“Fund performance-flow relationship and the role of institutional reform”

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FUND PERFORMANCE-FLOW RELATIONSHIP AND THE ROLE OF INSTITUTIONAL REFORM

Abstract

Extant literature shows the positive impact of institutional development on investor rationality and market efficiency. The authors extend this evidence by investigating the performance-flow relationship in the Chinese mutual fund market before and after the enforcement of the revised Law of the People's Republic of China on Securities Investment Fund. Empirical evidence reveals that Chinese investors irrationally chase past star performers before institutional reform, but gradually become rational and less obsessed with star-chasing behaviors after reform. Moving one percentile upward in the relative performance among the star funds is associated with money inflows by 0.532% after reform, much lower than 1.433% before reform. The findings confirm the positive influence of institutional development on investor rationality and market efficiency. The successful experience can be borrowed by other emerging markets with less developed institutions.

Keywords Chinese mutual fund market, institutional reform, investor rationality, market efficiency, performance-flow relationship

JEL Classification G15, G28, G32, G41

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INTRODUCTION

Much academic research explores the fund performance-flow relationship and concurs that investors chase star performers more intensely than sell poor performers, known as the asymmetric (convex) relationship. For example, Ippolito (1992) documents that the estimated coefficient of performance on fund growth is larger for funds with positive than negative excess returns. Categorizing funds to three performance regions: top, medium, and bottom, Sirri and Tufano (1998) report the significantly positive performance-flow relationship in the top region, but the rather weak relationship in other two regions (see, also, Del Guercio & Tkac, 2008; Goetzmann & Peles, 1997; Huang et al., 2007; Ivković & Weisbenner, 2009; Lynch & Musto, 2003). Explanations for the convex relationship involve various areas such as cognitive dissonance, transaction fees, searching costs, and participation costs (see Goetzmann & Peles, 1997; Huang et al., 2007; Sawicki, 2001; Sirri & Tufano, 1998). While the fund performance-flow relationship is well-examined in the US and other developed markets, it appears unreasonable to expect the same relationship in emerging markets that characterize the dominance of unsophisticated retail investors and weaker institutional arrangements (see Chan et al., 2008; Mei et al., 2009; Chi, 2016; Pearson et al., 2016). However, limited evidence is currently available concerning the fund performance-flow relationship in emerging markets.

This paper thus aims at complementing this literature on the performance-flow relationship and shedding new light on its variation under different market conditions from the Chinese mutual fund market, one

of the most important emerging markets in the world. In particular, due to the less developed and younger fund industry, the Chinese mutual fund market has an elevated level of participation of unsophisticated retail investors[1]. They succumb to miscalibration, judgmental biases, and heuristics (see Dhar & Zhu, 2006; Khorana et al., 2005; Kruger & Dunning, 1999, 2002; Lichtenstein & Fischhoff, 1977), and are less capable of information search, collection, and analysis, which are critical in making investment decisions (Huang et al., 2007; Sirri & Tufano, 1998). Hence, a unique pattern of the performance-flow relationship would be expected.

Our attention to the Chinese mutual fund market is particularly motivated by the fact that it experiences an important institutional reform in June 2013, which offers a natural experiment on assessing the influence of institutional development on investor rationality and market efficiency (see Chui et al., 2010; La Porta et al., 1998; Schmeling, 2009). Specifically, June 1st, 2013 witnesses the enforcement of the revised Law of the People's Republic of China on Securities Investment Fund (LPRCSIF) aiming at improving market efficiency and protecting investors' legal rights. Three main modifications in the fund industry come with the new LPRCSIF.

First, the revised LPRCSIF simplifies fund issuing procedures and provides more investment opportunities for investors. The pattern of fund issuance transits from the authorized system to the registered one, and more financial institutions are permitted to issue mutual funds. According to the China Securities Regulatory Commission (CSRC), only 81 fund management companies are permitted to issue mutual funds before the launch of the new LPRCSIF. However, after its enforcement, more financial institutions such as private placements, insurance companies, and commercial banks are granted permissions to issue mutual funds. By April 2016, there are 113 financial institutions obtaining the issuance license.

Second, sales and distribution of mutual funds are virtually monopolized by commercial banks before June 2013, which means that investors have to purchase (redeem) funds from banks. After the launch of the new LPRCSIF, more third-party fund sales and distribution agencies appear. These agencies provide comprehensive services, such as operating Internet-based information portals and sales platforms, offering market news and fund research, and allowing registered members to purchase (redeem) funds with lower transaction fees[2]. In this sense, information costs and transaction costs are much lower for investors.

Third, information disclosure is more strictly required to alleviate information asymmetry. Existing research based on earlier dataset before the enforcement of the revised LPRCSIF reports that Chinese mutual funds lack performance persistence and investors tend to make less optimal decisions in fund investment. Therefore, the smart money effect which is revealed in the US market is not observed in China (Feng et al., 2014; Gruber, 1996; Jun et al., 2014; Zheng, 1999). This can be ascribed to the unfamiliarity of investors with the funds that they are going to trade. As the new LPRCSIF stresses the information disclosure, Chinese investors would have more available information on fund investment.

Beyond the aforementioned three aspects, the new LPRCSIF improves the Chinese mutual fund market institution in a more general sense, such as standardizing fund-raising procedures, protecting investors' legal rights, and promoting the stable and healthy fund market, etc. As a result, it is reasonable to anticipate different patterns of the performance-flow relationship before and after the enforcement of the new LPRCSIF and using the unique dataset from the Chinese mutual fund market allows us to directly survey the role of institutional reform. More notably, if institutional reform proves successful, the experience can be borrowed by other emerging markets with less developed institutional arrangements.

The dataset in our paper spans from January 2005 to June 2017. We allocate all funds into top, medium, and bottom performance regions based on the linear piecewise regression that allows the sensitivities

1 According to the CSMAR, the share of retail investors in the Chinese mutual fund market was 72.29% in 2014.

2 For example, the Shanghai Tiantian Fund Distribution Co., Ltd. is one of the first independent fund sales and distribution agencies approved by the CSRC. It offers a wide range of services mentioned in our paper.

of fund flows to past performance to vary in distinct groups. In addition, we separately assess investors' purchase and redemption behaviors in an attempt to present the driving forces of the performance-flow relationship. Findings based on the entire sample reveal the differences in the sensitivities of fund flows to past performances. In particular, there is a positive performance-flow relationship in the top and bottom performers, driven by investors' intense purchases of star performers and redemptions of the poorest performers, respectively. In the medium performance region, however, fund flows are negatively related to past performance because of the strong adverse purchases of poorer performers. We also confirm the asymmetric performance-flow relationship that investors chase star performers more intensely than punish the poorest ones in the Chinese mutual fund market.

To check the influence of institutional reform on the fund performance-flow relationship, we split the entire sample period into two subperiods: before the launch of the revised LPRCSIF from January 2005 to March 2013 (the pre-reform period) and after the launch of the revised LPRCSIF from April 2013 to June 2017 (the post-reform period)[3]. In the pre-reform period, investors exhibit evident star-chasing behaviors. Meanwhile, they adversely purchase worse performers in the medium group and punish the poorest performers in the bottom group by great redemptions; however, the performance-flow relationship in these two groups are insignificant. The post-reform period presents that investors' star chasing becomes less pronounced and there is a significantly negative performance-flow relationship in the medium group. These findings show that the launch of the new LPRCSIF makes more information on fund performance persistence readily available and after knowing limited persistence of star performance, investors show less interest, confirming the positive influence of institutional improvement on investor rationality. Our presented results are robust to different risk-adjusted performance measures and the use of the tradable shares in computing pricing factors.

This study makes the following contributions. First, we provide additional empirical evidence on performance-flow relationship from the Chinese mutual fund market, one of the largest and the most important emerging markets across the globe. Second, we take both purchases and redemptions into account to reveal the driving forces of the performance-flow relationship. Third, we conduct comparative analyses on the fund performance-flow relationship under different market institutions and complement to the argument that an advanced system of market institutions generates a more efficient market. Fourth, further to the third contribution, our study proposes the policy suggestion that the successful experience of institutional reform in the Chinese mutual fund market can be borrowed by other emerging markets that have relatively less developed market institutions and a large fraction of irrational investors.

The remainder of this paper proceeds in the following manner. Section 1 presents data, methodology, and descriptive statistics. Section 2 illustrates main empirical results and a series of robustness tests. Last section concludes.

1. DATA, METHODOLOGY, AND DESCRIPTIVE STATISTICS

1.1. Data and specifications

We collect all data from the CSMAR Database compiled by GTA Data Services from January 2005 to June 2017[4]. We estimate the following equation at the quarterly interval:

$$Flow_{i,t} = c_i + \beta_1 High_{i,[t-4,t-1]} + \beta_2 Mid_{i,[t-4,t-1]} + \\ + \beta_3 Low_{i,[t-4,t-1]} + \gamma_1 \psi + \varepsilon_{i,t}, \quad (1)$$

where c_i is the constant term, $\varepsilon_{i,t}$ is the residual; $Flow_{i,t}$ is fund i's flows at quarter t, defined as

3 We separate our sample in this way because our data are at the quarterly interval. However, it does not affect our result if we exclude the second quarter of 2013 – that is the first subperiod from January 2005 to March 2013 and the second subperiod from July 2013 to June 2017.

4 Our dataset consists of actively-managed equity-leaning mutual funds including equity mutual funds and hybrid mutual funds.

Table 1. Descriptions of control variables

Variables	Descriptions
$R_{i,[t-4,t-1]}$	Realized performance of fund *i* over the past year, i.e. from quarter (*t*–4) to (*t*–1)
$Std_{i,[t-4,t-1]}$	Annualized standard deviation of monthly fund returns of fund *i* over the past year, i.e. from quarter (*t*–4) to (*t*–1)
$Ln(TNA_{i,t-1})$	The natural logarithm of the total net asset of fund *i* over the past quarter (*t*–1)
$Div_{i,t}$	The dividend amount of fund *i* in the current quarter *t*
$Div_Times_{i,t}$	The distribution times of fund *i* in the current quarter *t*
$Ln(TNA_{i\to company,t-1})$	The natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter (*t*–1)
$Num_{i\to company,t-1}$	The number of all funds in fund's *i*'s company over the past quarter (*t*–1)
$Ln(Age_{i\to company,t-1})$	The natural logarithm of the age of fund *i*'s company at the past quarter (*t*–1)
$Expense_{i\to company,t-1}$	The expense ratio of fund *i*'s company over the past quarter (*t*–1)
$Std_{M,[t-4,t-1]}$	The annualized standard deviation of monthly equity market returns over the past year, i.e. from quarter (*t*–4) to (*t*–1)

Note: This table reports the descriptions of all control variables adopted in Equation (1). We include this set of variables to control their impact on fund flows.

the net growth rate in fund's total net assets beyond reinvested dividends, computed from

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \cdot \left(1 + R_{i,t}\right)}{TNA_{i,t-1}}, \quad (2)$$

where $R_{i,t}$ is the realized return of fund i at quarter t, $TNA_{i,t}$ and $TNA_{i,t-1}$ is the total net assets of fund i at the end of quarter t and quarter $t-1$, respectively.

We compute fund past performance, $Rank_{i,[t-4,t-1]}$, as the return ranking of fund i's relative performance which is defined as the raw performance of fund i relative to other funds over the past year, ranging from 0 (worst) to 1 (best). The raw performance is measured as the risk-adjusted abnormal return from the three-factor alpha of Fama and French (1993). To start with, we estimate the following specification at the monthly interval over the past 24 months:

$$R_{i,t} - R_{f,t} = \alpha_{i,FF} + \beta_{i,MKT}\left(R_{m,t} - R_{f,t}\right) + \\ + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \varsigma_{i,t}, \quad (3)$$

where $R_{f,t}$ is the risk-free rate in month t, represented by the one-year interest rate for certified deposits; $R_{m,t}$ is the market return computed from Chinese equity market composite index adjusted for dividend distributions in month t; SMB_t, HML_t are the premium of the size factor and the premium of the book-to-market factor as defined in Fama and French (1993). All three pricing factors are calculated from the value-weighted index of all shares, i.e., both tradable and non-tradable shares. We store $\alpha_{i,FF}$ and obtain the risk-adjusted abnormal return from

$$\alpha_{i,t}^{FF} = \alpha_{i,FF} + \varsigma_{i,t}. \quad (4)$$

Since our primary interest is in the performance-flow relationship across funds with different past performance, we employ the piecewise linear specification in the manner of Sirri and Tufano (1998) and others, which allows performance-flow sensitivities to differ for bottom, medium, and top quintiles. Specifically, the fractional rank for fund i is defined as $Low_{i,[t-4,t-1]} = min(Rank_{i,[t-4,t-1]}, 0.2)$, $Mid_{i,[t-4,t-1]} = min(Rank_{i,[t-4,t-1]} - Low_{i,[t-4,t-1]}, 0.6)$, and $High_{i,[t-4,t-1]} = Rank_{i,[t-4,t-1]} - Mid_{i,[t-4,t-1]} - Low_{i,[t-4,t-1]}$.

In addition, we include a series of widely employed controls in matrix ψ in Equation (1) to disentangle the impact of other factors on fund flows (see Chevalier & Ellison, 1997; El Ghoul & Karoui, 2017; Gil-Bazo & Ruiz-Verdú, 2009; Goetzmann & Peles, 1997; Nanda et al., 2004). We detail all control variables in Table 1.

Finally, like O'Neal (2004), we decompose fund flows into inflows and outflows, represented by purchase and redemption rates ($Pur_{i,t}$ and $Red_{i,t}$). The purchase rate is the product of total shares purchased and the average net asset value, divided by beginning net assets. The redemption rate is the product of total shares redeemed and the average net asset value, divided by beginning net assets. To test their relationship with fund performance, we replace $Flow_{i,t}$ in Equation (1) with these two series, respectively.

Table 2. Descriptive statistics

Variable	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fund flows	–0.069	–0.005	0.591	0.006	–0.018	–0.011	–0.013	–0.044	–0.036	–0.012	0.129	0.085	0.059
Purchase rates	0.094	0.461	1.241	0.122	0.208	0.168	0.090	0.054	0.199	0.308	0.759	0.318	0.224
Redemption rates	0.162	0.440	0.518	0.111	0.219	0.176	0.099	0.100	0.222	0.304	0.533	0.198	0.155
Realized performance	0.009	0.213	0.257	–0.189	0.165	0.021	–0.073	0.019	0.038	0.060	0.120	–0.030	0.028
Fund volatility	0.158	0.221	0.329	0.641	0.383	0.328	0.270	0.382	0.432	0.176	0.300	0.446	0.134
Fund total net assets	1.690	1.480	4.200	4.870	3.740	3.410	2.860	2.150	1.890	1.580	1.640	1.250	1.150
Dividend amount	0.016	0.050	0.034	0.011	0.011	0.014	0.008	0.003	0.005	0.008	0.009	0.010	0.007
Dividend distribution times	0.224	0.687	0.407	0.133	0.155	0.181	0.117	0.028	0.073	0.103	0.125	0.123	0.085
Company total net assets	11.505	15.800	47.300	61.900	52.500	53.800	51.200	49.900	54.700	58.700	86.500	102.000	105.000
Number of funds per company	4.448	5.829	8.775	9.942	11.975	14.313	18.129	23.691	33.325	43.465	56.328	75.966	94.246
Age of fund companies	3.961	4.692	5.532	6.488	7.206	7.997	8.831	9.667	10.487	11.377	12.274	13.265	13.928
Company expense ratio	0.010	0.005	0.001	0.000	0.000	0.000	0.000	0.003	0.006	0.009	0.006	0.001	0.005

Note: This table presents descriptive statistics of sample Chinese mutual funds and fund companies from January 2004 to June 2017. In particular, we report fund flows, purchase rates, redemption rates, realized performance, fund volatility, fund total net assets (in billion RMB), dividend amount, dividend distribution times, company total net assets (in billion RMB), the number of funds per company, the age of fund companies, and company expense ratio. Fund and fund company data are reported as the annual cross-sectional average. All data are collected from the CSMAR Database compiled by GTA Data Service.

As we relate quarterly fund flows to performance obtained over the preceding 36 months[5], the cross-sectional estimated relationship in each quarter appears auto correlated, causing the underestimation of standard errors and the overestimation of *t*-statistics. To address this issue, we estimate each quarter's observations individually and store the time series of coefficient estimates. We report the means and *t*-statistics on the mean as Fama and MacBeth (1973), which generates more conservative significance levels.

1.2. Descriptive statistics

Table 2 reports descriptive statistics of Chinese mutual funds from January 2005 to June 2017. Despite its relatively shorter history, the Chinese mutual fund market exhibits evident development from 2005 to 2017, exemplified by company total net assets (from RMB 11.505 billion in 2005 to RMB 105.000 billion in 2017) and the number of funds per company (from 4.448 in 2005 to 94.246 in 2017). While fund total net assets show a declining trend on average (from RMB 1.690 billion in 2005 to RMB 1.150 billion in 2017), this is partially ascribed to the increasing number of funds provided by fund companies, which offers more investment options and diversified profits for Chinese investors so that in the more competitive fund market, investment money flows into different funds. As a matter of fact, we observe from Table 1 that company scales increase rapidly in the post-reform period, demonstrated by the number of funds per company and company total net assets. This explicitly reflects the impact of the new LPRCSIF simplifying new fund issuing procedures and increasing trading channels.

2. RESULTS AND DISCUSSION

This section presents results on performance-flow relationship in the Chinese mutual fund market. Subsection 2.1 discusses results based on the entire period. Subsection 2.2 conducts a comparative study by separating the entire sample into pre- and post-reform periods according to the launch of the revised LPRCISF. Subsection 2.3 reports robustness test results.

5 We use the preceding 24 months to compute fund raw performance from the three-factor model and in Equation (3). We then employ the relative return ranking over the past 12 months in Equation (1).

Table 3. Regression results

Variables	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
$High_{i,[t-4,t-1]}$	1.092[a]	2.111[a]	0.657[a]
	[2.879]	[3.468]	[3.831]
$Mid_{i,[t-4,t-1]}$	–0.156[a]	–0.345[a]	–0.160[a]
	[–2.653]	[–3.770]	[–6.193]
$Low_{i,[t-4,t-1]}$	0.250[c]	–0.131	–0.392[a]
	[1.798]	[–0.705]	[–5.121]
$R_{i,[t-4,t-1]}$	–0.002	0.166	0.242[a]
	[–0.011]	[0.500]	[3.120]
$Std_{i,[t-4,t-1]}$	0.123	0.286[c]	0.111[a]
	[1.216]	[1.897]	[2.862]
$Ln(TNA_{i,t-1})$	–0.087[a]	–0.165[a]	–0.054[a]
	[–4.004]	[–5.173]	[–6.785]
$Div_{i,t}$	0.142	0.286	0.069
	[0.740]	[0.566]	[0.467]
$Div_Times_{i,t}$	0.188[a]	0.374[a]	0.100[a]
	[6.308]	[5.602]	[5.407]
$Ln(TNA_{i\to company,t-1})$	0.026	0.038	0.010
	[1.481]	[1.354]	[1.108]
$Num_{i\to company,t-1}$	0.005	0.008	0.001
	[1.407]	[1.414]	[0.675]
$Ln(Age_{i\to company,t-1})$	–0.019	–0.042	–0.016
	[–0.634]	[–0.979]	[–1.643]
$Expense_{i\to company,t-1}$	0.126	0.963	–0.511
	[0.023]	[0.100]	[–0.199]
c_i	1.265[a]	3.053[a]	1.267[a]
	[2.693]	[4.055]	[5.706]
Avg. R^2	0.182	0.219	0.275
Obs.	22,751	22,751	22,751

Note: This table reports the regression results from Equation (1). The dependent variable is $Flow_{i,t}$, the fund flows of fund *i* at quarter *t*. The main explanatory variables include $High_{i,[t-4,t-1]}$, $Mid_{i,[t-4,t-1]}$, and $Low_{i,[t-4,t-1]}$, representing the return ranking in the top, medium, and bottom performance region, respectively, obtained based on the raw performance computed from Fama and French (1993) three-factor. In addition, we incorporate a series of control variables to remove other potential effects on fund flows. In particular, we have raw performance of fund *i* over the past year, $R_{i,[t-4,t-1]}$; the annualized standard deviation of monthly fund returns of fund *i* over the past year, $Std_{i,[t-1,t-4]}$; the natural logarithm of the total net asset of fund *i* over the past quarter, $Ln(TNA_{i,t-1})$; the dividend amount and distribution times of fund *i* in the current quarter, $Div_{i,t}$ and $Div_Times_{i,t}$; the natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter, $Ln(TNA_{i\to company,t-1})$; the number of all funds in fund's *i*'s company over the past quarter, $Num_{i\to company,t-1}$; the natural logarithm of the age of fund *i*'s company at the past quarter, $Ln(Age_{i\to company,t-1})$; and the expense ratio of fund *i*'s company over the past quarter, $Expense_{i\to company,t-1}$. We also report the average *R*-square (*Avg.* R^2) and the number of observations contained in each regression (*Obs.*). Additionally, we replace $Flow_{i,t}$ with $Pur_{i,t}$ and $Red_{i,t}$ to reveal the relationship between fund performance and purchase rates and between fund performance and redemption rates, respectively. The *t*-statistics are in brackets. [a], [b], and [c] represent statistical significance at the 1%, 5%, and 10% levels, respectively.

2.1. The entire period

Results from the entire period appear in Table 3. The top category presents the positive performance-flow relationship ($High_{i,[t-4,t-1]} = 1.092$, *t*-statistics = 2.879), meaning that Chinese investors chase past star performers. Moving 1 percentile upward in the relative performance among the top group is associated with significantly greater money inflows by 1.092%. While investors demonstrate the disposition effect – the tendency to redeem star performers but to retain worse performers (Kahneman & Tversky, 1979; Shefrin & Statman, 1985) given the positive relationship between fund performance and redemptions ($High_{i,[t-4,t-1]} = 0.657$, *t*-statistics = 3.831), the stronger positive feedback purchase of star performers ($High_{i,[t-4,t-1]} = 2.111$, *t*-statistics = 3.468) significantly dominates and hence drives the positive performance-flow relationship.

Different from extant literature, the medium three performance quintiles show a negative performance-flow relationship ($Mid_{i,[t-4,t-1]} = -0.156$, t-statistics = –2.653). Investors are likely to redeem worse funds ($Mid_{i,[t-4,t-1]} = -0.160$, t-statistics = –6.193); however, they exhibit intense adverse purchase behaviors – the purchase of worse performers – implied by the negative estimation of purchases ($Mid_{i,[t-4,t-1]} = -0.345$, t-statistics = –3.770). The more pronounced adverse purchase leads to the mildly negative relationship in this performance group. For the bottom region, there is no significant relationship between purchases and performance ($Low_{i,[t-4,t-1]} = -0.131$, t-statistics = –0.705), but investors have strong willingness to dispose of the poorest funds by greater redemptions ($Low_{i,[t-4,t-1]} = -0.392$, t-statistics = –5.121). Hence, there presents a positive performance-flow relationship in this group ($Low_{i,[t-4,t-1]} = 0.250$, t-statistics = 1.798), with marginal significance, though.

To check the convexity of the performance-flow relationship, we test the difference in the sensitivities between top and bottom groups, which is 0.842% (F-statistics = 4.199, not reported), signaling that Chinese investors chase star funds more strongly than punish poorest ones, in line with existing findings from developed markets.

Estimates of the control variables also provide some interesting points. While neither fund flows nor purchases are sensitive to the past realized performance, a 1% increase (decrease) in fund realized returns would cause a 0.242% (t-statistics = 3.120) increase (decrease) in redemptions. Given the presented results from the relative performance ranking, it indicates that the disposition effect is more dependent on the realized rather than relative performance, because the disposition effect is not detected in medium or bottom regions. Both purchases and redemptions are positively influenced by fund volatility. Investors would redeem funds with higher volatility ($Std_{i,[t-4,t-1]} = 0.111$, t-statistics = 2.862); however, they are more willing to take the higher risk ($Std_{i,[t-4,t-1]} = 0.286$, t-statistics = 1.897), implying Chinese fund investors to be risk-seeking. Consistent with extant evidence that larger funds grow more slowly than smaller ones (see Sirri & Tufano, 1998), there is a negative relationship between the fund scale and growth ($Ln(TNA_{i,t-1}) = -0.087$, t-statistics = –4.004), due to investors' purchases of small funds ($Ln(TNA_{i,t-1}) = -0.165$, t-statistics = –5.173). Finally, we are aware that instead of the amount of dividend ($Div_{i,t} = 0.142$, t-statistics = 0.740), Chinese investors care more about the times of dividend distribution ($Div_Times_{i,t} = 0.188$, t-statistics = 6.308). They purchase funds with more frequent dividend distributions.

2.2. Does institutional reform influence the performance-flow relationship?

This subsection examines the influence of institutional reform in Chinese mutual fund market on the performance-flow relationship. The revised LPRCSIF can be regarded as institutional advancement since it deregulates fund issuance and distribution procedures and tightens supervision on fund information disclosure. We split the entire sample period into two subperiods, from January 2005 to March 2013 (the pre-reform period) and from April 2013 to June 2017 (the post-reform period), and replicate the procedures in subsection 3.1 and report results in Table 4.

We see from the top region that in the pre-reform period, there is a strong positive performance-flow relationship ($High_{i,[t-4,t-1]} = 1.433$, t-statistics = 2.486), driven by the intense purchases of past star performers ($High_{i,[t-4,t-1]} = 2.413$, t-statistics = 2.614). However, in the post-reform subperiod, the star chasing appears weaker ($High_{i,[t-4,t-1]} = 1.612$, t-statistics = 2.936) and therefore, the positive performance-flow relationship is largely dampened ($High_{i,[t-4,t-1]} = 0.532$, t-statistics = 1.743). In the medium group, fund performance is negatively related to both purchases ($Mid_{i,[t-4,t-1]} = -0.227$, t-statistics = –1.884) and redemptions ($Mid_{i,[t-4,t-1]} = -0.105$, t-statistics = –3.464), the difference of which, however, is small and insignificant ($Mid_{i,[t-4,t-1]} = -0.107$, t-statistics = –1.410). This is also different from the post-reform period as we document a significantly negative performance-flow relationship ($Mid_{i,[t-4,t-1]} = -0.237$, t-statistics = –2.568). Results from the bottom performance group do not vary much. Investors consistently redeem the poorest performers in both periods ($Low_{i,[t-4,t-1]} = -0.390$, t-statistics = –4.378 and $Low_{i,[t-4,t-1]} = -0.395$, t-

Table 4. Two subperiods: pre- and post-reform periods

Variables	January 2005–March 2013 (I)			April 2013–June 2017 (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
$High_{i,[t-4,t-1]}$	1.433[b]	2.413[a]	0.646[b]	0.532[c]	1.612[a]	0.677[a]
	[2.486]	[2.614]	[2.406]	[1.743]	[2.936]	[5.692]
$Mid_{i,[t-4,t-1]}$	–0.107	–0.227[c]	–0.105[a]	–0.237[b]	–0.541[a]	–0.249[a]
	[–1.410]	[–1.884]	[–3.464]	[–2.568]	[–4.147]	[–6.511]
$Low_{i,[t-4,t-1]}$	0.271	–0.143	–0.390[a]	0.216	–0.111	–0.395[a]
	[1.490]	[–0.636]	[–4.378]	[0.976]	[–0.334]	[–2.753]
$R_{i,[t-4,t-1]}$	–0.402	–0.523	0.035	0.656[a]	1.300[a]	0.583[a]
	[–1.204]	[–1.131]	[0.492]	[3.536]	[4.591]	[4.322]
$Std_{i,[t-4,t-1]}$	0.198	0.359	0.098[b]	–0.001	0.165	0.131[c]
	[1.313]	[1.615]	[2.249]	[–0.008]	[1.016]	[1.763]
$Ln(TNA_{i,t-1})$	–0.101[a]	–0.182[a]	–0.059[a]	–0.063[a]	–0.136[a]	–0.047[a]
	[–2.944]	[–3.751]	[–5.789]	[–6.520]	[–5.020]	[–3.555]
$Div_{i,t}$	0.146	0.059	–0.031	0.134	0.661	0.234
	[0.683]	[0.163]	[–0.247]	[0.359]	[0.542]	[0.694]
$Div_Times_{i,t}$	1.500[a]	0.237[a]	0.067[a]	0.252[a]	0.601[a]	0.153[a]
	[4.608]	[4.505]	[3.960]	[4.494]	[4.285]	[4.118]
$Ln(TNA_{i\rightarrow company,t-1})$	0.041	0.068	0.018	0.002	–0.013	–0.002
	[1.532]	[1.630]	[1.230]	[0.118]	[–0.580]	[–0.542]
$Num_{i\rightarrow company,t-1}$	0.009	0.013	0.001	–0.000	–0.001	–0.000
	[1.472]	[1.478]	[0.728]	[–0.747]	[–0.787]	[–1.076]
$Ln(Age_{i\rightarrow company,t-1})$	–0.029	–0.061	–0.021	–0.002	–0.012	–0.008
	[–0.660]	[–0.964]	[–1.572]	[–0.058]	[–0.237]	[–0.567]
$Expense_{i\rightarrow company,t-1}$	–0.254	1.223	–0.662	0.753	0.536	–0.263
	[–0.028]	[0.078]	[–0.160]	[1.327]	[0.594]	[–0.551]
c_i	1.249[a]	2.750[b]	1.173[a]	1.291[b]	3.553[a]	1.421[a]
	[1.799]	[2.556]	[3.694]	[2.505]	[3.775]	[5.148]
Avg. R^2	0.225	0.245	0.311	0.110	0.176	0.216
Obs.	9,502	9,502	9,502	13,249	13,249	13,249

statistics = –2.753 in pre- and post-reform periods, respectively). As to the convexity, the differences in the performance-flow relationship between the top and bottom regions are significant in the first period (*F*-statistics = 3.643, not reported), but insignificant in the second period (*F*-statistics = 0.570, not reported).

Extant studies reveal that good performance of Chinese mutual fund is less likely to persist (Feng et al., 2014; Jun et al., 2014). In a rational context, Chinese investors are not expected to purchase past star performers. As reported in Table 4, investors show much stronger willingness to purchase star funds in the pre-reform period than in the post-reform period, indicating that investors gradually become more rational because they do not crazily chase star performers as they do in the pre-reform period, which can be ascribed to institutional improvement in the Chinese mutual fund market, i.e., the enforcement of the new LPRCSIF.

Different from publicly available "hard information", "soft information" collection and analyses, as Huang et al. (2007) suggest, is more about the familiarity of potential investors with specific funds and it can help them to "narrow the variance of their expectation of future fund returns" (1270). In the Chinese mutual fund market, for one aspect, fund information is less disclosed in the pre-reform period; for another, unsophisticated investors are unable to analyze information in an optimal way. Theoretically, the participation effect, the individual winner-picker effect, and the no-trading effect enable investors to investigate top performers; however, with high participation costs, Chinese investors can hardly access information on fund performance persistence and thus

they follow momentum trading and show the strong willingness to purchase those star funds[6].

From June 1, 2013, fund information disclosure is more strictly required and a growing number of Internet platforms embark on providing fund research that is readily available for investors. Also, wider trading channels make it more convenient for investors to adjust positions when needed. Realizing the less persistent star performance, Chinese investors become more rational and invest less in past top performers. Although there still presents a positive relationship between fund past performance and flows, the process of the fulfillment of the new LPRCSIF and investors being sophisticated is dynamic and may require long time to complete. Thus, to expect a total reverse of the positive relationship in the short run appears unrealistic. The similar argument applies to the medium group as investors purchase fewer better performers in the post-reform period.

Unlike potential investors screening numerous choices from the market, existing investors can focus more on the portfolios that they have. With high participation cost settings, existing investors can identify the poorest funds due to the no-trading effect and punish them by redemptions, which remains valid in the relatively low participation costs setting. That explains why we do not reveal evident changes in the performance-flow relationship for the bottom performers in pre- and post-reform periods.

The empirical evidence that the performance-flow relationship varies in the pre- and post-reform periods confirms the positive impact of institutional advancement on improving market efficiency. It is also constructive to other emerging markets with less developed market institutions. Specifically, it would be difficult for investors to make optimal choices in a less transparent market, leading to the absence of investors' protection and market fairness and efficiency. Policy makers in these markets thus can borrow the successful experience from the Chinese mutual fund market, such as simplifying new fund issuing procedures, increasing trading channels, and requiring information disclosure.

2.3. Robustness test

In the main test, we compute fund raw performance from the three-factor model of Fama and French (1993) and here we consider another two approaches – Jensen's alpha (Jensen, 1968) and four-factor alpha of Carhart (1997). Both approaches proceed similar methods to the three-factor model employed in Subsection 2.1, i.e. Equations (3) and (4). The results from the entire sample and two subperiods are presented in Tables 5 and 6, respectively.

The presented fund performance-flow relationship is not distorted in each performance group. CAPM and four-factor models discover the positive relationship in both top and bottom groups, but the negative relationship in the medium one. The positive relationship in top and bottom regions is due to investors' intense purchases of star funds and punishments for the worst performers, respectively. The adverse purchase of poorer performers in the medium region drives the negative performance-flow relationship.

The impact of the launch of the revised LPRCSIF also supports the reported results in Table 4. Shown by the four-factor model in column (II) of Table 6, for example, investors' star-chasing is largely weakened in the post-reform period, from 1.269 (t-statistics = 2.549) to 0.514 (t-statistics = 1.709). The adverse purchase in the medium group becomes more evident, from –0.193 (t-statistics = –1.769) to –0.529 (t-statistics = –4.346). Both findings confirm the positive impact of institutional advancement on investors' trading behaviors. Likewise, the bottom performance region exhibits little changes as investors consistently punish the worst performers by redemptions, from –0.420 (t-statistics = –4.523) to –0.422 (t-statistics = –3.059).

There are two types of stocks in the Chinese stock market – tradable and non-tradable. We combine both in computing the pricing factors including premium of the market, the book-to-market, and the size factor in the main empirical analyses and

6 Huang et al. (2007) specify three effects derived from participation costs including the participation effect, the individual winner-picking effect, and the no-trading effect. The participation effect shows that higher past performance makes investors with higher costs realize the utility gain from surveying and investing in the fund. The individual winner-picking effect shows that investors tend to concentrate investment on top performers since their high participation costs limit the amount of funds that they investigate. Finally, the no-trading effect suggests that due to transaction costs, investors would prefer not trading unless past performance is sufficiently good (bad).

Table 5. Robustness test: the adoption of CAPM alpha and four-factor alpha

Variables	CAPM (I)			Four-factor (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
$High_{i,[t-4,t-1]}$	1.152[a]	2.089[a]	0.694[a]	0.983[a]	1.892[a]	0.596[a]
	[2.678]	[3.113]	[3.424]	[2.965]	[3.639]	[4.082]
$Mid_{i,[t-4,t-1]}$	–0.163[a]	–0.368[a]	–0.191[a]	–0.149[a]	–0.320[a]	–0.147[a]
	[–2.616]	[–3.862]	[–6.676]	[–2.653]	[–3.774]	[–5.996]
$Low_{i,[t-4,t-1]}$	0.220[c]	–0.109	–0.326[a]	0.238[c]	–0.184	–0.421[a]
	[1.729]	[–0.609]	[–4.330]	[1.831]	[–1.053]	[–5.474]
$R_{i,[t-4,t-1]}$	0.003	0.147	0.218[a]	–0.007	0.157	0.239[a]
	[0.012]	[0.443]	[2.887]	[–0.031]	[0.468]	[3.082]
$Std_{i,[t-4,t-1]}$	0.115	0.273[c]	0.110[a]	0.125	0.289[c]	0.113[a]
	[1.128]	[1.820]	[2.967]	[1.247]	[1.922]	[2.907]
$Ln(TNA_{i,t-1})$	–0.086[a]	–0.163[a]	–0.054[a]	–0.087[a]	–0.165[a]	–0.055[a]
	[–3.996]	[–5.110]	[–6.681]	[–3.902]	[–5.016]	[–6.596]
$Div_{i,t}$	0.134	0.260	0.054	0.140	0.281	0.068
	[0.703]	[0.510]	[0.355]	[0.732]	[0.554]	[0.460]
$Div_Times_{i,t}$	0.187[a]	0.376[a]	0.101[a]	0.191[a]	0.377[a]	0.100[a]
	[6.316]	[5.604]	[5.432]	[6.359]	[5.634]	[5.416]
$Ln(TNA_{i\to company,t-1})$	0.025	0.035	0.010	0.027	0.039	0.011
	[1.386]	[1.255]	[1.016]	[1.505]	[1.393]	[1.154]
$Num_{i\to company,t-1}$	0.005[c]	0.008	0.001	0.005	0.008	0.001
	[1.645]	[1.550]	[0.531]	[1.223]	[1.236]	[0.714]
$Ln(Age_{i\to company,t-1})$	–0.015	–0.034	–0.013	–0.017	–0.041	–0.017
	[–0.601]	[–0.917]	[–1.341]	[–0.564]	[–0.895]	[–1.595]
$Expense_{i\to company,t-1}$	–2.113	–2.618	–0.743	0.236	0.945	–0.608
	[–0.375]	[–0.257]	[–0.288]	[0.040]	[0.093]	[–0.237]
c_i	1.294[a]	3.073[a]	1.255[a]	1.259[a]	3.045[a]	1.271[a]
	[2.708]	[3.974]	[5.428]	[2.692]	[4.077]	[5.798]
Avg. R^2	0.178	0.220	0.277	0.182	0.218	0.275
Obs.	22,751	22,751	22,751	22,751	22,751	22,751

Note: This table reports the regression results from Equation (1). The dependent variable is $Flow_{i,t}$, the fund flows of fund *i* at quarter *t*. The explanatory variables include $High_{i,[t-4,t-1]}$, $Mid_{i,[t-4,t-1]}$, and $Low_{i,[t-4,t-1]}$, representing the return ranking in the top, medium, and bottom performance region, respectively, obtained based on the raw performance computed from the CAPM model (in column I) and Carhart (1997) four-factor model (in column II). In addition, we incorporate a series of control variables to remove other potential effects on fund flows. In particular, we have raw performance of fund *i* over the past year, $R_{i,[t-4,t-1]}$; the annualized standard deviation of monthly fund returns of fund *i* over the past year, $Std_{i,[t-1,t-4]}$; the natural logarithm of the total net asset of fund *i* over the past quarter, $Ln(TNA_{i,t-1})$; the dividend amount and distribution times of fund *i* in the current quarter, $Div_{i,t}$ and $Div_Times_{i,t}$; the natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter, $Ln(TNA_{i\to company,t-1})$; the number of all funds in fund's *i*'s company over the past quarter, $Num_{i\to company,t-1}$; the natural logarithm of the age of fund *i*'s company at the past quarter, $Ln(Age_{i\to company,t-1})$; and the expense ratio of fund *i*'s company over the past quarter, $Expense_{i\to company,t-1}$. We also report the average *R*-square (*Avg.* R^2) and the number of observations contained in each regression (*Obs.*). Additionally, we replace $Flow_{i,t}$ with $Pur_{i,t}$ and $Red_{i,t}$ to reveal the relationship between fund performance and purchase rates and between fund performance and redemption rates, respectively. The *t*-statistics are in brackets. [a], [b], and [c] represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6. Robustness test on two subperiods: CAPM alpha and four-factor alpha

Variables	January 2005–March 2013 (I)			April 2013–June 2017 (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
Panel A: CAPM						
$High_{i,[t-4,t-1]}$	1.452[b]	2.366[b]	0.676[b]	0.658[b]	1.633[a]	0.724[a]
	[2.165]	[2.230]	[2.088]	[2.446]	[4.539]	[8.291]
$Mid_{i,[t-4,t-1]}$	–0.081	–0.180	–0.105[a]	–0.299[a]	–0.677[a]	–0.333[a]
	[–1.058]	[–1.493]	[–3.487]	[–2.954]	[–5.346]	[–8.811]
$Low_{i,[t-4,t-1]}$	0.143	–0.302	–0.384[a]	0.346	0.208	–0.230[c]
	[0.899]	[–1.482]	[–4.465]	[1.623]	[0.631]	[–1.640]
$R_{i,[t-4,t-1]}$	–0.395	–0.525	0.023	0.658[a]	1.255[a]	0.539[a]
	[–1.170]	[–1.125]	[0.330]	[3.643]	[4.523]	[4.092]

Table 6 (cont.). Robustness test on two subperiods: CAPM alpha and four-factor alpha

Variables	January 2005–March 2013 (I)			April 2013–June 2017 (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
Panel A: CAPM						
$Std_{i,[t-4,t-1]}$	0.185	0.349	0.105[b]	0.001	0.148	0.118[c]
	[1.217]	[1.567]	[2.453]	[0.006]	[0.946]	[1.688]
$Ln(TNA_{i,t-1})$	–0.101[a]	–0.181[a]	–0.058[a]	–0.062[a]	–0.134[a]	–0.046[a]
	[–2.954]	[–3.710]	[–5.688]	[–6.451]	[–4.957]	[–3.512]
$Div_{i,t}$	0.128	0.020	–0.045	0.145	0.655	0.216
	[0.598]	[0.057]	[–0.361]	[0.389]	[0.531]	[0.624]
$Div_Times_{i,t}$	0.148[a]	0.235[a]	0.067[a]	0.252[a]	0.606[a]	0.157[a]
	[4.644]	[4.541]	[3.960]	[4.479]	[4.302]	[4.182]
$Ln(TNA_{i\to company,t-1})$	0.039	0.065	0.017	0.001	–0.014	–0.003
	[1.445]	[1.541]	[1.174]	[0.078]	[–0.635]	[–0.753]
$Num_{i\to company,t-1}$	0.009[c]	0.013	0.001	–0.001	–0.001	–0.000
	[1.739]	[1.634]	[0.583]	[–0.790]	[–0.848]	[–1.188]
$Ln(Age_{i\to company,t-1})$	–0.025	–0.053	–0.019	0.001	–0.004	–0.002
	[–0.703]	[–1.017]	[–1.483]	[0.039]	[–0.072]	[–0.167]
$Expense_{i\to company,t-1}$	–3.875	–4.580	–1.036	0.790	0.613	–0.262
	[–0.426]	[–0.279]	[–0.249]	[1.402]	[0.632]	[–0.529]
c_i	1.307[c]	2.797[b]	1.165[a]	1.272[b]	3.526[a]	1.405[a]
	[1.843]	[2.510]	[3.476]	[2.478]	[3.763]	[5.124]
Avg. R^2	0.218	0.245	0.311	0.113	0.179	0.222
Obs.	9,502	9,502	9,502	13,249	13,249	13,249
Panel B: Four-factor						
$High_{i,[t-4,t-1]}$	1.269[b]	2.073[a]	0.549[b]	0.514[c]	1.592[a]	0.672[a]
	[2.549]	[2.669]	[2.417]	[1.709]	[3.000]	[6.400]
$Mid_{i,[t-4,t-1]}$	–0.097	–0.193[c]	–0.088[a]	–0.235[a]	–0.529[a]	–0.245[a]
	[–1.357]	[–1.769]	[–3.204]	[–2.617]	[–4.346]	[–6.696]
$Low_{i,[t-4,t-1]}$	0.266	–0.183	–0.420[a]	0.191	–0.185	–0.422[a]
	[1.546]	[–0.856]	[–4.523]	[0.953]	[–0.601]	[–3.059]
$R_{i,[t-4,t-1]}$	–0.407	–0.533	0.031	0.651[a]	1.293[a]	0.581[a]
	[–1.206]	[–1.139]	[0.429]	[3.561]	[4.614]	[4.390]
$Std_{i,[t-4,t-1]}$	0.199	0.362	0.101[b]	0.004	0.170	0.132[c]
	[1.322]	[1.624]	[2.288]	[0.040]	[1.064]	[1.781]
$Ln(TNA_{i,t-1})$	–0.101[a]	–0.183[a]	–0.060[a]	–0.063[a]	–0.136[a]	–0.047[a]
	[–2.867]	[–3.629]	[–5.525]	[–6.480]	[–5.002]	[–3.567]
$Div_{i,t}$	0.150	0.062	–0.030	0.124	0.642	0.230
	[0.703]	[0.170]	[–0.238]	[0.332]	[0.526]	[0.682]
$Div_Times_{i,t}$	0.153[a]	0.241[a]	0.067[a]	0.253[a]	0.602[a]	0.153[a]
	[4.656]	[4.531]	[3.977]	[4.505]	[4.289]	[4.119]
Ln(TNAi→company,t–1)	0.042	0.070[c]	0.018	0.002	–0.012	–0.002
	[1.554]	[1.664]	[1.264]	[0.130]	[–0.551]	[–0.462]
Numi→company,t–1	0.009	0.013	0.002	–0.001	–0.001	–0.000
	[1.278]	[1.291]	[0.771]	[–0.782]	[–0.834]	[–1.167]
Ln(Agei→company,t–1)	–0.027	–0.059	–0.022	–0.001	–0.012	–0.008
	[–0.584]	[–0.864]	[–1.517]	[–0.046]	[–0.243]	[–0.547]
Expensei→company,t–1	–0.079	1.202	–0.808	0.754	0.520	–0.278
	[–0.008]	[0.073]	[–0.195]	[1.331]	[0.573]	[–0.580]
ci	1.241[c]	2.736[b]	1.181[a]	1.289[b]	3.555[a]	1.421[a]
	[1.795]	[2.571]	[3.782]	[2.505]	[3.773]	[5.125]
Avg. R2	0.226	0.243	0.310	0.110	0.176	0.217
Obs.	9,502	9,502	9,502	13,249	13,249	13,249

Note: This table reports the regression results from Equation (1) based on two subperiods, before the revised LPRCSIF from January 2005 to March 2013 and after the revised LPRCSIF from April 2013 to June 2017, in columns I and II, respectively. The dependent variable is $Flow_{i,t}$, the fund flows of fund *i* at quarter *t*. The explanatory variables include $High_{i,[t-4,t-1]}$, $Mid_{i,[t-4,t-1]}$, and $Low_{i,[t-4,t-1]}$, representing the return ranking in the top, medium, and bottom performance region, respectively, obtained based on the raw performance computed from the CAPM model (in Panel A) and Carhart (1997) four-factor model (in Panel B). In addition, we incorporate a series of control variables to remove other potential effects on fund flows. In particular, we have raw performance of fund *i* over the past year, $R_{i,[t-4,t-1]}$; the annualized standard deviation of monthly fund returns of fund *i* over the past year, $Std_{i,[t-1,t-4]}$; the natural logarithm of the total net asset of fund *i* over the past quarter, $Ln(TNA_{i,t-1})$; the dividend amount and distribution times of fund *i* in the current quarter, $Div_{i,t}$ and $Div_Times_{i,t}$; the natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter, $Ln(TNA_{i\to company,t-1})$; the number of all funds in fund's *i*'s company over the past quarter, $Num_{i\to company,t-1}$; the natural logarithm of the age of fund *i*'s company at the past quarter, $Ln(Age_{i\to company,t-1})$; and the expense ratio of fund *i*'s company over the past quarter, $Expense_{i\to company,t-1}$. We also report the average *R*-square (*Avg.* R^2) and the number of observations contained in each regression (*Obs.*). Additionally, we replace $Flow_{i,t}$ with $Pur_{i,t}$ and $Red_{i,t}$ to reveal the relationship between fund performance and purchase rates and between fund performance and redemption rates, respectively. The *t*–statistics are in brackets. [a], [b], and [c] represent statistical significance at the 1%, 5%, and 10% levels, respectively.

the premium of the momentum factor in the robustness test above. In this robustness check, we use tradable shares only.

Table 7 shows the consistent results, with trivial exceptions, though. Across all three models, the positive performance-flow relationship in the top group and the negative one in the medium group remain unchanged. We notice that the presented positive relationship in the bottom region becomes insignificant in three-factor ($Low_{i,[t-4,t-1]}$ = 0.198, *t*-statistics = 1.443) and CAPM ($Low_{i,[t-4,t-1]}$ = 0.212, *t*-statistics = 1.611) models. However, this inconsistency does not weaken our argument that investors redeem the poorest performers. As presented in Table 7, a 1 percentile downward movement in the bottom performance group is expected to suffer greater money outflows by 0.395% (*t*-statistics = –4.997) and 0.326% (*t*-statistics = –4.371) in three-factor and CAPM models, respectively.

Table 7. Robustness test: the adoption of tradable shares in computing pricing factors

Variables	Three-factor (I)			CAPM (II)			Four-factor (III)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
$High_{i,[t-4,t-1]}$	1.013[a]	2.001[a]	0.638[a]	1.211[a]	2.168[a]	0.698[a]	1.054[a]	1.988[a]	0.609[a]
	[2.755]	[3.429]	[4.077]	[2.703]	[3.141]	[3.485]	[2.937]	[3.575]	[4.129]
$Mid_{i,[t-4,t-1]}$	–0.138[b]	–0.320[a]	–0.158[a]	–0.163[a]	–0.369[a]	–0.192[a]	–0.150[a]	–0.328[a]	–0.156[a]
	[–2.367]	[–3.564]	[–6.198]	[–2.625]	[–3.929]	[–6.767]	[–2.743]	[–3.905]	[–6.120]
$Low_{i,[t-4,t-1]}$	0.198	–0.204	–0.395[a]	0.212	–0.120	–0.326[a]	0.237[c]	–0.155	–0.386[a]
	[1.443]	[–1.098]	[–4.997]	[1.611]	[–0.652]	[–4.317]	[1.809]	[–0.878]	[–5.191]
$R_{i,[t-4,t-1]}$	–0.001	0.168	0.240[a]	0.006	0.153	0.219[a]	–0.000	0.163	0.237[a]
	[–0.003]	[0.506]	[3.114]	[0.028]	[0.461]	[2.908]	[–0.001]	[0.491]	[3.091]
$Std_{i,[t-4,t-1]}$	0.117	0.278[c]	0.110[a]	0.111	0.267[c]	0.108[a]	0.117	0.280[c]	0.113[a]
	[1.166]	[1.867]	[2.882]	[1.092]	[1.788]	[2.956]	[1.174]	[1.882]	[2.945]
$Ln(TNA_{i,t-1})$	–0.087[a]	–0.165[a]	–0.055[a]	–0.086[a]	–0.163[a]	–0.053[a]	–0.085[a]	–0.163[a]	–0.055[a]
	[–3.968]	[–5.101]	[–6.653]	[–4.009]	[–5.125]	[–6.683]	[–3.961]	[–5.096]	[–6.638]
$Div_{i,t}$	0.138	0.280	0.069	0.130	0.255	0.053	0.141	0.280	0.068
	[0.720]	[0.553]	[0.463]	[0.684]	[0.501]	[0.354]	[0.732]	[0.552]	[0.455]
$Div_Times_{i,t}$	0.189[a]	0.374[a]	0.100[a]	0.187[a]	0.376[a]	0.101[a]	0.190[a]	0.376[a]	0.100[a]
	[6.319]	[5.600]	[5.405]	[6.327]	[5.607]	[5.430]	[6.315]	[5.621]	[5.440]
$Ln(TNA_{i\to company,t-1})$	0.027	0.039	0.011	0.024	0.035	0.009	0.027	0.039	0.011
	[1.496]	[1.378]	[1.128]	[1.371]	[1.235]	[0.997]	[1.524]	[1.401]	[1.143]
$Num_{i\to company,t-1}$	0.005	0.008	0.001	0.006[c]	0.008	0.001	0.005	0.008	0.001
	[1.397]	[1.402]	[0.715]	[1.670]	[1.571]	[0.575]	[1.267]	[1.276]	[0.747]
$Ln(Age_{i\to company,t-1})$	–0.020	–0.045	–0.017[c]	–0.017	–0.037	–0.013	–0.019	–0.044	–0.017
	[–0.678]	[–1.022]	[–1.655]	[–0.650]	[–0.956]	[–1.371]	[–0.627]	[–0.964]	[–1.631]
$Expense_{i\to company,t-1}$	–0.232	0.407	–0.694	–1.736	–2.068	–0.697	–0.788	–0.203	–0.420
	[–0.042]	[0.042]	[–0.267]	[–0.315]	[–0.208]	[–0.273]	[–0.126]	[–0.019]	[–0.164]
c_i	1.269[a]	3.056[a]	1.268[a]	1.296[a]	3.075[a]	1.254[a]	1.226[a]	3.002[a]	1.268[a]
	[2.709]	[4.058]	[5.707]	[2.714]	[3.983]	[5.446]	[2.685]	[4.066]	[5.752]
Avg. R^2	0.181	0.219	0.275	0.179	0.220	0.277	0.181	0.219	0.274
Obs.	22,751	22,751	22,751	22,751	22,751	22,751	22,751	22,751	22,751

Note: This table reports the regression results from Equation (1). The dependent variable is $Flow_{i,t}$, the fund flows of fund *i* at quarter *t*. The explanatory variables include $High_{i,[t-4,t-1]}$, $Mid_{i,[t-4,t-1]}$, and $Low_{i,[t-4,t-1]}$, representing the return ranking in the top, medium, and bottom performance region, respectively, obtained based on the raw performance computed from the Fama and French (1993) three-factor model (in column I), CAPM model (in column II), and Carhart (1997) four-factor model (in column III). In this robustness test, we employ tradable shares in computing these pricing factors. In addition, we incorporate a series of control variables to remove other potential effects on fund flows. In particular, we have raw performance of fund *i* over the past year, $R_{i,[t-4,t-1]}$; the annualized standard deviation of monthly fund returns of fund *i* over the past year, $Std_{i,[t-1,t-4]}$; the natural logarithm of the total net asset of fund *i* over the past quarter, $Ln(TNA_{i,t-1})$; the dividend amount and distribution times of fund *i* in the current quarter, $Div_{i,t}$ and $Div_Times_{i,t}$; the natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter, $Ln(TNA_{i\to company,t-1})$; the number of all funds in fund's *i*'s company over the past quarter, $Num_{i\to company,t-1}$; the natural logarithm of the age of fund *i*'s company at the past quarter, $Ln(Age_{i\to company,t-1})$; and the expense ratio of fund *i*'s company over the past quarter, $Expense_{i\to company,t-1}$. We also report the average *R*–square (*Avg.* R^2) and the number of observations contained in each regression (*Obs.*). Additionally, we replace $Flow_{i,t}$ with $Pur_{i,t}$ and $Red_{i,t}$ to reveal the relationship between fund performance and purchase rates and between fund performance and redemption rates, respectively. The *t*-statistics are in brackets. [a], [b], and [c] represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Results in Table 8 based on two subperiods confirm the positive influence of institutional development as well. For example, according to Panel A, there is a significant performance-flow relationship in the top performance region ($High_{i,[t-4,t-1]}$ = 1.319, *t*-statistics = 2.369), led by the intense purchase of star performers ($High_{i,[t-4,t-1]}$ = 2.241, *t*-statistics = 2.564) that dominates the disposition effect ($High_{i,[t-4,t-1]}$ = 0.608, *t*-statistics = 2.519). However, we see from the post-reform period that the performance-flow relationship becomes insignificant ($High_{i,[t-4,t-1]}$ = 0.508, *t*-statistics = 1.640) because of the less pronounced star chasing ($High_{i,[t-4,t-1]}$ = 1.606, *t*-statistics = 2.752) and more evident disposition effect ($High_{i,[t-4,t-1]}$ = 0.687, *t*-statistics = 5.418). For the medium region, investors exhibit stronger adverse purchase in the post-reform period, from –0.212 (*t*-statistics = –1.728) to –0.499 (*t*-statistics = –4.255). Still, no obvious changes are detected in redemptions in the bottom performance region.

Table 8. Robustness test on two subperiods: the adoption of tradable shares

Variables	January 2005–March 2013 (I)			April 2013–June 2017 (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
Panel A: Three-factor						
$High_{i,[t-4,t-1]}$	1.319[b]	2.241[b]	0.608[b]	0.508	1.606[a]	0.687[a]
	[2.369]	[2.564]	[2.519]	[1.640]	[2.752]	[5.418]
$Mid_{i,[t-4,t-1]}$	–0.097	–0.212[c]	–0.103[a]	–0.204[b]	–0.499[a]	–0.249[a]
	[–1.219]	[–1.728]	[–3.440]	[–2.522]	[–4.255]	[–6.610]
$Low_{i,[t-4,t-1]}$	0.269	–0.145	–0.389[a]	0.081	–0.302	–0.406[a]
	[1.480]	[–0.639]	[–4.275]	[0.388]	[–0.920]	[–2.703]
$R_{i,[t-4,t-1]}$	–0.402	–0.522	0.035	0.661[a]	1.303[a]	0.579[a]
	[–1.206]	[–1.131]	[0.490]	[3.594]	[4.652]	[4.331]
$Std_{i,[t-4,t-1]}$	0.188	0.346	0.097[b]	–0.000	0.168	0.133[c]
	[1.255]	[1.570]	[2.232]	[–0.000]	[1.044]	[1.808]
$Ln(TNA_{i,t-1})$	–0.101[a]	–0.183[a]	–0.059[a]	–0.064[a]	–0.136[a]	–0.047[a]
	[–2.913]	[–3.695]	[–5.627]	[–6.490]	[–5.000]	[–3.537]
$Div_{i,t}$	0.147	0.060	–0.029	0.124	0.642	0.229
	[0.683]	[0.167]	[–0.231]	[0.332]	[0.525]	[0.677]
$Div_Times_{i,t}$	0.149[a]	0.236[a]	0.067[a]	0.253[a]	0.601[a]	0.153[a]
	[4.615]	[4.517]	[3.978]	[4.508]	[4.282]	[4.096]
$Ln(TNA_{i\rightarrow company,t-1})$	0.042	0.070[c]	0.018	0.001	–0.013	–0.002
	[1.558]	[1.657]	[1.244]	[0.090]	[–0.593]	[–0.507]
$Num_{i\rightarrow company,t-1}$	0.009	0.014	0.002	–0.000	–0.001	–0.000
	[1.458]	[1.463]	[0.770]	[–0.717]	[–0.775]	[–1.126]
$Ln(Age_{i\rightarrow company,t-1})$	–0.031	–0.065	–0.022	–0.002	–0.013	–0.008
	[–0.698]	[–0.996]	[–1.561]	[–0.073]	[–0.263]	[–0.598]
$Expense_{i\rightarrow company,t-1}$	–0.793	0.386	–0.944	0.692	0.441	–0.282
	[–0.088]	[0.025]	[–0.225]	[1.215]	[0.502]	[–0.598]
c_i	1.235[c]	2.731[b]	1.176[a]	1.324[b]	3.592[a]	1.420[a]
	[1.787]	[2.551]	[3.714]	[2.549]	[3.756]	[5.069]
Avg. R^2	0.225	0.245	0.311	0.109	0.176	0.216
Obs.	9,502	9,502	9,502	13,249	13,249	13,249
Panel B: CAPM						
$High_{i,[t-4,t-1]}$	1.541[b]	2.495[b]	0.689[b]	0.669[b]	1.631[a]	0.711[a]
	[2.207]	[2.286]	[2.155]	[2.375]	[4.481]	[8.408]
$Mid_{i,[t-4,t-1]}$	–0.087	–0.191	–0.107[a]	–0.288[a]	–0.663[a]	–0.332[a]
	[–1.114]	[–1.570]	[–3.601]	[–2.957]	[–5.497]	[–8.761]
$Low_{i,[t-4,t-1]}$	0.157	–0.282	–0.381[a]	0.301	0.146	–0.236[c]
	[0.974]	[–1.353]	[–4.384]	[1.316]	[0.425]	[–1.680]
$R_{i,[t-4,t-1]}$	–0.393	–0.521	0.025	0.664[a]	1.263[a]	0.539[a]
	[–1.167]	[–1.120]	[0.353]	[3.695]	[4.563]	[4.103]
$Std_{i,[t-4,t-1]}$	0.178	0.339	0.102[b]	0.001	0.148	0.119[c]
	[1.177]	[1.530]	[2.433]	[0.009]	[0.949]	[1.700]
$Ln(TNA_{i,t-1})$	–0.100[a]	–0.180[a]	–0.058[a]	–0.062[a]	–0.134[a]	–0.046[a]
	[–2.960]	[–3.717]	[–5.692]	[–6.483]	[–4.967]	[–3.509]

Table 8 (cont.). Robustness test on two subperiods: the adoption of tradable shares

Variables	January 2005–March 2013 (I)			April 2013–June 2017 (II)		
	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$	$Flow_{i,t}$	$Pur_{i,t}$	$Red_{i,t}$
Panel B: CAPM						
$Div_{i,t}$	0.121	0.012	–0.046	0.145	0.656	0.216
	[0.571]	[0.034]	[–0.366]	[0.389]	[0.532]	[0.626]
$Div_Times_{i,t}$	0.148[a]	0.235[a]	0.067[a]	0.252[a]	0.607[a]	0.157[a]
	[4.659]	[4.548]	[3.950]	[4.484]	[4.307]	[4.190]
$Ln(TNA_{i\rightarrow company,t-1})$	0.039	0.065	0.017	0.001	–0.014	–0.003
	[1.428]	[1.518]	[1.153]	[0.080]	[–0.633]	[–0.749]
$Num_{i\rightarrow company,t-1}$	0.009[c]	0.013[c]	0.001	–0.001	–0.001	–0.000
	[1.765]	[1.654]	[0.628]	[–0.792]	[–0.849]	[–1.184]
$Ln(Age_{i\rightarrow company,t-1})$	–0.028	–0.057	–0.020	0.002	–0.003	–0.002
	[–0.767]	[–1.070]	[–1.527]	[0.059]	[–0.050]	[–0.152]
$Expense_{i\rightarrow company,t-1}$	–3.259	–3.681	–0.961	0.772	0.588	–0.264
	[–0.366]	[–0.229]	[–0.233]	[1.371]	[0.615]	[–0.535]
c_i	1.311[c]	2.802[b]	1.163[a]	1.272[b]	3.526[a]	1.404[a]
	[1.850]	[2.519]	[3.492]	[2.474]	[3.758]	[5.108]
Avg. R^2	0.219	0.245	0.310	0.113	0.179	0.222
Obs.	9,502	9,502	9,502	13,249	13,249	13,249
Panel C: Four-factor						
$High_{i,[t-4,t-1]}$	1.357[b]	2.181[a]	0.551[b]	0.555[c]	1.670[a]	0.705[a]
	[2.498]	[2.636]	[2.432]	[1.831]	[2.870]	[5.771]
$Mid_{i,[t-4,t-1]}$	–0.106	–0.210[c]	–0.094[a]	–0.222[a]	–0.524[a]	–0.258[a]
	[–1.439]	[–1.867]	[–3.319]	[–2.833]	[–4.670]	[–6.770]
$Low_{i,[t-4,t-1]}$	0.291[c]	–0.119	–0.385[a]	0.147	–0.213	–0.390[a]
	[1.710]	[–0.571]	[–4.447]	[0.707]	[–0.659]	[–2.786]
$R_{i,[t-4,t-1]}$	–0.400	–0.523	0.032	0.658[a]	1.294[a]	0.575[a]
	[–1.190]	[–1.125]	[0.448]	[3.619]	[4.655]	[4.382]
$Std_{i,[t-4,t-1]}$	0.187	0.349	0.101[b]	0.002	0.167	0.132[c]
	[1.255]	[1.583]	[2.298]	[0.019]	[1.056]	[1.819]
$Ln(TNA_{i,t-1})$	–0.099[a]	–0.180[a]	–0.060[a]	–0.063[a]	–0.135[a]	–0.047[a]
	[–2.894]	[–3.680]	[–5.596]	[–6.455]	[–4.992]	[–3.550]
$Div_{i,t}$	0.148	0.058	–0.031	0.128	0.646	0.230
	[0.696]	[0.159]	[–0.245]	[0.339]	[0.528]	[0.681]
$Div_Times_{i,t}$	0.151[a]	0.240[a]	0.068[a]	0.253[a]	0.601[a]	0.153[a]
	[4.600]	[4.529]	[4.020]	[4.500]	[4.276]	[4.105]
$Ln(TNA_{i\rightarrow company,t-1})$	0.042	0.070[c]	0.018	0.001	–0.013	–0.002
	[1.591]	[1.690]	[1.259]	[0.092]	[–0.589]	[–0.494]
$Num_{i\rightarrow company,t-1}$	0.009	0.013	0.002	–0.000	–0.001	–0.000
	[1.320]	[1.330]	[0.804]	[–0.710]	[–0.782]	[–1.149]
$Ln(Age_{i\rightarrow company,t-1})$	–0.029	–0.062	–0.023	–0.003	–0.013	–0.008
	[–0.636]	[–0.926]	[–1.552]	[–0.087]	[–0.273]	[–0.558]
$Expense_{i\rightarrow company,t-1}$	–1.666	–0.544	–0.486	0.660	0.360	–0.313
	[–0.165]	[–0.031]	[–0.117]	[1.145]	[0.414]	[–0.666]
c_i	1.176[c]	2.654[b]	1.176[a]	1.309[b]	3.576[a]	1.419[a]
	[1.758]	[2.549]	[3.761]	[2.507]	[3.719]	[5.030]
Avg. R^2	0.225	0.245	0.307	0.109	0.176	0.218
Obs.	9,502	9,502	9,502	13,249	13,249	13,249

Note: This table reports the regression results from Equation (1) based on two subperiods, before the revised LPRCSIF from January 2005 to March 2013 and after the revised LPRCSIF from April 2013 to June 2017, in Column (I) and (II), respectively, obtained based on the raw performance computed from the Fama and French (1993) three-factor model (in Panel A), CAPM model (in Panel B), and Carhart (1997) four-factor model (in Panel C). The dependent variable is $Flow_{i,t}$, the fund flows of fund *i* at quarter *t*. The explanatory variables include $High_{i,[t-4,t-1]}$, $Mid_{i,[t-4,t-1]}$, and $Low_{i,[t-4,t-1]}$, representing the return ranking in the top, medium, and bottom performance region, respectively. In addition, we incorporate a series of control variables to remove other potential effects on fund flows. In particular, we have raw performance of fund *i* over the past year, $R_{i,[t-4,t-1]}$; the annualized standard deviation of monthly fund returns of fund *i* over the past year, $Std_{i,[t-1,t-4]}$; the natural logarithm of the total net asset of fund *i* over the past quarter, $Ln(TNA_{i,t-1})$; the dividend amount and distribution times of fund *i* in the current quarter, $Div_{i,t}$ and $Div_Times_{i,t}$; the natural logarithm of the total net asset of all funds in fund *i*'s company over the past quarter, $Ln(TNA_{i\rightarrow company,t-1})$; the number of all funds in fund's *i*'s company over the past quarter, $Num_{i\rightarrow company,t-1}$; the natural logarithm of the age of fund *i*'s company at the past quarter, $Ln(Age_{i\rightarrow company,t-1})$; and the expense ratio of fund *i*'s company over the past quarter, $Expense_{i\rightarrow company,t-1}$. We also report the average *R*-square (*Avg.* R^2) and the number of observations contained in each regression (*Obs.*). Additionally, we replace $Flow_{i,t}$ with $Pur_{i,t}$ and $Red_{i,t}$ to reveal the relationship between fund performance and purchase rates and between fund performance and redemption rates, respectively. The *t*-statistics are in brackets. [a], [b], and [c] represent statistical significance at the 1%, 5%, and 10% levels, respectively.

CONCLUSION

A large body of extant literature examines the fund performance-flow relationship in developed mutual fund markets and concurs that such relationship is asymmetric – investors chase star funds more intensely than punish poorest funds. However, there is less evidence currently available on the performance-flow relationship in an emerging market context. To fill this gap, we, hence, base our analysis in the Chinese mutual fund market considering the unsophistication of Chinese investors and less developed market mechanisms. More importantly, the Chinese mutual fund market witnesses institutional reform represented by the enforcement of the revised LPRCSIF designed to improve investor rationality and market efficiency in June 2013, which provides an opportunity to conduct a natural experiment on the influence of institutional reform on investor rationality and market efficiency.

Empirical analyses start from the investigation on the entire period. Findings reveal that while both top and bottom groups exhibit the positive performance-flow relationship, the driving forces are different: For the top group, the positive relationship is due to investors' unreasonably crazy star-chasing behaviors, and for the bottom region, it is because of their willingness to dispose of the poorest performers. However, different from extant findings, we document a negative performance-flow relationship in the medium group, which is triggered by investors' adverse purchases of the poorer performers.

More notably, our paper finds that institutional reform – the launch of the new LPRCSIF – is crucial in influencing the performance-flow relationship. In the pre-reform period, Chinese investors irrationally chase past star performers to a very large extent; however, in the post-reform period, Chinese investors gradually become rational and show less interest in past top performers, which suggests that institutional reform is successful in improving investor rationality and market efficiency. All presented results are robust to different approaches to measure risk-adjusted performance and the use of the tradable shares in obtaining pricing factors.

Our paper makes contributions to both theoretical and practical domains. It offers additional evidence on fund performance-flow relationship in the Chinese mutual fund market – one of the most important emerging markets in the world. In addition, by separating investors' fund trading behaviors into purchases and redemptions, we explore the driving forces of the presented performance-flow relationship. Beyond these contributions to literature, our paper presents further insights into the positive influence of institutional reform on investor rationality and market efficiency. This evidence suggests policy makers, especially those in relatively less developed emerging markets, to enact or revise related laws and regulations such as simplifying new fund issuing procedures, widening trading channels, and requiring stricter information disclosure to make investors better off and improve the market efficiency.

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