifications of model (1). In particular, results analogous to the baseline estimate are obtained using a more parsimonious specification - substituting the full set of time dummies with just the $Post_t$ variable (column 1) - and also including in the regression the 52 fund families as further controls (column 3).

The result does not change if we use the Jensen alpha - a more accurate proxy of performance - instead of returns and their standard deviations (column 4)[14] or if we do not normalize our dependent variable dividing it by the size of the fund (Table 6).[15]

We also experiment with different time windows (Table 7, columns 1 and 2). First, we restrict the sample to the three months before and the three months after the change. Second, we extend the pre-treatment period up to January 2010. In both cases the effect of the tax-regime change appears strongly statistically significant. In the former, it is somewhat larger than in our baseline estimate (2.4% instead of 1.8%) in the latter it is slightly lower (1.5%).

A further set of sensitivity analyses concerns the extension of the sample of funds considered. First, we enlarge the sample to include country and sector equity funds. As a second step, we consider an even larger sample, including also bond and mixed (bond and equity) funds, for a total of 3203 funds (as mentioned in Section 4, this represents basically 100% of all Italian funds and three-quarters of all foreign funds). To build this sample, we have to rely on Assogestioni data, which are released on a quarterly, not monthly, basis. In both cases, the baseline estimates are substantially confirmed (Table 7, respectively columns 5 and 6).

Difference-in-differences estimates are potentially exposed to the econometric problems

[14] The Jensen alpha is computed from a standard Capital Asset Pricing Model regression in which the fund's extra-return with respect to the risk-free rate is regressed against a constant (the Jensen's alpha) and the extra-return of the category to which the fund belongs (European, American, etc.). See Cesari and Panetta (2002) for a more detailed analysis of Italian funds ' performance.

[15] In order to tackle scale problems we consider instead the hyperbolic sine of net inflows (the log transformation is obviously not viable as net flows can take negative values). The coefficient of the interaction term can be interpreted as the semi-elasticity with respect to the change in the tax regime.

highlighted by Bertrand et al. (2004), namely a tendency (due to correlated residuals) to find a significant treatment effect even when there is none, because the standard deviation of the estimators is underestimated. However, to avoid this problem we adopted several precautions. First, all our inferences are done using standard errors clustered at the fund's level. Moreover, we checked that the treatment effect is significant at 1% even if errors are clustered at the group level, i.e. distinguishing Italian from Foreign funds[16](Table 8, column 1).

The statistical significance of the treatment effect remains very high even when the standard errors are clustered in different ways (Table 8, columns 2 and 3), or the Bertrand et al. (2004) recipe of collapsing the dataset into a $T = 2$ panel is adopted, with variables averaged over the pre- and post-treatment period respectively (Table 8, column 4), or when resorting to Generalized Least Squares estimation (Table 8, column 5).

4.2 Assessing the common trend assumption

The difference-in-difference approach relies on the assumption that, without the treatment, the change in the outcome variable for the treated population would have been the same as the change observed for the control group, conditional on the control variables (*common trend assumption*). The common trend assumption is not directly testable, as it relies on a counter-factual scenario. However, we can indirectly assess its plausibility. A simple eye-ball test in our case does not seem inconsistent with the assumption, looking at net inflows normalized by the fund's size (Figure **??**) or at the residual of the regression of net inflows with respect to the mean and the standard deviation of returns (Figure 2). In this section we discuss the issue more formally.

As a first check, we conduct a battery of "placebo" experiments, testing whether a significant difference in the dynamics of inflows between foreign and domestic funds appeared even in periods in which the treatment did not take place (in other words, we assessed the effects of several "mock reforms"). The evidence supports the common trend assumption

[16] This is the coarsest possible partition of our sample. Clustering at that level is suggested by Moulton (1990).

at least until the first quarter of 2011(see Figure **??**). The fact that the treatment effect starts to appear slightly significant a few months before the change became effective might signal an anticipation effect. As we discussed above, the law which changed the tax regime for the Italian funds was passed at the beginning of January, even if the change took place in the following July.[17] If anything, this should strengthen our case for a positive impact of the tax change on impact.

Another set of "placebo" experiments is performed using only foreign (i.e. non-treated) funds. Namely, we pick at random a subset of them and pretend that they are treated; we then run our baseline regression using this fake treatment group. The empirical distribution of the estimate of the interaction term, shown in Figure 4, correctly suggests that the placebo treatment has no effect.

As a further check, we address the concern that Italian intermediaries providing both Italian and foreign funds might have changed their marketing strategies at the same time of the reform, therefore inducing a violation of the common trend assumption. This might be in some way due to the increased funding difficulties experienced by some banks (which are among the most important fund promoters) around mid-2011. While there is no evidence, either formal or anecdotal, that this is the case (in particular, it does not appear that Italian intermediaries started pushing Italian funds more aggressively than foreign funds), to be on the safe side we repeat our baseline estimation excluding from the sample all foreign funds sponsored by Italian groups. Reassuringly, the results don't change (Table 7, column 1). Similarly, we repeat our exercise excluding from the sample those funds (be they foreign or domestic) that were sponsored by one of the five top Italian banking groups, which were those that experienced the more severe deterioration in funding conditions (Table 7, column 2). Also in this case, our results hold.

Finally, we estimate a difference-in-difference model for all the controls we have used in the baseline model. None of the controls appears to be influenced in a statistically relevant way by the reform, in fact the coefficient of the interaction term is never statistically different

[17] Of course, the existence of an anticipation effect would only reinforce our point concerning the importance of tax considerations for mutual fund investors.

from zero.

4.3 Allowing for substitution effects

In principle, the change in the taxation of Italian funds (the treatment group) might have influenced the demand for foreign mutual funds (the control group). In fact following the reform some investors may have decided to move part of their savings from foreign mutual funds to Italian ones. If this is so, our estimates would encompass the effect of the tax change on both on the demand for Italian funds and on that for foreign funds. Moreover, the presence of a substitution effect would violate the assumptions of the (simplest version of the) difference-in-differences methodology. To obtain a consistent estimate of the *direct* effect of taxation on the demand for Italian mutual funds in the presence of a substitution effect between the two groups, we have to modify our difference-in-difference strategy.

In this section we follow Miguel and Kremer (2004), and adopt a procedure which doesn't require the no-substitution assumption. We assume, instead, that there is a sostitution effect but one that for each fund it is limited to a subset of funds which are more similar (its "reference group"). In other words, within the class of foreign funds (the control group) the change of taxation for Italian funds (the treatment group) has an effect which depends on (a measure of) similarity/substitutability among funds. Based on this weaker assumption, we include two more regressors in the baseline regression: the *total* number of mutual funds belonging to fund i's reference group and the number of *treated* funds belonging to fund i's reference group. As for the reference groups, we adopt the Morningstar clusters, which are built by looking at similarity along four dimensions: asset class, investment style, geographic and sector specialization.

The results of this richer regression (Table 9, column 1) are very similar to those of our baseline regression, suggesting that the substitution effect did not play an important role. This may not be surprising, given that only a relatively small fraction of the wealth of Italian households is invested in equity funds (the resources to increase households' investments in Italian mutual funds could therefore be easily found elsewhere).[18]

[18] Moreover, the overall amount of available resources is obviously not fixed: it can be increased by

Some asset management group sponsors mutual funds with the same asset allocation but with a different domicile. We exploit this peculiarity of the Italian mutual funds industry for a further robustness check. In particular, for each fund we define as its reference group the mutual funds which have the same Morningstar classification and are run by asset management companies belonging to the same group (Table 9, column 2). Even in this case, the results are very similar to our baseline, again suggesting that the effect of the treatment on the control group is negligible. Other ways to build the reference groups yield similar results too (Table 9, columns 3 and 4).

4.4 Matching estimators

Another set of estimators which do not require the common trend assumption to hold is provided by matching estimators. They rest on the assumption that the effect of the treatment will be the same both for the treated and for the non-treated population, conditional on the included controls (*unconfoundedness assumption*). As remarked, among others, by Imbens and Wooldridge (2009) and Lechner (2011), neither the common trend assumption nor the unconfoundedness assumption implies the other. In particular, contrary to the matching approach, the difference-in-differences approach is correct in the case of unobserved time-invarying variables. However, given the panel nature of our data, we have the possibility of including the pre-treatment outcome (i.e. $Inflow_{it-1}$) among the regressors. This goes a long way towards controlling for unobservables, and increases the plausibility of the unconfoundedness assumption. On this basis, the matching approach is often deemed preferable to difference-in-differences when panel data are concerned (Imbens and Wooldridge, 2009).

The matching approach has two further advantages with respect to the difference-in-differences estimator: first, it is fully non-parametric, so it does not assume linearity of the treatment effect; second, it allows for heterogeneous treatment effects.

Therefore, in this section we complement the analysis of Section 4.1 by computing two quite standard matching estimators (in both cases, we consider a $T = 2$ panel in which variables are averaged over the pre-treatment and the post-treatment period, respectively).

increasing the saving rate.

The first is a propensity score matching estimator (Rosenbaum and Rubin, 1983). To compute it, we first estimate the propensity score of each observation using a probit in which the dependent variable is the treatment dummy, and the independent variables are lagged inflows, returns, and volatility; then, each observation is associated to one group of observations or "stratum", so that the average propensity score of the treated and the non-treated within each group/stratum is the same.[19] For each stratum, the average difference in the difference in inflows between Italian and foreign funds is computed; the estimator of the average treatment effect is the across-strata average of this magnitude. More formally (denoting by Ω the set of all strata S, by $|.|$ the number of elements of a set, and by N the set of all observed funds), we have:

$$\hat{\delta} = \sum_{S \in \Omega} \frac{|S|}{|N|} \hat{\delta}_S, \text{ where } \hat{\delta}_S = \frac{\sum_{i \in \{i:Treat_i=1\} \cap S} \Delta Inflow_i}{|\{i : Treat_i = 1\} \cap S|} - \frac{\sum_{i \in \{i:Treat_i=0\} \cap S} \Delta Inflow_i}{|\{i : Treat_i = 0\} \cap S|} \tag{2}$$

The estimated treatment effect obtained with this methodology ($\hat{\delta}$) is in line with the one obtained with difference-in-differences and highly statistically significant (Table 10, column 1).

The second estimator that we compute is a pairwise-matching estimator. We match each treated fund with the most similar one among the non-treated, compute the difference-in-differences between each treated fund and its non-treated counterpart, and finally average across all the treated funds. In symbols, this amounts to the following estimator:

$$\hat{\delta} = \frac{\sum_{\{i:Treat_i=1\}} \left(\Delta Inflow_i - \Delta Inflow_{M(i)} \right)}{|\{i : Treat_i = 1\}|}, \tag{3}$$

where $M(i)$ denotes the non-treated unit matched to the treated unit i. The similarity is judged by considering the same covariates that we used in the case of the propensity score matching, therefore pre-treatment inflows are also considered. The result is similar in size to the one obtained using a propensity score, and it is again highly significant (Table 10,

[19] For this purpose, we use the algorithm by Becker and Ichino (2002).

columns 2 and 3).[20]

As a final exercise, we compute the Athey and Imbens (2006) changes-in-changes estimator, which also allows for heterogenous and non-linear treatment effects. Incidentally, we notice that the estimator proposed by Athey and Imbens allows for the treatment to influence the outcome of the control groups. Hence it can be used to tackle the issue related to the presence of a substitution effect among the two sets of funds, discussed in Section 4.3. Table 10 (column 4) reports the results of the changes-in-changes estimation. Our main result is again confirmed: the average effect of the reform for Italian mutual funds is positive and statistically significant.

5 Conclusions

In this paper we use a new method to identify the impact of a change in the tax burden on mutual funds' inflows, exploiting a switch from an accrual-based to a realization-based tax regime. In particular, we take advantage of a quasi-natural experiment due to a tax reform enacted in Italy in 2011.

Our results indicate that there is an increase in the net inflows for the treated funds which is both economically and statistically significant, as well as robust to different identification assumptions, estimation windows, and specifications. Moreover, we found no evidence that the increase in the demand for Italian funds came at the expense of foreign funds.

Before concluding, we would like to stress that our results do not mean that the reform was welfare-enhancing. Indeed, while the development of the institutional investors' industry in non-anglosaxon countries is often seen as a policy priority, this objective can be pursued by other means as well. Resorting to the taxation lever entails costs for the public budget. It would be interesting to compute these costs and to arrive at a full-fledged evaluation of the Italian 2011 reform. It would also be interesting to investigate what kind of investor is more sensitive to tax considerations. Both topics are left for future research.

[20] Two different metrics are used; for more details see Abadie et al. (2001). We also adjusted the pairwise matching estimator to take into account the bias highlighted by Abadie and Imbens (2006). No relevant differences emerged.

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Figure 1: Average net inflows (normalized by the fund's size; percentage points).

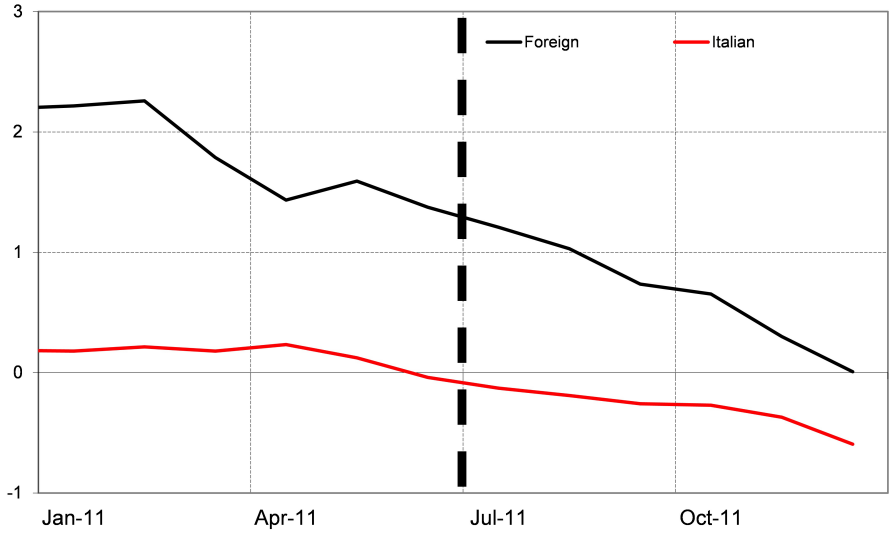


Figure 2: Average of the residuals of net inflows (normalized by the fund's size) regressed on the mean and the standard deviation of returns (percentage points).

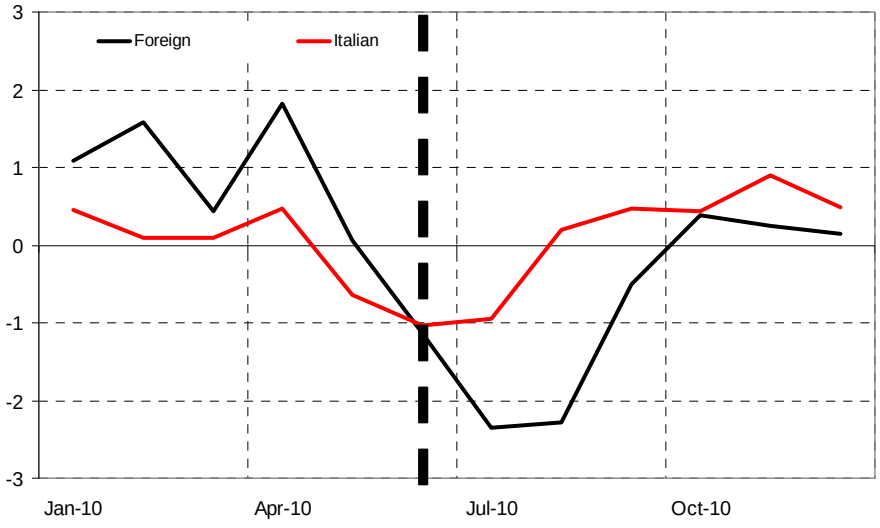
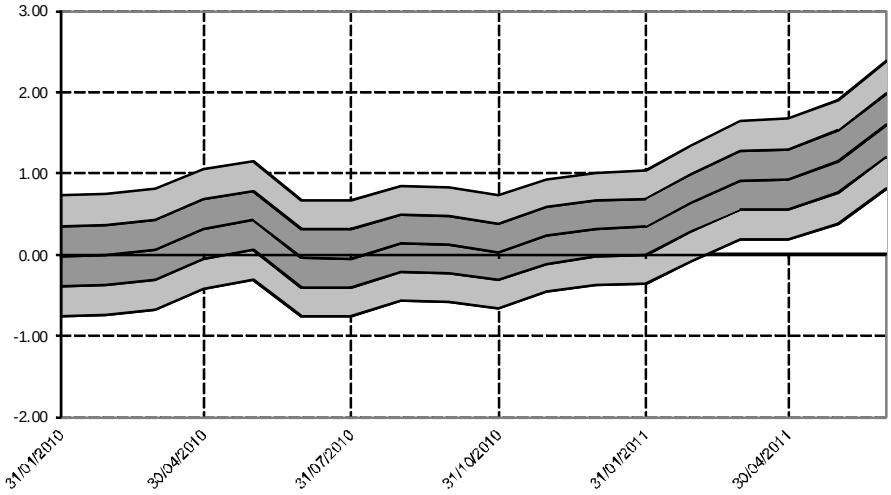
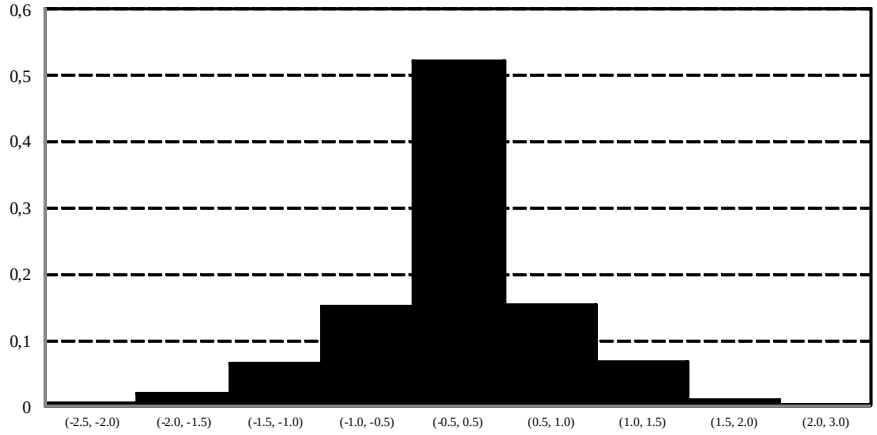


Figure 3: Average treatment effect on the treated.



Note: Point estimate of the treatment effect for different hypothetical treatment dates (shown on the X axis). Confidence bounds: 10% and 5%.

Figure 4: Distribution of the point estimate of the treatment effect.



Note: We run the baseline regression considering only foreign funds and randomly assigning them to the treated group. We run this exercise 1000 times and plot the distribution of the obtained point estimate.

Table 1: Open-end mutual funds held by Italian investors: market structure (end of 2011).

	Number of funds	Net assets (million euros)	Net inflows (million euros)
Total funds	3.737	426.771	-33.270
Domestic (1)	811	153.692	-34.486
of which: Equity funds	*166*	*19.145*	*-1.906*
Foreign (2)	2.926	273.079	1.216
of which: Equity funds	*1.330*	*73.449*	*-2.159*
of which: Set up by domestic intermediaries	*901*	*176.166*	*-3.974*

Sources: Bank of Italy and Assogestioni.
(1) Domestic funds are defined as those run by asset management companies based in Italy. (2) Foreign funds are defined as those run by a foreign asset management company.

Table 2: Holdings of mutual funds by sector (percentage points).

	Italian funds			Foreign funds		
	Financial Sector	Firms	Households	Financial Sector	Firms	Households
Jan-11	24,1	0,6	73,3	24,4	1,0	69,2
Feb-11	27,9	0,6	69,6	24,3	1,1	68,9
Mar-11	22,3	0,6	75,2	24,4	1,1	69,0
Apr-11	29,3	0,6	68,3	25,1	1,1	68,2
May-11	30,0	0,6	67,7	24,9	1,1	68,4
Jun-11	29,8	0,6	67,9	24,6	1,1	68,6
Jul-11	29,0	0,6	68,6	24,8	1,1	68,9
Aug-11	29,0	0,6	68,9	24,4	1,0	69,5
Sep-11	21,9	0,6	75,9	24,6	1,0	69,6
Oct-11	22,5	0,6	75,4	24,1	1,2	69,8
Nov-11	22,5	0,6	75,7	23,9	1,2	69,8
Dec-11	22,8	0,6	75,5	23,3	1,2	70,2

Source: Bank of Italy.

Table 3: Summary statistics.

	Italian funds			Foreign Funds		
	Number of funds	Average assets *(mln euro)*	Average net inflows over assets *(%)*	Number of funds	Average assets *(mln*	Average net inflows over assets *(%)*
Equity America	18	117	0,03	49	138	0,15
Equity Europe	29	179	-1,78	54	100	-3,08
Equity Pacific	16	120	-1,66	42	86	-1,59
Equity Euro-Area	11	107	-1,13	14	30	-1,77
Equity International	27	131	-0,88	38	134	-1,79
Equity Emerging Markets	15	201	-2,51	62	112	-1,32

Table 4: Summary Statistics.

	Italian funds		Foreign Funds	
	Before reform (1)	After reform (2)	Before reform (1)	After reform (2)
Number of funds	116	116	259	259
Asset under management (3)				
mean	170,43	147,04	125,96	109,89
median	73,71	67,44	48,96	42,93
standard deviation	228,57	195,12	214,87	191,17
Net inflows (mln Euro)				
mean	-1,00	-1,03	0,21	-1,02
median	-0,29	-0,32	-0,02	-0,28
standard deviation	5,51	4,85	8,99	6,06
Net inflows over assets (4)				
mean	-1,71	-1,02	0,76	-0,47
median	-0,98	-0,66	-0,10	-0,74
standard deviation	7,24	4,85	8,58	4,38
Average fund return over past 12 months (4)				
mean	0,86	-0,48	0,99	-0,46
median	0,86	-0,44	0,98	-0,38
standard deviation	0,50	0,68	0,65	0,88
Standard deviation of fund returns over past 12 months (4)				
mean	3,15	3,99	3,44	4,30
median	3,04	3,91	3,32	4,25
standard deviation	0,66	0,94	0,86	1,18

(1) Between January and June 2011. (2) Between July and December 2011. (3) Assets held by Italian investors; millions of euros. (4) Percentage points.

Table 5: Diff-in-diff regressions.

	(1)	(2)	(3)	(4)
Treatment	-0.6281*	-0.7385**	-1.1956**	-1.3237*
Post	-2.5569***	-	-	-
Treatment * Post	1.7828***	1.7871***	1.8269***	1.7924***
Assets (t-1)	Y	Y	Y	Y
Past 12 months returns				
Mean	Y	Y	Y	N
Standard deviation	Y	Y	Y	N
Fund specialization	Y	Y	Y	Y
Jensen alpha	N	N	N	Y
Full set of time dummies	N	Y	Y	Y
Fund family	N	N	Y	Y
Number of observations	5.143	5.143	5.143	3.913

Note: In all regressions robust standard errors are used, clustered at the individual fund level. (1) Includes a dummy variable equal to 1 in the post-treatment periods instead of a full set of time dummies. (2) Baseline model. (3) Includes controls for fund families.(4) Past performance is measured using Jensen's alpha.

Table 6: Diff-in-diff regressions: a different dependent variable.

	(1)	(2)	(3)	(4)
Treatment	-0.3354***	-0.3606***	-0.5322***	-0.5032***
Post	0.2975***	-	-	-
Treatment * Post	0.2975***	0.3***	0.2914***	0.2893**
Assets (t-1)	Y	Y	Y	Y
Past 12 months returns				
Mean	Y	Y	Y	N
Standard deviation	Y	Y	Y	N
Fund specialization	Y	Y	Y	Y
Jensen alpha	N	N	N	Y
Full set of time dummies	N	Y	Y	Y
Fund family	N	N	Y	Y
Number of observations	5.143	4.694	5.143	3.913

Note: Dependent variable: hyperbolic sine of net inflows. In all regressions robust standard errors are used, clustered at the individual fund level. (1) Includes a dummy variable equal to 1 in the post-treatment periods istead of a full set of time dummies. (2) Baseline model. (3) Includes controls for fund families. (4) Past performance is measured using Jensen's alpha.

Table 7: Diff-in-diff regressions: various samples.

	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-1.0202***	-0.7027***	-1.6416***	-0.7949**	-0.9086***	-2.967***
Post	-	-	-	-	-	-
Treatment * Post	2.3116***	1.5125***	2.5749***	1.9077***	1.8873***	1.6836***
Assets (t-1)	Y	Y	Y	Y	Y	Y
Past 12 months returns						
Mean	Y	Y	Y	Y	Y	Y
Standard deviation	Y	Y	Y	Y	Y	Y
Fund specialization	Y	Y	Y	Y	Y	Y
Jensen alpha	N	N	N	N	N	N
Full set of time dummies	Y	Y	Y	Y	Y	Y
Fund family	N	N	N	N	N	N
Number of observations	2.574	9.774	4.398	4.579	7.427	8.663

Note: In all regressions we use robust standard errors, clustered at the individual fund level. (1) Sample restricted between March and September 2011. (2) Sample enlarged starting from January 2010. (3) We exclude foreign funds sponsored by Italian intermediaries. (4) We exclude funds belonging to the top five Italian bankingr groups; (5) Sample enlarged to include all the equity funds (even those with country or sector investment strategies); (6) Assogestioni Sample: quarterly data including both equity and non-equity (bond and mixed) mutual funds.

Table 8: Diff-in-diff regressions: different ways to account for correlated residuals.

	(1)	(2)	(3)	(4)	(5)
Treatment	-0.7385**	-0.7385	-0.7385***	-1.4674***	-1.2428***
Post	-	-	-	-2.5379***	-
Treatment * Post	1.7871***	1.7871**	1.7871***	2.2663***	1.9703***
Assets (t-1)	Y	Y	Y	Y	Y
Past 12 months returns					
Mean	Y	Y	Y	Y	Y
Standard deviation	Y	Y	Y	Y	Y
Fund specialization	Y	Y	Y	N	Y
Jensen alpha	N	N	N	N	Y
Full set of time dummies	Y	Y	Y	N	Y
Fund family	N	N	N	Y	Y
Number of observations	5.143	5.143	5.143	850	5.143

(1) Baseline specification with clustering according to treatment status. (2) Baseline specification with clustering according to family group and time period. (3) Baseline specification with clustering at the fund-family level. (4) Variables averaged over the 6 months before and after July 1 (Betrand et al., 2004). (5) GLS.

Table 9: Diff-in-diff regressions: allowing for substitution effects.

	(1)	(2)	(3)	(4)
Treatment	-1.0785***	-0.8618*	-0.9742***	-0.8491**
Post	-2.4337***	-2.4295***	-2.4088***	-2.422***
Treatment * Post	1.8047***	1.805***	1.804***	1.8056***
Assets (t-1)	Y	Y	Y	Y
Past 12 months returns				
Mean	Y	Y	Y	Y
Standard deviation	Y	Y	Y	Y
Fund specialization	N	N	Y	Y
Fund family	N	N	N	N
Number of funds in the reference group	Y	Y	Y	Y
Number of treated in the reference group	Y	Y	Y	Y
Number of observations	3.819	3.819	3.819	3.819

Note: In all regressions robust standard errors are used, clustered at individual fund level. For each fund, the reference group is given by all the funds with: (1) the same Morningstar classification; (2) the same Morningstar classification and belonging to the same family; (3) the same investment area; (4) the same investment area and belonging to the same family.

Table 10: Matching estimates and Changes-In-Changes estimates.

	(1)	(2)	(3)	(4)
Average Treatment Effect on the Treated	2.266***	2.214***	1.865***	1.63***
	(0.444)	(0.397)	(0.723)	(0.710)
Assets (t-1)	Y	Y	Y	Y
Past 12 months returns				
Mean	Y	Y	Y	Y
Standard deviation	Y	Y	Y	Y
Number of observations	444	444	444	696

(1) Average Treatment Effect on the Treated estimated using propensity score. (2) Average Treatment Effect on the Treated estimated using parwise matching (radius metric). (3) Average Treatment Effect estimated using pairwise matching (nearest neighbor metric). (4) Changes-In-Changes.

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