Federal Reserve Bank of New York
Staff Reports

Investors' Appetite for Money-Like Assets: The Money Market Fund Industry after the 2014 Regulatory Reform

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Staff Report No. 816
June 2017
Revised June 2018

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JEL classification: G23, G28

Abstract

This paper uses a quasi-natural experiment to estimate the premium investors are willing to pay to hold money-like assets. The 2014 SEC reform of the money market fund (MMF) industry reduced the money-likeness only of prime MMFs, by increasing the information sensitivity of their shares, and left government MMFs unaffected. As a result, investors fled from prime to government MMFs, with total outflows exceeding $1 trillion. By comparing investors' response to the regulatory change with past episodes of industry dislocation (for example, the 2008 MMF run), we highlight the difference between a desire to preserve money-likeness and a simple flight to safety. Using a difference-in-differences design that exploits the differential treatment of prime and government MMFs, as well as institutional and retail share classes, we estimate the premium for money-likeness to be 20 basis points for retail investors and 28 basis points for institutional ones (who have been more affected by the regulation). Using family specialization as an instrument for fund yields, we are able to identify the elasticity of substitution between prime and government institutional MMF shares: the regulation caused the elasticity to decrease from 0.50 to 0.11.

Key words: money-like assets, information sensitivity, money market funds, money market funds reform

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1 Introduction

Several papers have recently shown that investors are willing to pay a premium to hold money-like assets. Krishnamurthy and Vissing-Jorgensen (2012) and Nagel (2016) show that US Treasuries trade at premium because of their money-like attributes. Investors' appetite for money-like assets has important macroeconomic and financial stability implications. Del Negro *et al.* (2017a) show that, in the United States, interest rates have been persistently low since the Great Recession because of an increase in the premium for safety and liquidity, two characteristics of money-like assets.[1] Money-like assets can also be provided by the private sector: Sunderam (2015) shows that investors treat shadow-bank debt as a money-like claim. Greenwood *et al.* (2015 and 2016) show that privately supplied money-like assets increase financial fragility because of run risk and fire-sale externalities; for this reason, the official sector should increase its supply of money-like assets and partially crowd out money creation by the private sector. While private money-like assets are central to both financial stability and the real economy, investors' demand for such assets and the premium stemming from their liquidity services are much less understood than those of Treasuries and other publicly supplied assets.

In this paper, we use the 2014 SEC reform of the money market fund (MMF) industry as a quasi-natural experiment to study investors' appetite for money-like assets, and in particular, for money-like assets supplied by the private sector. The reform changed the information sensitivity and, therefore, money-likeness of only a segment of the MMF industry; this paper leverages such a change to quantify for the first time the premium investors are willing to pay in order to hold private money-like assets.

Information-insensitive assets are immune from adverse selection and can be used as means of payments in transactions (Gorton and Pennacchi, 1990; Holmstrom, 2015; Dang *et al.*, 2015; Lester *et al.*, 2011 and 2012; Hanson *et al.*, 2015a). For this reason, money-like assets are usually information-insensitive, debt-like securities with low credit risk and short maturity. US MMF shares are the typical example of privately supplied money-like assets.[2] Until recently, like traditional money instruments (e.g.,

[1] Similarly, Del Negro *et al.* (2017b) show that a shock to the liquidity of private paper has a large effect on both real output and inflation.

[2] Da*ng et al.* (2015) argue that debt-on-debt are the least information sensitive assets; we can think of MMF shares (before the reform) as an example of debt backed by other debt (the assets in the fund's portfolio).

bank deposits), all US MMFs have allowed investors to redeem their shares both on demand and at par. In 2014, however, in an effort to make the industry more resilient to financial shocks, the SEC approved a new regulation that affects how some MMFs operate. According to the new rule, which came into effect in October 2016, prime MMFs are forced to adopt a system of redemption gates and liquidity fees; in addition, prime MMFs offered to institutional investors are forced to value their shares at market price. These regulatory changes have made prime MMFs, and in particular institutional ones, more information sensitive and therefore less money-like: investors must now consider the likelihood of fees and gates being imposed, and be able to predict the changes in their fund's NAV. In contrast, the rest of the industry, i.e., government MMFs, has not been affected by the regulation.[3]

Since investors value the money-like features of their MMF investment, one would expect them to react to the reform by leaving the segment of the industry that was impacted by the regulation and by flowing to the segment that was not. Indeed, that is what happened. In anticipation of the new rule, more than one trillion dollars flowed from prime into government MMFs. As a consequence, the share of government MMFs in the industry climbed from 33% to 76%. Consistent with the fact that institutional funds were more impacted by the rule, institutional investors responded more strongly: the share of government MMFs increased by 50 percentage points among institutional share classes and by 36 percentage points among retail ones.

By comparing the intra-industry flows caused by the reform to past MMF runs, we highlight the differences between a response to structural reductions in money-likeness and a flight-to-safety episode. In response to the SEC reform, investors largely remained within the same fund family and moved to the subset of government MMFs with a risk-return profile more similar to that of prime MMFs, agency MMFs. Moreover, the response of retail investors, although weaker than that of institutional investors, was still significant. These features of investors' behavior are very different from what happened during previous runs on prime MMFs, which occurred as a reaction to an increase in industry risk, such as the 2008 run caused by the Lehman Brothers default and the 2011 slow-motion run caused by the European debt crisis.[4] In both runs, a significant share of investors' flows occurred across families, investors

[3]Aldasoro *et al.* (2017) use the SEC reform to estimate the demand schedule for the dollar funding of Japanese banks.

[4]See Kacperczyk and Schnabl (2013) and Chernenko and Sunderam (2014).

mainly flew to the safest type of government MMFs (i.e., treasury MMFs), and the response of retail investors was hardly noticeable.

Using a difference-in-differences design, we estimate the premium investors are willing to pay for money-like assets from the net-yield spread between prime and government MMFs. We find that the premium is large: retail investors demand an average of 20 bps to keep their investment in prime funds, and institutional ones an additional 8 bps. These estimates are comparable to the liquidity premium of Treasuries estimated by Krishnamurthy and Vissing-Jorgensen (2012) for the 1926–2008 period (i.e., 46 bps) and by Nagel (2016) for the 1991–2011 period (i.e., 24 bps). Our results are not driven by changes in market perceived risk or monetary policy, which could also affect the net-yield spread between prime and government MMFs. Moreover, our estimate of the money-likeness premium for institutional investors is robust to controlling for all time-varying factors that could differentially impact prime and government MMFs as well as institutional and retail investors.

Using an instrumental variables approach, we estimate the demand elasticity of substitution between prime and government MMFs for institutional investors. The structural equation for the demand function is estimated at the MMF-family level. For each family-month, we instrument the net-yield spread between prime and government MMFs with a proxy for family specialization in prime MMF products. The rationale behind the instrument is that families specialize to a different degree in offering either prime or government MMFs, and such specialization, which affects their supply curve, is persistent.[5] We find that prime and government MMFs were close to being perfect substitutes before the regulation came into effect; the reform caused the elasticity of substitution between the two products to drop from 0.50 to 0.11. This decrease confirms that, whereas before the regulation prime and government MMFs were perceived as very similar financial products, such similarity disappeared once shares in prime MMFs became information sensitive and therefore ceased to be perceived as money-like assets.

The paper is organized as follows. Section 2 describes the MMF industry and the data. Section 3 describes investors' reaction to the 2014 SEC reform. Section 4 compares the intra-industry flows caused by the reform with past episodes of industry dislocation. Section 5 estimates the money-likeness premium. Section 6 estimates the elasticity of substitution between prime and government MMFs before and after

[5] Our identification strategy does not work for retail investors because of their much lower price-sensitivity. See footnote 31.

the rule change.

2 The Money Market Fund Industry

2.1 The MMF Industry Before and After the 2014 SEC Rule

US money market funds are open-ended mutual funds that invest in money market instruments. MMFs are pivotal players in the financial markets: as of the end of 2014, they had roughly $3 trillion in assets under management (AUM) and held 35% of the global outstanding volume of commercial papers (Investment Company Institute, 2015). In particular, they are a critical source of short-term financing for other financial institutions: in May 2012, they provided 35% of the short-term, wholesale dollar funding used by large global financial firms (Hanson *et al.*, 2015b).

The MMF industry is divided in three main sectors according to investment strategy: 1) prime MMFs invest in unsecured and secured private debt as well as Treasuries and Agency debt; 2) muni MMFs invest in municipal and local authorities' debt; 3) government MMFs invest in Treasuries, Agency debt, and repurchase agreements (repos) collateralized by Treasuries or Agency debt. Government MMFs can be further divided in two subgroups: treasury MMFs, which invest in Treasuries and repos collateralized by Treasuries, and agency MMFs, which invest in Agency debt and repos collateralized by Agency debt.[6] Finally, based on the profile of their investors, MMF share classes can be divided into institutional and retail depending on whether they are offered to legal or natural persons, respectively.

Similarly to other mutual funds, all MMFs are paid fees as a fixed percentage of their AUM; as a result, they are subject to the tournament-like incentives generated by the positive flow-performance relation observed in the data (La Spada, 2018). In contrast to other mutual funds, however, until the new SEC regulation came into effect in October 2016, all MMFs were allowed to keep their net asset value (NAV) at $1 per share; they did so by valuing assets at amortized cost and distributing daily dividends as securities progress toward their maturity date. Since MMF shares are not insured

[6] The fund type is determined by the Names Rule (Rule 35d-1) of the Investment Company Act of 1940, which requires a fund to invest at least 80% of its assets in the type of investment suggested by its name. Furthermore, with the 2014 reform, the SEC has adopted a more stringent definition of government funds: a government money market fund is a fund investing at least 99.5 percent of its total assets in cash, government securities or repos backed by government securities.

by the government and are daily redeemable, this stable-NAV feature makes MMFs susceptible to runs: if a fund "breaks the buck," i.e., its NAV drops below $1, investors will redeem their investment en masse (i.e., run on the fund) to preserve the value of their capital. This happened on September 16, 2008, when the Reserve Primary Fund, the oldest MMF, broke the buck after writing off Lehman Brothers debt. As discussed in the introduction, the ability to maintain a fixed NAV (i.e., a debt-like payoff structure), along with the callability of MMF shares, made MMFs the typical example of privately provided money-like assets, which underpinned the large expansion of the MMF industry since the 1970s.

The interaction between risk-taking incentives and exposure to runs made MMFs a key ingredient of the 2007–2009 financial crisis. Indeed, in September 2008, the run on the Reserve Primary Fund quickly spread to other prime and muni MMFs, triggering investors' redemptions of more than $300 billion within a few days after Lehman's default. This run caused a severe shortage of short-term credit to the banking sector (Kacperczyk and Schnabl, 2013). In the summer of 2011, a "slow-motion run" hit the prime MMF sector as fears about European sovereign debt problems mounted, causing redemptions of more than $170 billion in approximately two months and disrupting the ability of both European and non-European firms to raise financing in the money markets (Chernenko and Sunderam, 2014). In both episodes, only prime and muni MMFs suffered outflows; government MMFs actually experienced inflows as they were perceived as a safe haven. Moreover, within the prime and muni sector, institutional share classes were the most affected, whereas outflows from retail classes were much smaller and slower. The systemic importance of MMFs highlighted by these episodes led the SEC to adopt changes to their regulation.

MMFs are regulated under Rule 2a-7 of the Investment Company Act of 1940. This regulation restricts their holdings to short-term, high-quality debt securities. For example, prime MMFs can only hold commercial papers that carry either the highest or second-highest rating from at least two of the nationally recognized credit rating agencies. From June 1991 to May 2010, prime MMFs were not permitted to hold more than 5% of investments in second tier (A2-P2) paper or have more than a 5% exposure to any single issuer (other than the US government and agencies). Also, the weighted average maturity of their portfolios was capped to 90 days. In 2010, after the turmoil generated by the collapse of the Reserve Primary Fund, the SEC adopted amendments to Rule 2a-7, requiring prime MMFs to invest in even higherquality assets with shorter maturities.[7]

On July 23, 2014, in a further attempt to make the industry more resilient to financial shocks, the SEC approved a new set of rules for prime and muni MMFs (SEC Release No. IC-31166).[8] The purpose of these rules was to eliminate, or at least mitigate, the risk of runs by making prime and muni MMFs less money-like and more similar to investments in traditional mutual funds. The main pillar of this regulatory change is that, starting from October 2016, institutional prime and muni MMFs must sell and redeem shares based on the market value of the securities in their portfolios. That is, they have to move from a stable to a floating NAV. Moreover, all prime and muni MMFs will have the discretion to temporarily suspend (or "gate") redemptions for up to 10 business days in a 90-day period or impose a liquidity fee of up to 2%, if the fund's weekly liquid assets fall below 30% of its total assets. Additionally, prime and muni MMFs are required to impose a liquidity fee of 1% on all redemptions if the fund's share of weekly liquid assets falls below 10%, unless the fund's board of directors determines that imposing such a fee would not be in the best interests of the fund's shareholders.

Both the possible introduction of redemption gates and fees and the adoption of a floating NAV make prime and muni MMF shares more information sensitive and hence less money-like. Retail investors must now consider the possibility that the fund management gates redemptions or introduce a redemption fee. In addition, institutional investors must also be able to forecast the change in NAV from one day to the next, even when these changes are expected to be small. This sensitivity to information about the underlying portfolio makes the use of prime and muni MMF shares as a means of payment much more difficult.

2.2 The Data

The Form N-MFP is a publicly available regulatory filing that every MMF is required to submit to the SEC each month. Funds report information as of the end of the

[7]E.g., weighted average maturity was capped to 60 days (SEC Release No. IC-29132). Funds were also required to have enhanced reserves of cash and other liquid securities to meet redemption requests and could invest only 3% (down from 5%) of total assets in second tier securities. These first regulatory changes, while making MMF portfolios safer, did not alter the money-like features of MMFs and, in particular, did not alter their runnability. For this reason, the 2010 rule did not create large outflows from any sector of the industry and is not the subject of this analysis.

[8]For a detailed discussion of the several reform options under consideration by the SEC, see McCabe *et al.*, 2013.

month and submit their filings to the SEC within the first five business days of the next month. The SEC makes all N-MFP submissions publicly available. The form was created in May 2010, and it is available since November 2010; in this paper, we use the data in the N-MFP forms submitted until September 2017 (i.e., one year after the regulation was implemented).

We download, parse, and clean information from the Form N-MFP to construct our monthly panel dataset of MMFs. The filing reports, among other items, the fund's type, its total net assets (TNA), its annualized gross yield for the last seven days of the month, and its month-end dollar weighted average portfolio maturity. Each fund also reports detailed information on the securities in its portfolio. One fund can have multiple share classes, that is, types of shares that differ in terms of fees, minimum investment, and other characteristics. For each of its share classes, the fund reports the TNA, the aggregate monthly redemptions and subscriptions by shareholders, and the annualized net yield for the last seven days of the month. Generally, each share class is offered either to institutional or to retail investors. In the empirical analysis, we compare the different behavior of these two investor types; unfortunately, however, the N-MFP does not provide information on whether a share class is institutional or retail. To this purpose, we match our dataset with the iMoneyNet database;[9] from iMoneyNet, we use the classification of share classes into institutional and retail, as well as data on net yields. Since iMoneyNet only covers a subsample of all funds, any analysis involving the distinction between institutional and retail share classes is done on a slightly smaller sample: on average, between November 2010 and September 2017, iMoneyNet data covers 90% of overall MMF TNA as reported in Form N-MFP.[10] For a more detailed description of the construction of our dataset, see Appendix E.

[9] iMoneyNet is a private provider of MMF data collected through voluntary filings.

[10] In Section 4, we also use iMoneyNet data to discuss the behavior of the MMF industry in 2008, before the introduction of the N-MFP form.

3 Investors' Response to the 2014 SEC Reform

3.1 Flows from Prime to Government MMFs

Figure 1 and Table 1 show that, from January 2015 to September 2017, the TNA of the whole MMF industry remain roughly constant at around $3 trillion.[11] Within the industry, however, the relative size of the different MMF types changes dramatically. The TNA of prime MMFs decrease by $1,258 billion (i.e., by 61%), while the TNA of government funds increase by $1,235 billion (i.e., by 123%).[12] As a result, the share of government funds in the MMF industry goes from 33% in January 2015 to 74% in September 2017. The bulk of these flows (about 60%) occurs between June and October 2016, that is, six months before the SEC regulation comes into effect.

We study the changes in MMF TNA, as opposed to looking at redemptions and subscriptions, because we want to capture those instances in which a fund reclassified from prime to government. Such reclassifications have indeed occurred after the SEC regulation came into effect. The first major flow from prime into government funds attributable to the new rule occurred in December 2015, when Fidelity converted three of its prime MMFs worth $130 billion (i.e., roughly 34% of its prime MMF business) into government MMFs, citing the reform as reason for the conversions. This and other subsequent fund reclassifications show up in our data as an increase in the family's government MMF TNA and a decrease in the family's prime MMF TNA.[13]

The response of MMF investors to the new regulation is consistent with their desire to hold money-like assets. From an investor's perspective, the introduction of redemption gates and liquidity fees and the adoption of a floating NAV make a prime MMF less similar to a regular bank deposit. In response to these regulatory

[11] A fund's TNA is the total value of its securities portfolio minus its debt liabilities. MMFs usually issue very little debt: between January 2015 and September 2017, total MMF debt was only 1.1% of the industry's total assets. For this reason, the industry's TNA reported in Form N-MFP are very close to the industry's total assets under management (AUM).

[12] The introduction of liquidity gates and fees and the adoption of a floating NAV required by the 2014 SEC reform apply in the same way to prime and muni MMFs; moreover, over our sample, the TNA of the muni sector have only averaged $257bn, less than 15% of the TNA of the prime sector. For these reasons, from now on, we pool these two types of funds together and simply refer to them as prime MMFs.

[13] In contrast, if we focused on investors' redemptions and subscriptions, we would miss the change in investors' holdings, since reclassifications do not require investors to redeem their shares. However, even when using redemptions and subscriptions, we obtain a similar pattern of flows from prime to government funds.

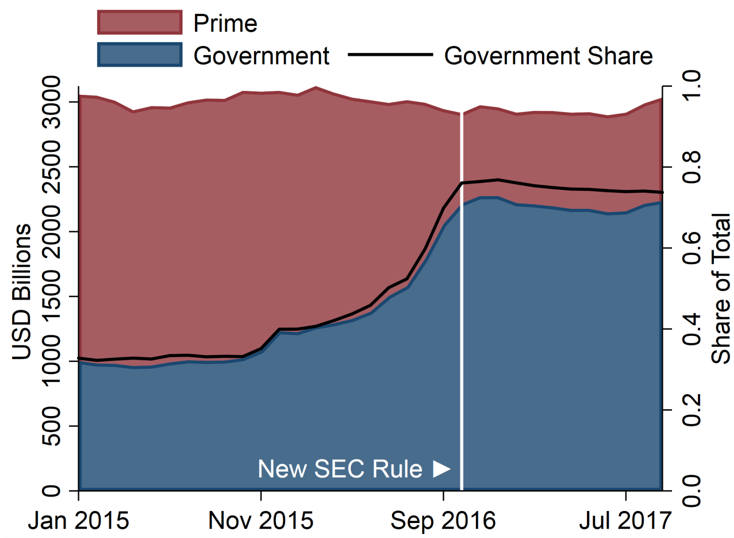


Figure 1. Total Net Assets by Money Market Fund (MMF) Type. The sample is all US MMFs. The blue area represents government MMFs; the red area represents prime MMFs. The solid black line is the share of government MMFs (right y-axis). The vertical white line represents the month of the implementation of the 2014 SEC reform (October 2016).

[USD billions]	January 2015	October 2016	Δ	September 2017	Δ
Total	\$3,057	\$2,915	-\$142	\$3,034	-\$23
Prime	\$2,054	\$698	-\$1,356	\$796	-\$1,258
Government	\$1,003	\$2,217	+\$1,214	\$2,238	+\$1,235
Government Share	32.8%	76.1%	+43.3pp	73.8%	+41.0pp

Table 1. Total Net Assets by Money Market Fund (MMF) Type. The sample is all US MMFs.

changes, investors move their assets into government funds, which instead preserve the money-like features historically associated with MMF shares.

In our data, however, we do not directly observe individual investors' flows; we only observe fund TNA at month-end and aggregate redemptions and subscriptions within-month. The growth of government MMFs and the decline of prime MMFs could be unrelated to the SEC reform. For example, changes in macroeconomic conditions and available investment opportunities might have led investors in prime funds to leave the MMF industry altogether, while outside investors placed their cash into government funds; alternatively, some government funds or fund families specializing in government funds may have had a better advertising strategy than prime funds in 2016. If this were the case, the flows from prime into government

MMFs would be equally likely to occur across as well as within families. In contrast, if the growth of the government segment is the result of investors' fleeing the prime segment due to the new SEC rule, investors' flows are more likely to occur within families; the reason is threefold: the reform affects all families with prime MMF business equally, fund families have a strong incentive to retain their clients, and, ceteris paribus, investors have a strong incentive to remain within the same family, since doing so reduces information acquisition costs.

Figure 2 plots the change in a family's government MMF TNA against the corresponding change in its prime MMF TNA between November 2015 and October 2016 both in levels and on a log-log scale.[14]The relation between outflows from prime MMFs and inflows to government MMFs appears to be one-to-one over the whole range of family sizes. Moreover, the relation between prime outflows and government inflows is very tight: almost all the families lie close the unconditional OLS regression line.

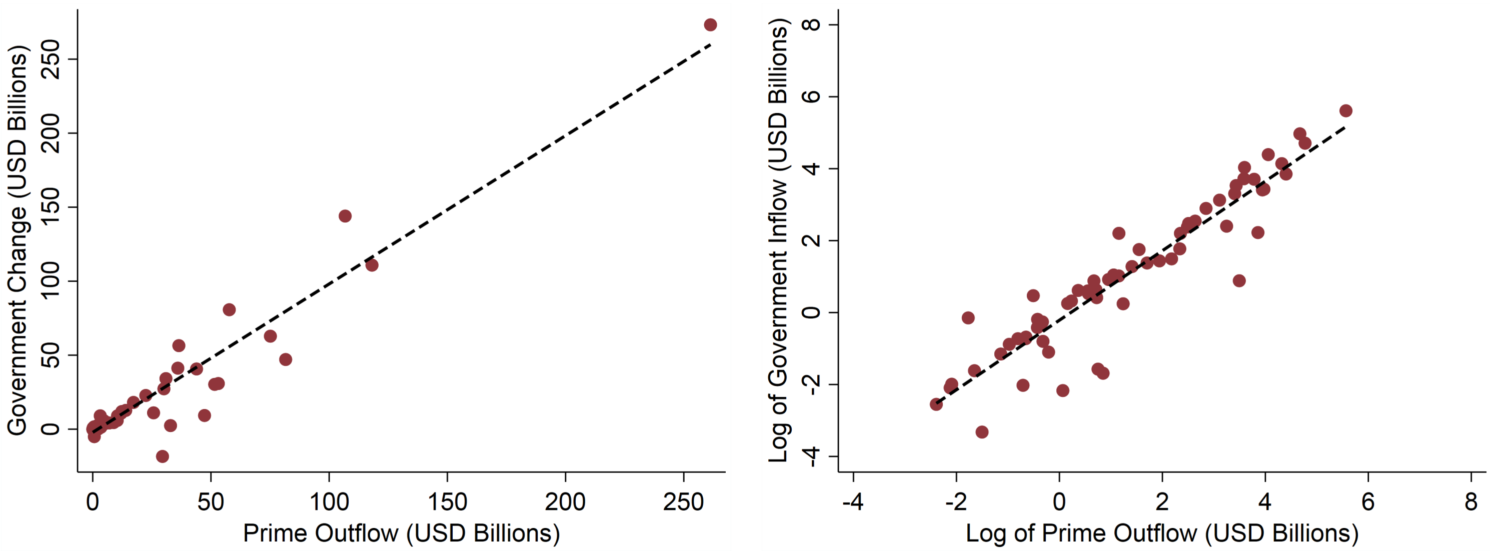
To test formally whether flows from prime to government MMFs occurred across or within families, we run the following monthly regression at the family level:

$$\Delta \text{Government TNA}_{it} = \alpha_i + \mu_t + \beta_0 \Delta \text{Prime TNA}_{it} + \varepsilon_{it}, \tag{1}$$

where ΔGovernment TNA$_{it}$ is the monthly change in the TNA of family i's government MMFs; ΔPrime TNA$_{it}$ is the monthly change in the TNA of family i's prime MMFs; and α_i and μ_t are family and month fixed effects. The regression is estimated on the November 2015–October 2016 period. Standard errors are heteroskedasticity, autocorrelation, and spatial correlation (HACSC) robust to account for correlations both within and across MMF families.[15] The results are in Table 2. The estimated slope on contemporaneous changes in prime MMF TNA is -0.78 (p–value=0.017); that is, for each dollar increase (decrease) in the TNA of a family's prime MMFs, the TNA of the same family's government MMFs decrease (increase) by roughly 80 cents within the same month. To account for the possibility that within-family flows are

[14]Logarithmic scales allow us to visualize more clearly the behavior of all the families in the sample, ranging from a few dozen million to several hundred billion dollars of outflows and inflows.

[15]We use Driscoll and Kraay (1998) robust standard errors with 3-month lags. We take the heuristic for the lag selection from the first step of the Newey and West (1994) plug-in procedure, which sets the maximum number of lags up to which residuals may be autocorrelated equal to floor$[4(T/100)^{2/9}]$, where T is the length of the panel. We calculate critical values using the fixed-b asymptotics derived by Vogelsang (2012), which are shown to provide more robust and conservative inference than traditional Normal or Chi-square approximations.



(a) Linear-linear scale.

(b) Log-log scale.

Figure 2. Within-family Flows from Prime to Government Money Market Funds (MMFs) between November 2015 and October 2016. The sample is all families with a reduction in prime MMF TNA between the two months. x-axis: total outflow from a family's prime MMFs; y-axis: total change in the TNA of the family's government MMFs. Panel (a) uses linear scales on both axes. Panel (b) uses logarithmic scales on both axes. (For this reason, panel (b) only shows inflows to government MMFs on the y-axis.) The dashed lines are OLS regression lines: in panel (a), the slope is 1.00 (0.05), with $R^2 = 0.92$; in panel (b), the slope is 0.97 (0.05), with $R^2 = 0.87$.

not contemporaneous, we also estimate regression (1) with five lags of ΔPrime TNA$_{it}$. The results are in Column 2 and show that most of the flows into government occur at the same time as the outflows from prime.

The regressions in the first two columns of Table 2 do not distinguish between outflows and inflows to prime MMFs. In Column 3, we estimate regression (1) only on the family-months that experience outflows from their prime MMFs. In this case, the estimated coefficient on contemporaneous prime MMF outflows is -0.88 (p–value=0.002). For each dollar that flows out of a family's prime MMFs, about 90 cents flow into the same family's government MMFs. Moreover, if we simultaneously estimate separate slopes for prime MMF outflows and inflows, the slope for outflows remains similar (-0.86, with p–value=0.003), but the slope for inflows has the opposite sign (1.03, with p–value=0.031). In other words, family-months with inflows to prime MMFs experience quantitatively similar inflows to government MMFs, and, as a result, the family's overall TNA increase; this is consistent with the fact that the family itself may have become more attractive to investors. In contrast, when investors flow out of a family's prime MMFs, the family's total TNA do not change as investors flow into government MMFs within the family; this is consistent with the fact that investors respond to the lack of money-like features of their prime investment caused by the regulation.

Columns 5–8 of Table 2 report the results of regression (1) for the balanced panel of MMF families that are continuously active in both the prime and government segments from November 2015 to October 2016. Results are similar: there is almost a one-to-one relation between outflows from prime and inflows to government MMFs within the same family-month, whereas inflows to prime MMFs correspond to similar inflows in government MMFs.

In order to link investors' behavior to the implementation of the new rules, we use the November 2014–October 2015 period (i.e., more than a year before the new SEC regulation came into effect) as a control sample. The results are in Table 3: the coefficient on changes in a family's prime MMF TNA is positive (e.g., in the baseline regression the coefficient is 0.15, with p–value=0.088), suggesting a positive relation between a family's government and prime TNA even after conditioning on month and family effects. That is, it is only in the year before the regulation came into effect that investors moved their assets from prime to government MMFs within the same family. Additionally, the relation between prime and government flows is much weaker: the within-R^2 is between 0.6 and 0.8 in the November 2015–October 2016

	ΔGovernment TNA$_{it}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔPrime TNA$_{it}$	-0.78**	-0.76**			-0.88***	-0.86***		
	(0.16)	(0.16)			(0.13)	(0.13)		
ΔPrime TNA$_{i,t-1}$		-0.01				-0.03		
		(0.06)				(0.07)		
ΔPrime TNA$_{i,t-2}$		0.01				-0.00		
		(0.03)				(0.03)		
ΔPrime TNA$_{i,t-3}$		-0.02				-0.02		
		(0.02)				(0.02)		
ΔPrime TNA$_{i,t-4}$		0.06				0.08*		
		(0.05)				(0.03)		
ΔPrime TNA$_{i,t-5}$		0.04				0.03		
		(0.03)				(0.03)		
$\min(\Delta\text{Prime TNA}_{it}, 0)$			-0.88***	-0.86***			-0.98***	-0.96***
			(0.13)	(0.14)			(0.11)	(0.11)
$\max(\Delta\text{Prime TNA}_{it}, 0)$				1.03**				1.31**
				(0.25)				(0.31)
$\sum_s \Delta$Prime TNA$_{i,t-s}$		-0.68***				-0.80***		
ΔPrime TNA$_{it} < 0$			Yes				Yes	
Balanced					Yes	Yes	Yes	Yes
Adj. R^2	0.72	0.72	0.80	0.76	0.77	0.78	0.87	0.83
Adj. Within R^2	0.62	0.63	0.75	0.68	0.70	0.70	0.83	0.77
Observations	792	790	512	792	288	288	197	288

Table 2. Within-Family Flows from Prime to Government Money Market Funds (MMFs). The sample is all US MMF families. The regressions are estimated on the November 2015–October 2016 period, that is, one year before the 2014 SEC reform came into effect. ΔGovernment TNA$_{it}$ is the monthly change in a family's government MMF TNA and ΔPrime TNA$_{it}$ is the monthly change in a family's prime MMF TNA. Family-month observations for which the change in prime MMF TNA is zero and the previous month's level of prime MMF TNA is also zero are dropped from the sample. Columns 1 to 4 report the results for the unbalanced panel of families. Columns 5 to 8 report the results for the balanced panel of families. Columns 3 and 7 are run only on family–months with outflows from prime MMFs. All regressions include month and family fixed-effects. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

regressions, but consistently lower than 0.05 in the November 2014–October 2015 regressions.

One could wonder whether our results for the November 2015–October 2016 period are only due to the effect of conversions.[16] This is not the case. Table 4 replicates Columns 1–4 of Table 2 excluding conversions from the sample.[17] The simultaneous effect of a change in a family's prime MMF TNA on the change in the family's government MMF TNA drops to -0.41 and becomes statistically insignificant. However, when we include the past five lags of the ΔPrime TNA_{it}, the cumulated effect is -0.86 and statistically significant (p–value=0.002). That is, even after excluding fund conversions, for a one-dollar outflow from a family's prime MMFs in the past 6 months, almost 90 cents go into the family's government MMFs.

Another possible concern is that our results could be driven by outliers. Indeed, as Table 5 shows, there is great heterogeneity in the size of fund families. Although the average TNA across families is $33 bn, the median family has TNA of $2 bn, the standard deviation of TNA across families is $78 bn, and the distribution of family sizes is heavily skewed to the right. In other words, there are a few families with very large TNA relative to the rest of the industry. Our regression results could be driven by the fact that only few very large families have a sufficiently strong franchise value or reputation to retain their prime investors in the transition to government funds. This is not the case.

Table 6 replicates the monthly regressions in Columns 1–4 of Table 2 excluding those observations for which the prime outflow in a month is in the top 5% of the cross-sectional distribution for that month. The results align with those of Table 2, confirming that the within-family, one-to-one relation between outflows from prime and inflows to government MMFs is not driven by the behavior of the largest families.

3.2 Institutional versus Retail Investors

The new SEC rule impacts institutional and retail investors in prime MMFs differently. The regulation requires both institutional and retail funds to adopt liquidity

[16]Note that, even if they were, flows from prime to government MMFs would still represent investors' response since, after a conversion, investors are not forced to keep their money in the same fund.

[17]Form N-MFP does not report conversion data. We identify as conversions all instances in which a fund is classified as prime in one month and as government in the following month. Descriptive statistics of conversions in our sample are reported in Appendix A.

	ΔGovernment TNA$_{it}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔPrime TNA$_{it}$	0.15*	0.17*			0.15	0.16*		
	(0.05)	(0.05)			(0.05)	(0.05)		
ΔPrime TNA$_{i,t-1}$		0.04				0.04		
		(0.05)				(0.05)		
ΔPrime TNA$_{i,t-2}$		-0.08				-0.09		
		(0.03)				(0.03)		
ΔPrime TNA$_{i,t-3}$		-0.03				-0.02		
		(0.07)				(0.07)		
ΔPrime TNA$_{i,t-4}$		0.04				0.04		
		(0.09)				(0.10)		
ΔPrime TNA$_{i,t-5}$		0.04				0.03		
		(0.04)				(0.04)		
min(ΔPrime TNA$_{it}$, 0)			0.10	0.02			0.04	-0.01
			(0.08)	(0.07)			(0.11)	(0.08)
max(ΔPrime TNA$_{it}$, 0)				0.27				0.28
				(0.11)				(0.11)
$\sum_s \Delta$Prime TNA$_{i,t-s}$		0.18				0.16		
ΔPrime TNA$_{it} < 0$			Yes				Yes	
Balanced					Yes	Yes	Yes	Yes
Adj. R^2	0.01	0.02	-0.05	0.01	0.03	0.03	-0.03	0.03
Adj. Within R^2	0.03	0.04	0.00	0.04	0.03	0.03	-0.00	0.03
Observations	1003	995	542	1003	468	468	240	468

Table 3. Within-Family Flows from Prime to Government Money Market Funds (MMFs). The sample is all US MMF families. The regressions are estimated on the November 2014–October 2015 period, that is, two years before the 2014 SEC reform came into effect. ΔGovernment TNA$_{it}$ is the monthly change in a family's government MMF TNA and ΔPrime TNA$_{it}$ is the monthly change in a family's prime MMF TNA. Family-month observations for which the change in prime MMF TNA is zero and the previous month's level of prime MMF TNA is also zero are dropped from the sample. Columns 1 to 4 report the results for the unbalanced panel of families. Columns 5 to 8 report the results for the balanced panel of families. Columns 3 and 7 are run only on family–months with outflows from prime MMFs. All regressions include month and family fixed-effects. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

	ΔGovernment TNA$_{it}$			
	(1)	(2)	(3)	(4)
ΔPrime TNA$_{it}$	-0.41	-0.35		
	(0.20)	(0.19)		
ΔPrime TNA$_{i,t-1}$		-0.15**		
		(0.04)		
ΔPrime TNA$_{i,t-2}$		-0.14		
		(0.05)		
ΔPrime TNA$_{i,t-3}$		-0.20		
		(0.08)		
ΔPrime TNA$_{i,t-4}$		-0.02		
		(0.08)		
ΔPrime TNA$_{i,t-5}$		-0.01		
		(0.14)		
$\min(\Delta\text{Prime TNA}_{it}, 0)$			-0.54*	-0.55*
			(0.16)	(0.16)
$\max(\Delta\text{Prime TNA}_{it}, 0)$				0.63***
				(0.08)
$\sum_s \Delta$Prime TNA$_{i,t-s}$		-0.86***		
ΔPrime TNA$_{it} < 0$			Yes	
Adj. R^2	0.53	0.57	0.62	0.59
Adj. Within R^2	0.25	0.32	0.35	0.35
Observations	576	571	378	576

Table 4. Within-Family Flows from Prime to Government Money Market Funds (MMFs) Excluding Conversions (i.e., a prime MMF converted into a government MMF). The sample is all US MMF families. The regressions are estimated on the November 2015–October 2016 period, that is, one year before the 2014 SEC reform came into effect. ΔGovernment TNA$_{it}$ is the monthly change in a family's government MMF TNA and ΔPrime TNA$_{it}$ is the monthly change in a family's prime MMF TNA. Family-month observations for which the change in prime MMF TNA is zero and the previous month's level of prime MMF TNA is also zero are dropped from the sample. Regressions are estimated on the unbalanced panel of families. Column 3 is run only on family–months with outflows from prime MMFs. All regressions include month and family fixed-effects. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

[USD billions]	Mean	Median	Standard Deviation	Inter-Quartile Range
Total Net Assets	\$33	\$2	\$78	\$14
Prime	\$25	\$3	\$50	\$22
Government	\$22	\$2	\$49	\$19
Monthly Change	-\$0.1	-\$0.0008	\$3.0	\$0.1
Prime	-\$1.7	-\$0.0212	\$6.8	\$0.7
Government	\$1.5	\$0.0100	\$6.8	\$0.5

Table 5. Summary Statistics of TNA and Net Flows within Money Market Fund (MMF) Families between November 2015 and October 2016. The sample is all US MMF families. The statistics on prime and government funds exclude families with no funds in those types.

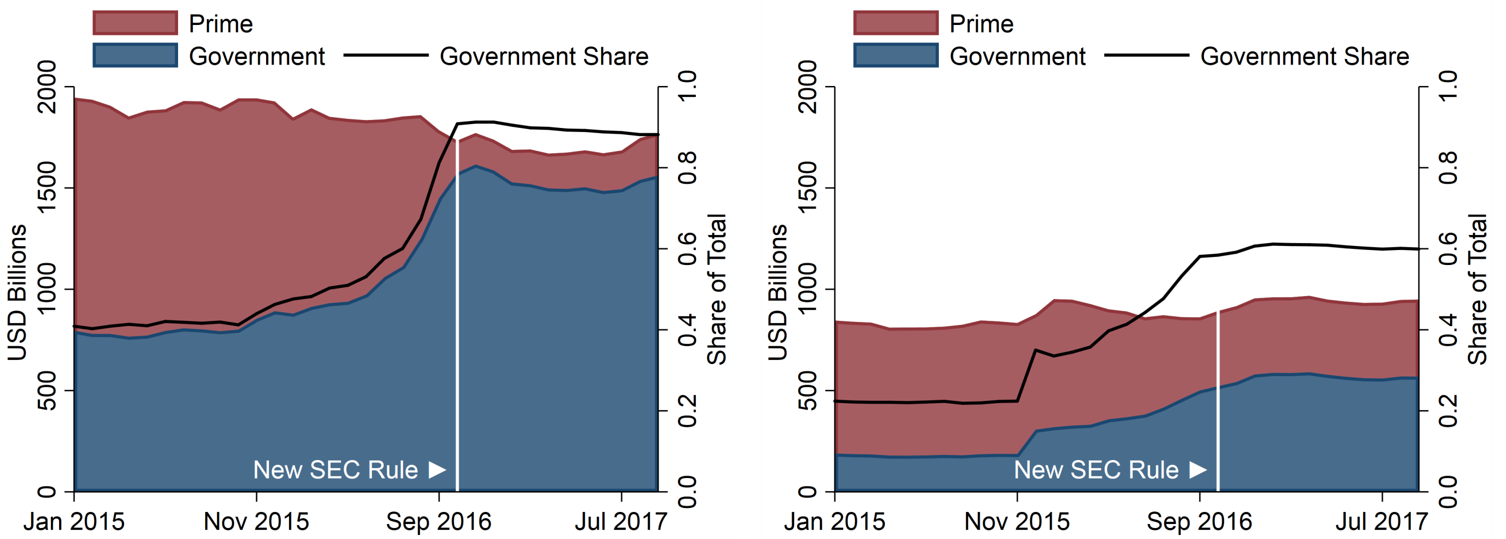
fees and redemption gates; only institutional funds, however, must switch to a floating NAV. This difference means that an investment in a prime MMF is further away from a money-like investment for institutional investors than for retail investors. Moreover, the experience of the 2008 run on MMFs has shown that, in general, institutional investors are much more responsive (e.g., to economic news) than retail investors. For both reasons, we should expect that, although both institutional and retail investors transfer their funds from prime into government MMFs, institutional investors do so to a greater extent. This is indeed what we observe in the data.

Figure 3 shows TNA by MMF category from January 2015 to September 2017 separately for institutional and retail share classes.[18] The TNA of institutional prime MMFs decrease by roughly 82% (i.e., by \$942 bn), while the TNA of retail prime MMFs decrease by only 42% (i.e., by \$276 bn). For both institutional and retail investors, the bulk of flows from prime to government MMFs occurred before October 2016, when the new rule came into effect: Table 7 shows that, from January 2015 to October 2016, the share of government funds in the institutional segment increases by 50 percentage points, from 41% to 91%, whereas the share of government funds in the retail segment increases by only 36 pp, from 22% to 58%.

[18] For the classification of fund shares into institutional and retail, we used the iMoneyNet dataset because Form N-MFP does not provide that information; remember that the iMoneyNet dataset only covers a subsample of the whole MMF industry (see Section 2).

	ΔGovernment TNA_{it}			
	(1)	(2)	(3)	(4)
ΔPrime TNA_{it}	-0.85***	-0.84***		
	(0.13)	(0.13)		
ΔPrime $\text{TNA}_{i,t-1}$		-0.01		
		(0.07)		
ΔPrime $\text{TNA}_{i,t-2}$		-0.01		
		(0.04)		
ΔPrime $\text{TNA}_{i,t-3}$		-0.02		
		(0.02)		
ΔPrime $\text{TNA}_{i,t-4}$		0.05		
		(0.03)		
ΔPrime $\text{TNA}_{i,t-5}$		0.06		
		(0.03)		
$\min(\Delta\text{Prime TNA}_{it}, 0)$			-0.88***	-0.88***
			(0.13)	(0.13)
$\max(\Delta\text{Prime TNA}_{it}, 0)$				2.61***
				(0.42)
$\sum_s \Delta\text{Prime TNA}_{i,t-s}$		-0.76***		
$\Delta\text{Prime TNA}_{it} < 0$			Yes	
Adj. R^2	0.78	0.78	0.80	0.80
Adj. Within R^2	0.71	0.71	0.75	0.73
Observations	748	746	512	748

Table 6. Within-Family Flows from Prime to Government Money Market Funds (MMFs) Excluding Outliers. The sample is all US MMF families excluding those family-month observations for which $\Delta\text{Prime TNA}_{it}$ is in the top 5% of the cross-sectional distribution for month t. The regressions are estimated on the November 2015–October 2016 period, that is, one year ahead of the 2014 SEC reform's implementation. $\Delta\text{Government TNA}_{it}$ is the monthly change in a family's government MMF TNA and $\Delta\text{Prime TNA}_{it}$ is the monthly change in a family's prime MMF TNA. Family-month observations for which the change in prime MMF TNA is zero and the previous month's level of prime MMF TNA is also zero are dropped from the sample before the computation of the top percentile. Column 3 is run only on family–months with outflows from prime MMFs. All regressions include month and family fixed-effects. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.



(a) Institutional Share Classes

(b) Retail Share Classes

Figure 3. Total Net Assets (TNA) by Money Market Fund (MMF) Type and Investor Type: Institutional (left) vs. Retail (right) Investors. The solid black line is the share of government MMFs in the industry (right y-axis). The vertical white line represents the month of the implementation of the 2014 SEC reform (October 2016). Note that, for the classification of share classes into institutional and retail, we use the iMoneyNet dataset; since the iMoneyNet dataset only covers a subsample of the whole MMF industry (see Section 2), the sums of institutional and retail TNA in these charts are slightly smaller than the totals reported in Figure 1.

	Institutional				Retail			
[USD billions]	Jan. 2015	Oct. 2016	Sept. 2017	Δ	Jan. 2015	Oct. 2016	Sept. 2017	Δ
Prime	\$1,151	\$159	\$209	-\$942	\$656	\$371	\$380	-\$276
Government	\$796	\$1,575	\$1562	+\$766	\$189	\$522	\$569	+\$380
Government Share	40.9%	90.8%	88.2%	+47.3pp	22.4%	58.4%	59.9%	+37.5

Table 7. Total Net Assets (TNA) by Money Market Fund (MMF) Type and Investor Type: Institutional vs. Retail Investors. Note that, for the classification of share classes into institutional and retail, we use the iMoneyNet dataset; since the iMoneyNet dataset only covers a subsample of the whole MMF industry (see Section 2), the sums of institutional and retail TNA in this table are slightly smaller than the totals reported in Table 1.

	Agency MMFs				Treasury MMFs			
[billions]	Jan. 2015	Oct. 2016	Sept. 2017	Δ	Jan. 2015	Oct. 2016	Sept. 2017	Δ
Total	\$507	\$1,557	\$1,574	+\$1,067	\$495	\$660	\$663	+\$168
Share	16.6%	53.4%	51.9%	+35.3pp	16.2%	22.6%	21.9%	+5.7pp

Table 8. Total Net Assets by Type of Government Money Market Fund (MMF): Agency vs. Treasury. The sample is all US MMFs.

3.3 The Risk Appetite of Prime MMF Investors

Prime MMFs can hold riskier assets (e.g., commercial papers and certificates of deposit) than government MMFs and therefore offer higher yields to their investors. From 2011 to 2015, the TNA-weighted average gross yield of prime MMFs was 24 basis points, while that of government MMFs was only 11 basis points. Investors that previously invested in prime MMFs have arguably a greater risk appetite than traditional investors in government MMFs and should be more likely to flow into higher-yield government funds. Namely, we should expect larger inflows to agency MMFs than to treasury MMFs, since agency funds can also buy Agency debt and repos backed by Agency debt. From 2011 to 2015, agency MMFs earned on average 5 basis points more than treasury MMFs. As expected, the data show that inflows are concentrated among agency MMFs.

Figure 4 shows the TNA of both agency and treasury MMFs from January 2015 to September 2017. Agency funds grow by roughly \$1,067 bn (i.e., by 210%), while treasury funds grow only by \$168 billion (i.e., by 34%). The overall surge in the share of government funds in the industry is almost entirely accounted by agency MMFs, whose share goes from 17% in January 2015 to 52% in September 2017. In contrast, the share of treasury MMFs increases by only 6 pp, from 16% to 22%. Table 8 shows the TNA and industry share of agency and treasury MMFs in January 2015 and in October 2016, when the new rule came into effect.

To quantify the risk appetite of the investors that previously placed their cash in prime MMFs, we run the following monthly regression at the family level:

$$\Delta\text{Government TNA}_{ikt} = \alpha_{ik} + \mu_t + \beta_1 \Delta\text{Prime TNA}_{it} + \beta_2 \text{Agency}_k \times \Delta\text{Prime TNA}_{it} + \varepsilon_{ikt}, \quad (2)$$

where k is either "agency" or "treasury;" Agency_k is a dummy for agency MMFs; $\Delta\text{Government TNA}_{ikt}$ is the monthly change in the TNA of family i's type-k gov-

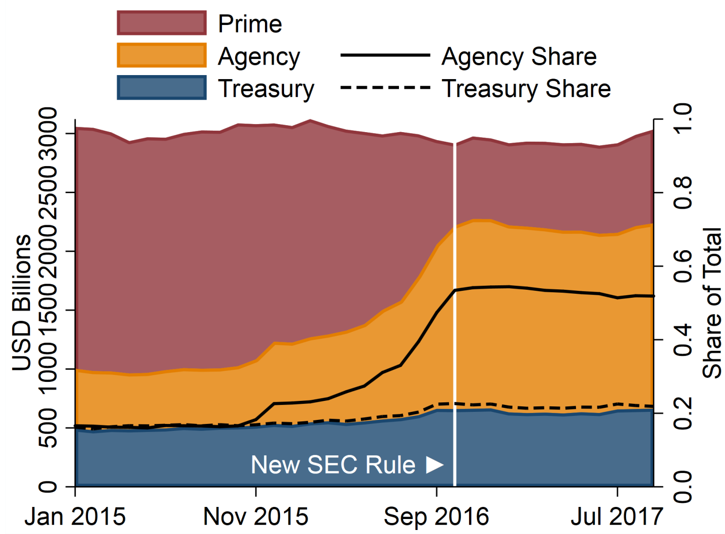


Figure 4. Total Net Assets by Money Market Fund Type: Treasury, Agency, and Prime. The sample is all US MMFs. The blue area represents treasury MMFs; the orange area represents agency MMFs; and the red area represents prime MMFs. The solid black line is the share of agency MMFs and the dashed black line the share of treasury MMFs (right y-axis). The vertical white line represents the month of the implementation of the 2014 SEC reform (October 2016).

ernment MMFs; ΔPrime TNA$_{it}$ is the corresponding monthly change in the TNA of family i's prime MMFs; α_{ik} are fixed effects for the interaction of family and government-MMF type; and μ_t are month fixed effects. The coefficients of interest are β_1 and β_2: β_1 represents the fraction of outflows from prime MMFs that flows into treasury MMFs of the same family, and $\beta_1 + \beta_2$ represents the fraction of outflows from prime MMFs that flows into agency MMFs of the same family. The results are in Column 1 of Table 9: a one-dollar outflow from a family's prime funds generates a 76-cent inflow to the family's agency funds (p–value=0.017) and only a statistically insignificant one-cent inflow to the family's treasury funds. Figure 5 plots ΔGovernment TNA$_{ik}$ against ΔPrime TNA$_i$ from November 2015 to October 2016, separating inflows to agency MMFs from inflows to treasury MMFs. For both types of government MMFs, the relation between their inflows and the outflows from prime MMFs in the same family is very tight: all points in the chart lie close the unconditional OLS regression lines; however, consistent with the results in Table 9, the predicted inflow following an outflow from the family's prime MMFs is much larger for agency MMFs than for treasury MMFs.[19]

[19]As a robustness check, Columns 2 to 6 replicate Columns 3, 4, 5, 7, and 9 of Table 2.

	ΔGovernment TNA_{ikt}					
	(1)	(2)	(3)	(4)	(5)	(6)
$\text{Agency}_k \times \Delta\text{Prime TNA}_{it}$	-0.76**			-0.81**		
	(0.16)			(0.17)		
$\Delta\text{Prime TNA}_{it}$	-0.01			-0.04		
	(0.03)			(0.03)		
$\text{Agency}_k \times \min(\Delta\text{Prime TNA}_{it}, 0)$		-0.77**	-0.77**		-0.82**	-0.82**
		(0.16)	(0.16)		(0.17)	(0.17)
$\min(\Delta\text{Prime TNA}_{it}, 0)$		-0.06	-0.04		-0.08	-0.08
		(0.03)	(0.03)		(0.03)	(0.03)
$\text{Agency}_k \times \max(\Delta\text{Prime TNA}_{it}, 0)$			0.03			0.06
			(0.19)			(0.28)
$\max(\Delta\text{Prime TNA}_{it}, 0)$			0.50**			0.66***
			(0.11)			(0.08)
$\Delta\text{Prime TNA}_{it} < 0$		Yes			Yes	
Balanced				Yes	Yes	Yes
Adj. R^2	0.71	0.76	0.74	0.77	0.83	0.80
Adj. Within R^2	0.67	0.74	0.70	0.74	0.81	0.77
Observations	1590	1030	1590	432	308	432

Table 9. Within-Family Flows from Prime to Agency and Treasury Money Market Funs (MMFs). The sample is all US MMF families. The regressions are estimated on the November 2015–October 2016 period, i.e., one year ahead of the 2014 SEC reform's implementation. ΔGovernment TNA_{ikt} is the monthly change in family i's type-k (agency or treasury) government MMF TNA; Agency_k is a dummy for agency MMFs; ΔPrime TNA_{it} is the monthly change in family i's prime MMF TNA. Family-month observations for which the change in prime MMF TNA is zero and the previous month's level of prime MMF TNA is also zero are dropped from the sample. All regressions include month and family-government MMF type fixed effects. Columns 1 to 3 report results for the unbalanced panel of families. Columns 4 to 6 report the results for the balanced panel of families with nonzero treasury, agency, and prime MMF TNA for all months from November 2015 to October 2016. Columns 2 and 5 are run only on family-months with an outflow from prime MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

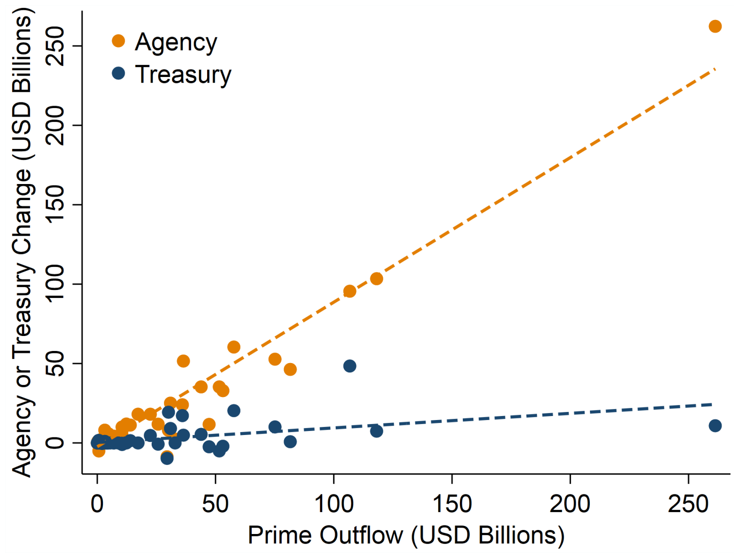


Figure 5. Within-family Flows from Prime to Agency and Treasury Money Market Funds (MMFs) between November 2015 and October 2016. The sample is all US MMF families that experienced a reduction in prime MMF TNA from November 2015 to October 2016. x-axis: total outflow from a family's prime MMFs; y-axis: total change in the TNA of the family's agency and treasury MMFs separately (orange and blue dots, respectively). The dashed lines are OLS regression lines of y against x. The slope for inflows to treasury MMFs is 0.09 (0.05), with $R^2 = 0.24$. The slope for inflows to agency MMFs is 0.91 (0.07), with $R^2 = 0.94$.

4 The 2008 MMF Run

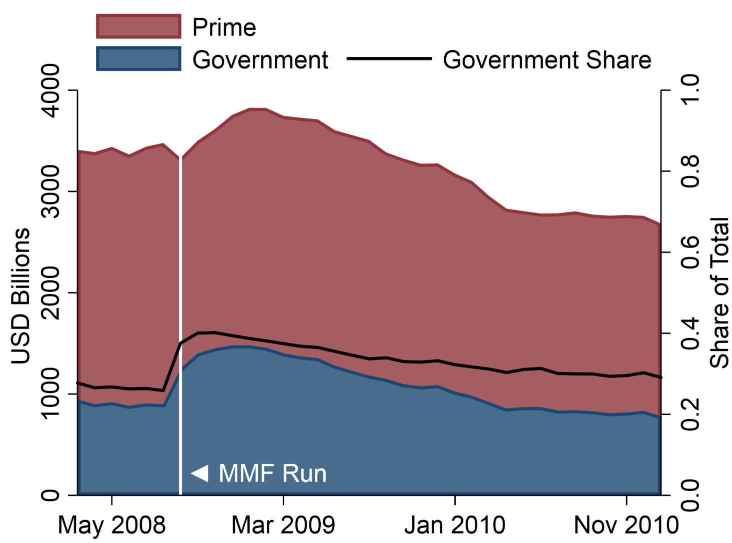
In September 2008, the Reserve Primary Fund broke the buck because of its exposure to Lehman debt. This event triggered a run on the prime MMF sector, the so-called "2008 MMF run." Whereas investors' flows over 2015–2016 were a reaction to the change in the money-likeness of prime MMFs due the new regulation, the 2008 MMF run was driven by investors' concerns and uncertainty over the safety of prime MMFs after Lehman's bankruptcy. In order to understand the difference between investors' preferences for money-likeness and flight to safety, it is instructive to compare the behavior of portfolio flows around these two episodes of dislocation in the MMF industry.

Figure 6 and Table 10 show MMF TNA from March 2008 to January 2011. Between August 2008 and October 2008, investors redeemed \$479 bn from prime MMFs and invested \$502 bn in government MMFs. Outflows from prime into government funds, however, subsided after October 2008: the share of government MMF assets jumped to 38% at the end of September 2008, reached a peak of 40% in November, and gradually reverted to its pre-run level over the following three years. Moreover, institutional investors accounted for almost all of the net outflows from prime MMFs. By January 2011, the overall industry had shrunk by \$794 bn, i.e., by 23% of its size in August 2008.

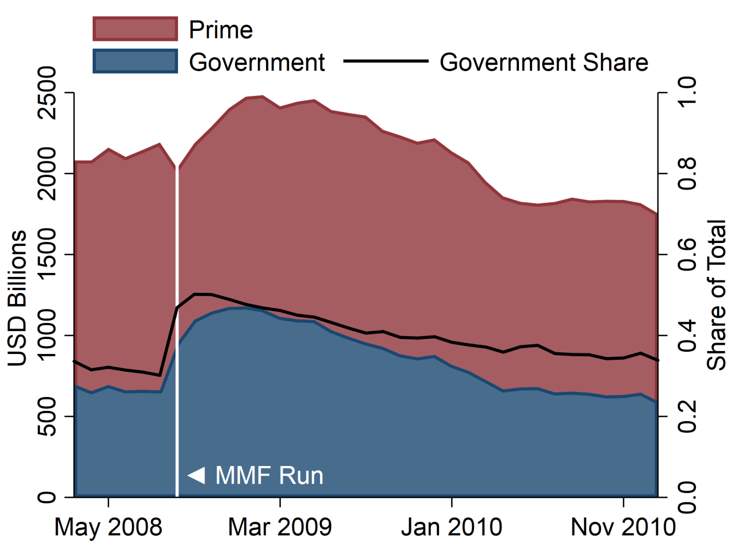
These numbers pale in comparison to what happened between January 2015 and October 2016, when, in response to the new SEC regulation, investors moved more than \$1 tn from prime to government MMFs. Moreover, although the 2015–2016 outflows from prime funds were more pronounced for institutional share classes, they were highly significant for retail classes as well (in contrast to what happened in 2008). Finally, the overall share of government MMFs jumped from 33% to 76% and has remained roughly stable since. The contrast between investors' behavior in 2015–2016 and that in 2008 is even more surprising if one considers that the 2008 MMF run happened in the midst of the financial crisis and after the Lehman bankruptcy. In contrast, the 2015–2016 outflows from prime MMFs occurred during a time of relative calm in financial markets.

This comparison suggests that the SEC reform affected investors' desire to hold prime MMFs in a more fundamental (and permanent) way than the credit-risk shock caused by the Lehman default. The system of redemption gates and fees and, for institutional funds, the adoption of a floating NAV have made prime MMFs more information sensitive and therefore less similar to money instruments: under the new rule, prime MMF investors have to pay attention (and possibly gather private information) to all those instances that cause the fund board to adopt gates or fees and, if the investor is institutional, also to any change in market prices that causes the NAV to fluctuate. The reduction in prime MMFs' money-likeness has affected investors' desire to hold them. A seemingly small change in the regulatory framework has had a larger impact on investors' choices than the safety concerns that emerged from the worst financial crisis since the Great Depression.

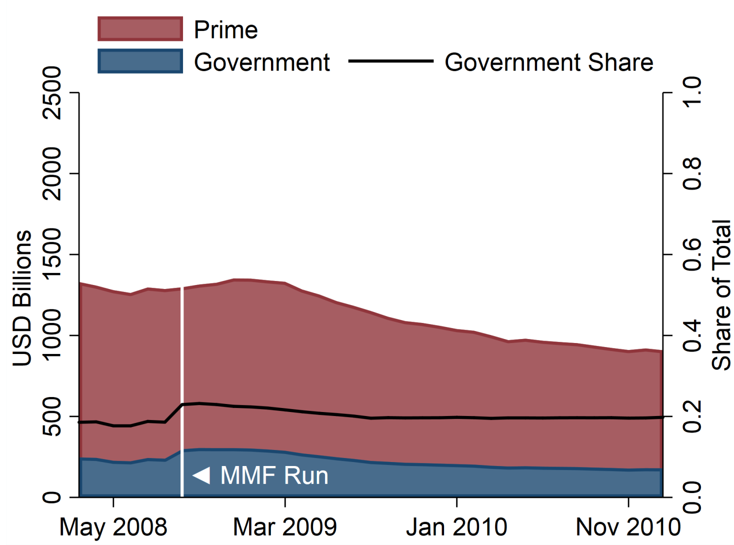
Investors' response to the 2014 reform and the 2008 MMF run differ not only in magnitude but also in other characteristics of the intra-industry flows. In 2015–2016, flows from prime into government MMFs mainly occurred within families: as we discussed in Section 3, since the reason behind such flows is investors' desire to preserve the money feature of their investment, there is no reason for investors to move to a different fund family and disrupt the investor-sponsor relationship (as all families with prime MMFs are impacted equally by the regulation). In contrast, when flows from prime to government funds are due to credit-risk concerns, as in 2008, there is less reason for investors to remain within the same family: the preservation of the investor-sponsor relationship should be weighted against the fact that MMF families may differ in their risk exposure. Accordingly, during the 2008 MMF run, the within-family relation between prime MMF outflows and government MMF inflows is weaker.



(a) All Share Classes



(b) Institutional Share Classes



(c) Retail Share Classes

Figure 6. Money Market Funds (MMFs) Total Net Assets by Fund and Investor Type around the 2008 MMF Run. The sample is all US MMFs. The solid black line is share of government MMFs in the industry or in the relevant segment (right y-axis). The vertical white line represents the month of the 2008 MMF run (September 2008).

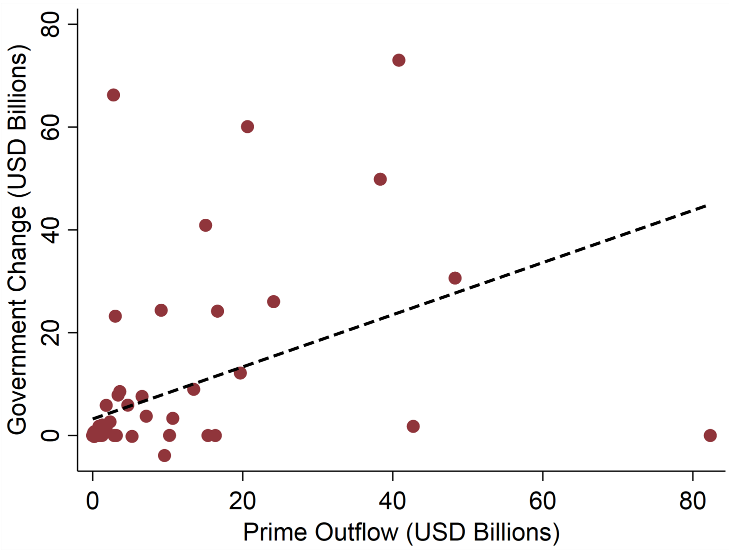
[USD billions]	August 2008	October 2008	Δ	January 2011	Δ
Total	$3,478	$3,501	+$23	$2,684	-$794
Prime	$2,578	$2,099	-$479	$1,903	-$675
Government	$900	$1,402	+$502	$781	-$119
Government Share	25.9%	40.0%	+14.1pp	29.1%	+3.2pp

Table 10. Total Net Assets by Money Market Fund (MMF) Type around the 2008 MMF Run. The sample is all US MMFs.

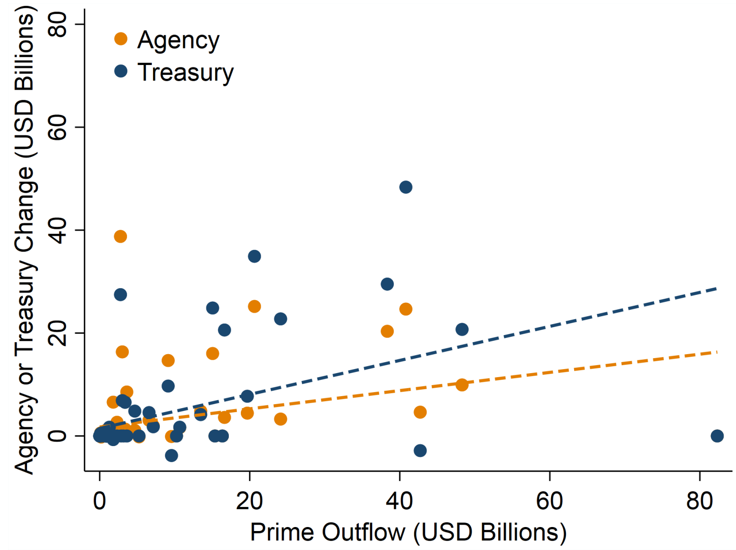
Indeed, as Panel (a) of Figure 7 shows, the relation between outflows from prime and inflows to government around the 2008 run is much less tight than it was ahead of the implementation of the new SEC rule (Figure 2). The slope from an OLS regression of inflows to government MMFs between August and October 2008 against the corresponding outflows from prime MMFs in the same family is only 0.51; this estimate contrasts with the almost one-to-one relation observed in the year before the SEC reform came into effect.[20] Furthermore, as panel (b) of Figure 7 shows, there is little difference between inflows to agency and treasury MMFs; the OLS coefficients are 0.18 (p–value = 0.096) and 0.33 (p–value = 0.088), respectively. If anything, during the 2008 MMF Run, the relation between prime MMF outflows and government MMF inflows is stronger for treasury MMFs than for agency MMFs. This evidence is consistent with the fact that prime investors were "flying to safety" rather than seeking to preserve the money-likeness of their investment.

In this section, we compare the behavior of MMF investors in the year ahead the SEC reform with their behavior around the 2008 run. We could have made similar remarks had we looked at another run on the prime MMF sector, the so-called 2011 Silent Run, which was caused by concerns about the safety of prime MMFs at the height of the European debt crisis (see Appendix B). If we look at both the 2008 and 2011 run episodes, we can infer that when investors leave the prime MMF industry in response to safety concerns, (i) the size of the MMF industry shrinks, (ii) flows to government MMFs, although significant, are smaller than those observed in 2015–2016, (iii) a significant portion of prime-to-government flows occurs across families and is directed towards treasury MMFs, (iv) retail share classes are largely unaffected, (v) outflows from prime MMFs revert once the safety concerns subside. This pattern of behavior is very different–both qualitatively and in terms of

[20] The coefficient is statistically significant (p–value = 0.089) but also statistically different from one (p–value = 0.098).



(a) All Government MMFs



(b) Government MMFs by Type

Figure 7. Within-family Flows around the 2008 Money Market Fund (MMF) Run. The sample is all US MMF families with a reduction in prime MMF TNA between August and October 2008. x-axis: total outflows from a family's prime MMFs. y-axis: total changes in the TNA of the family's government MMFs in panel (a) and total changes in the TNA of the family's agency and treasury MMFs separately in panel (b). The dashed lines are the OLS regression lines of y against x, allowing for different slopes for agency and treasury MMF inflows in panel (b). In panel (a), the slope for inflows to government MMFs is 0.51 (0.29), with $R^2 = 0.20$; in panel (b), the slope for inflows to agency MMFs is 0.18 (0.11), with $R^2 = 0.12$, and that for inflows to treasury MMFs is 0.33 (0.19), with $R^2 = 0.24$.

magnitude of flows–to what we observe in the months ahead of the implementation of the SEC reform: at that time, although the change in regulation was relatively minor, its effect on the money-likeness of prime MMFs caused permanent outflows from the sector, flows that were largely within fund-families and of an order of magnitude greater than those observed in 2008 and 2011. Such contrast in industry outcomes highlights the difference between investors' preference for money-like assets and their simple desire to preserve the safety of their investment.

5 The Premium for Money-like Assets

How much are investors willing to pay to preserve the money-likeness of their investment? In other words, what is the premium for money-likeness? As Figure 8 shows, the difference between the net yield of prime and government MMFs widens sub-

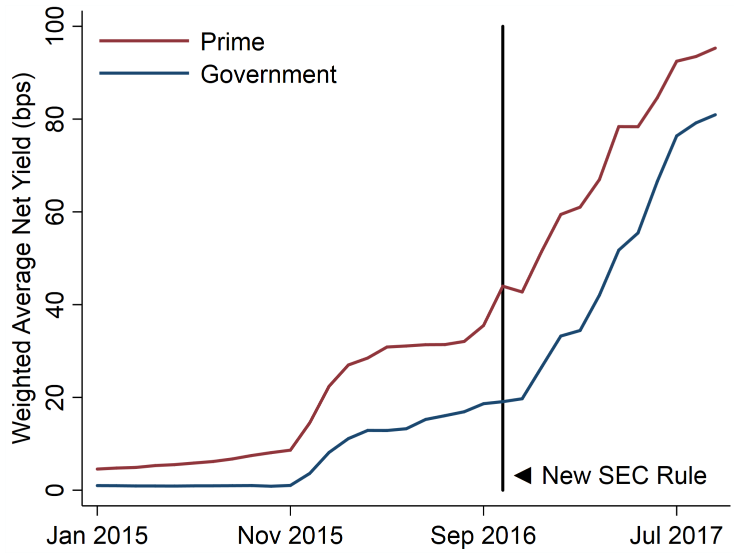


Figure 8. Weighted Average Net Yield by Money Market Fund (MMF) Type. The sample is all US MMFs from January 2015 to September 2017. The red line is the weighted average net yield of prime MMFs; the blue line is the weighted average net yield of government MMFs. The yield is expressed in basis points. The black vertical line represents the month in which the 2014 SEC reform came into effect (October 2016).

stantially in the months before and after the implementation of the new SEC rule. The net-yield spread between the two MMF types averages under 8 bps through November 2015, jumps to 25 bps in October 2016, and remains above 14 bps since then, suggesting that prime MMF investors require a higher spread to keep their money in prime MMFs as compensation for the fact that the regulation has made prime MMF shares less money-like.

Fluctuations in the net yield spread between prime and government MMFs, however, can be due to factors other than the 2014 SEC reform. For example, an increase in risk aversion or market volatility could lead prime MMF investors to require a higher yield relative to government MMFs since prime MMFs are riskier. Similarly, a tightening of monetary policy, by raising short-term interest rates, increases the opportunity cost of holding money and may drive up the premium for money-like assets (Nagel, 2016). In this section, we isolate the impact of the SEC reform on the prime-government yield spread through a difference-in-differences approach. Our regression design allows us to estimate the premium investors attach to the money-likeness of their (government) MMF shares and relate this premium to the information insensitivity generated by the absence of redemption gates or fees and by the presence of a stable NAV.

To estimate the premium for money-likeness, we run the family-level regression:

$$y_{ijkt} = \alpha_{ijk} + \mu_{jt} + \gamma_1 \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}} + \gamma_2 \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}} + \\ \gamma_3 \times \text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}} + \gamma_4 \times \text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}} + \varepsilon_{ijkt}, \quad (3)$$

where y_{ijkt} is the weighted average net yield of MMFs of type $k \in \{\text{prime, government}\}$, for share classes of type $j \in \{\text{institutional, retail}\}$, in family i, in month t. Prime_k is a dummy for prime MMFs; Inst_j is a dummy for institutional share classes; $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015—when MMF investors started to react to the new regulation—onwards; and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016—when the new regulation came into effect—onwards. The coefficients γ_1 and γ_2 measure how the prime-government yield spread of retail share classes responds to the reform; γ_3 and γ_4 measure the additional effect for institutional classes. In other words, we interpret $\gamma_1 + \gamma_2$ as the premium for money-likeness paid by retail investors, and $\gamma_3 + \gamma_4$ as the additional premium paid by institutional ones.

To control for other factors that could affect the net-yield spread between prime and government MMFs and differentially impact institutional and retail share classes, we saturate regression (3) with fixed effects: α_{ijk} are fixed effects for the interaction of family, MMF-type, and investor-type, which control for heterogeneity across families in their ability to offer better yields on different MMF products (institutional prime, retail prime, institutional government and retail government); μ_{jt} are fixed effects for the interaction of investor-type and time, which control for time-varying factors that affect the net yields of institutional and retail share classes differently.

Results of regression (3) are in Table 11. Standard errors are heteroskedasticity, autocorrelation, and spatial correlation (HACSC) robust to account for correlations within and across fund families.[21] Column 1 reports the estimates for our baseline sample, the unbalanced panel of MMF families active in any month from January 2015 to September 2017. For retail investors, the net-yield spread between prime and government MMFs does not change significantly ahead of the regulatory change but increases sharply after the regulation comes into place. After October 2016, the yield paid by retail prime funds in excess of that paid by retail government funds increases in a statistically significant way by 20 bps (p–value = 0.000); such rise reflects the higher information sensitivity of prime MMF investments due to the introduction

[21] As in Section 3, we use Driscoll and Kraay (1998) standard errors with 3-month lags.

of gates and fees and the resulting reduction in their money-likeness.[22] For institutional investors, whose prime MMF shares must also operate with a floating NAV, the response to the regulation is faster and stronger. The yield spread between institutional prime and institutional government funds widens by around 5 bps in the year ahead of the regulatory change and by an additional 22 bps after the regulation comes into effect.[23] Both increases are statistically significant (p–value = 0.001 and p–value = 0.000). The overall increase in the net-yield spread for institutional investors is 28 bps and is significantly greater (by 8 bps) than that for retail investors (p–value = 0.001).[24]

The earlier and stronger reaction of institutional investors is consistent both with the fact that they are more sophisticated and attentive to changes in their investments' characteristics and with the fact that, through the additional requirement of a floating NAV, the reform has made institutional prime funds even less money-like than retail ones. Overall, the results of regression (3) indicate that investors are willing to pay a high premium for the money-likeness of their MMF investment, ranging from 20 bps for retail investors to 28 bps for institutional investors. These estimates of the premium for money-likeness estimated on privately supplied money-like assets (MMFs shares) are comparable to those found by Krishnamurthy and Vissing-Jorgensen (2012) and Nagel (2016) estimated on publicly supplied money-like assets (US Treasuries), 46 and 24 bps; in other words, the premium attached to the information insensitivity of (government) MMF shares (due to their fixed NAV and to their lack of gates and fees) is comparable to the premium attached to the information insensitivity of US Treasuries.

We run several robustness checks. Column 2 of Table 11replicates the results of Column 1 estimating regression (3) on the balanced panel of MMF families active each month from January 2015 to September 2017. Results are qualitatively and quantitatively similar: the premium for money-likeness paid by retail investors is 20 bps and the additional premium paid by institutional investors is 10 bps. Column 3 reports the results of regression (3) for a much longer sample, namely, the unbalanced panel of MMF families active in any month from November 2010 (i.e., the first

[22] The effect is the sum of the two coefficients $\gamma_1 + \gamma_2 = 0.58 + 19.30 = 19.88$.

[23] The first effect is the sum of the two coefficients $\gamma_1 + \gamma_3 = 0.58 + 4.62 = 5.20$; the second is the sum of the two coefficients $\gamma_2 + \gamma_4 = 19.30 + 3.02 = 22.32$.

[24] Our estimates suggest that the increase in spread attributable to gates and fees (20 bps) is larger than that attributable to the adoption of the floating NAV (8 bps); this contrasts with the general wisdom at the time of the reform enactment, when most practitioners were concerned about the impact on the industry of the floating NAV (e.g., ICI, 2010 and ICI, 2013).

	Net Yield$_{ijkt}$		
	(1)	(2)	(3)
Prime$_k$ × $1_{t \geq \text{Nov. 2015}}$	0.58	2.00	0.90
	(0.75)	(1.18)	(0.75)
Prime$_k$ × $1_{t \geq \text{Oct. 2016}}$	19.30***	18.30***	19.82***
	(1.99)	(2.08)	(1.91)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Nov. 2015}}$	4.62***	9.19***	4.16***
	(0.87)	(1.85)	(0.87)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Oct. 2016}}$	3.02	0.72	4.10***
	(1.71)	(1.69)	(1.23)
Prime$_k$ × $\sum_s 1_{t \geq s}$	19.88***	20.29***	20.72***
Inst$_j$ × Prime$_k$ × $\sum_s 1_{t \geq s}$	7.64***	9.90***	8.26***
Balanced		Yes	
Nov. 2010 - Sep. 2017			Yes
Adj. R^2	0.92	0.92	0.90
Adj. Within R^2	0.26	0.29	0.26
Observations	5257	3333	15723

Table 11. The Premium for Money-likeness: Regression Analysis. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or government) in month t. Prime$_k$ is a dummy for $k =$"prime." Inst$_j$ is a dummy for $j =$"institutional." $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; and fixed effects for the interaction of class-type and time. Column 1 reports the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Column 2 reports the results for the balanced panel of families continuously active from January 2015 to September 2017. Column 3 reports the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

available date for N-MFP data) until September 2017. Again, the estimates are very close to those in Columns 1 and 2. Finally, the within R^2 of all regressions in Table 11 is between 25 and 30%, indicating that our baseline specification has good explanatory power.[25]

Regression (3) does not control for time-varying macroeconomic factors that could affect the yield spread between prime and government MMFs independently of the SEC reform. One potential factor is perceived market volatility, whose increase could lead prime MMF investors to require higher yields compared to government MMF investors as prime MMFs are riskier; moreover, as Section 4 shows, such an effect could be stronger for institutional investors since they are more responsive to flight-to-safety episodes. To control for this, we estimate regression (3) adding as independent variables the interactions of the VIX with Prime_k, $\text{Inst}_j \times \text{Prime}_k$, and their own interactions with the regulation dummies. Results are in Columns 1 to 3 of Table 12 and are quantitatively and qualitatively similar to those in Table 11.[26]

Another potential time-varying factor that could bias our results is monetary policy, which affects the opportunity cost of money and may influence the premium for money-like assets (Nagel, 2016). As a result, changes in the prime-government yield spread around October 2016 could reflect not only the reduction in the information insensitivity of prime MMFs due to the reform but also fluctuations in monetary policy. To control for the possible differential effects of monetary policy on MMF yields around the reform implementation, we estimate regression (3) adding as independent variables the interactions of the effective federal funds rate with Prime_k, $\text{Inst}_j \times \text{Prime}_k$, and their own interactions with the regulation dummies. Results are in Columns 4 to 6 of Table 12 and are very close to those of our baseline specification: the money-likeness premium is between 20 and 23 bps for retail investors, and there is an additional premium of between 8 and 11 bps for institutional ones.

Controlling for market volatility and monetary policy does not exclude the possibility that our results may still be biased by other time-varying factors that affect the

[25] Another concern is that, in Table 11, we compare the yield of prime MMFs to that of all government MMFs, including both treasury and agency funds, whereas most of the prime MMF outflows caused by the reform went to the agency MMF subsegment. For robustness, we estimate regression (3) excluding treasury MMFs from the sample. Results are in Table 17 of Appendix C and are qualitatively and quantitatively similar to those in Table 11.

[26] As further robustness check, we estimate regression (3) adding controls for fund risk-taking, such as the weighted average maturity of a fund's portfolio and the share of risky asset classes (i.e., certificates of deposits and commercial papers) in a fund's portfolio. Results are in Table 19 of Appendix C and are also very similar to those in Table 11.

	Net Yield$_{ijkt}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Prime$_k$ × $1_{t\geq \text{Nov. 2015}}$	5.34	9.65*	6.10*	-1.85	-2.36*	-1.96**
	(3.17)	(4.32)	(3.14)	(0.91)	(1.14)	(0.83)
Prime$_k$ × $1_{t\geq \text{Oct. 2016}}$	18.37	9.51	18.45*	22.29***	25.33***	23.10***
	(9.28)	(9.47)	(9.09)	(3.21)	(3.01)	(3.14)
Inst$_j$ × Prime$_k$ × $1_{t\geq \text{Nov. 2015}}$	4.28	2.21	5.60*	7.03***	12.16***	4.71***
	(2.67)	(5.91)	(2.75)	(1.52)	(2.78)	(1.20)
Inst$_j$ × Prime$_k$ × $1_{t\geq \text{Oct. 2016}}$	8.45	17.93**	8.17	1.60	-0.77	3.08
	(5.35)	(7.05)	(5.00)	(3.53)	(4.14)	(3.08)
Prime$_k$ × $\sum_s 1_{t\geq s}$	23.71**	19.16*	24.55**	20.45***	22.97***	21.14***
Inst$_j$ × Prime$_k$ × $\sum_s 1_{t\geq s}$	12.73**	20.14***	13.78***	8.63**	11.40**	7.80**
Balanced		Yes			Yes	
Nov. 2010 - Sep. 2017			Yes			Yes
Control	VIX$_{t-1}$	VIX$_{t-1}$	VIX$_{t-1}$	FF$_{t-1}$	FF$_{t-1}$	FF$_{t-1}$
Adj. R^2	0.92	0.92	0.90	0.92	0.92	0.90
Adj. Within R^2	0.26	0.29	0.26	0.26	0.30	0.26
Observations	5257	3333	15723	5257	3333	15723

Table 12. The Premium for Money-likeness: Regression Analysis with Controls for Time-varying Macro Factors. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or government) in month t. Prime$_k$ is a dummy for k =“prime.” Inst$_j$ is a dummy for j =“institutional.” $1_{t\geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; and fixed effects for the interaction of class-type and time. Columns 1 and 2 report the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Columns 2 and 5 report the results for the balanced panel of families continuously active from January 2015 to September 2017. Columns 3 and 6 report the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Columns 1 to 3 (4 to 6) include the interactions of the last month's VIX (effective federal funds rate) with Prime$_k$ and with Inst$_j$×Prime$_k$, and their own interactions with the regulation dummies.Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

spread between prime and government MMFs. To control for this, we can estimate the impact of the 2014 SEC reform by exploiting the differential treatment of institutional and retail share classes. We do so by adding to regression (3) fixed effects for the interaction of MMF-type and time. In other words, we estimate the following equation:

$$y_{ijkt} = \alpha_{ijk} + \mu_{jt} + \nu_{kt} + \gamma_3 \times \text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}} + \gamma_4 \times \text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}} + \varepsilon_{ijkt}, \tag{4}$$

where ν_{kt} are fixed effects for the interaction of MMF-type and time, which control for all time-varying factors that affect the net yields of prime and government funds differently. This specification comes at the cost of losing identification of the premium for money-likeness paid by retail investors but provides a more robust estimate of the additional premium paid by institutional investors. Results are in Table 13 and are very close to those of the baseline specification: the additional premium paid by institutional investors because of the new regulation is between 7 and 21 bps (with p–values ranging from 0.000 to 0.033).

6 The Elasticity of Substitution between Prime and Government MMFs

In this section, we estimate the effect of the 2014 SEC reform on the elasticity of substitution between prime and government MMFs. As we explained in the previous sections, the introduction of gates, fees, and of a floating NAV has reduced the money-likeness of prime MMFs vis-à-vis that of government MMFs. Here we estimate whether the substitutability of these two type of instruments has changed as a result.

We model investors' relative demand for prime versus government MMFs in the following way:[27]

$$\log(q_{it}^P/q_{it}^G) = \alpha + \delta_0 1_{t \geq \text{Oct. 2016}} + \delta_1 \log(p_{it}^P/p_{it}^G) + \delta_2 1_{t \geq \text{Oct. 2016}} \times \log(p_{it}^P/p_{it}^G) + \varepsilon_{it}, \tag{5}$$

where q_{it}^P and q_{it}^G are the TNA of prime and government funds of family i in month t,

[27] We use the term "demand" because we interpret our results as estimates of investors' willingness to hold money-like assets (i.e., their demand for such assets). Of course, one could reinterpret this demand function as investors' supply of funds to the MMF industry.

	Net Yield$_{ijkt}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}}$	4.70***	9.19***	4.23***	4.52	2.21	5.84**	7.00***	12.16***	4.66***
	(0.85)	(1.86)	(0.85)	(2.62)	(5.94)	(2.63)	(1.52)	(2.79)	(1.20)
$\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}}$	2.87	0.72	3.92***	8.34	17.93**	8.03	1.43	-0.77	2.92
	(1.71)	(1.69)	(1.25)	(5.36)	(7.08)	(4.98)	(3.58)	(4.16)	(3.11)
$\text{Inst}_j \times \text{Prime}_k \times \sum_s 1_{t \geq s}$	7.57***	9.90***	8.15***	12.86**	20.14***	13.86***	8.43**	11.40**	7.58**
Balanced		Yes			Yes			Yes	
Nov. 2010 - Sep. 2017			Yes			Yes			Yes
Control				VIX_{t-1}	VIX_{t-1}	VIX_{t-1}	FF_{t-1}	FF_{t-1}	FF_{t-1}
Adj. R^2	0.92	0.92	0.90	0.92	0.92	0.90	0.92	0.92	0.90
Adj. Within R^2	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01
Observations	5257	3333	15723	5257	3333	15723	5257	3333	15723

Table 13. The Premium for Money-likeness for Institutional Investors: Regression Analysis. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or government) in month t. Prime$_k$ is a dummy for $k =$"prime." Inst$_j$ is a dummy for $j =$"institutional." $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; fixed effects for the interaction of MMF-type and time; and fixed effects for the interaction of class-type and time. Columns 4–6 (7-9) include the interaction of last month's VIX (effective federal funds rate) with $\text{Inst}_j \times \text{Prime}_k$, $\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}}$, and $\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}}$. Columns 1, 4, and 7 report the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Columns 2, 5, and 8 report the results for the balanced panel of families continuously active from January 2015 to September 2017. Columns 3, 6, and 9 report the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

and p_{it}^P and p_{it}^G are the corresponding weighted average prices; in our regressions, we approximate the log of the price ratio with the net yield spread between government and prime funds, $y_{it}^G - y_{it}^P$.[28] $1_{t \geq \text{Oct. } 2016}$ is a dummy for October 2016 (the month in which the new rule comes into effect) onwards. The parameter δ_0 is the change in the relative demand for prime versus government MMFs caused by the reform independently of prices, that is, a parallel shift in the demand curve. The parameter δ_1 is the elasticity of substitution (i.e., the slope of the demand curve when both the dependent and the independent variable are modeled as log ratios) before the regulatory change; the parameter δ_2 is the change in the elasticity of substitution caused by the reform.

Of course, prices and quantities are jointly determined in equilibrium. To address this endogeneity problem, we use an instrumental variables approach. We exploit the fact that, over the years, MMF families have specialized in either the prime or the government segment of the industry. That is, different families have accumulated differential expertise and economies of scale in managing prime rather than government MMF portfolios. This heterogeneity in specialization across MMF families can be interpreted as a cross-sectional shifter of the relative supply function that allows us to estimate the demand equation.

In particular, we run a two-stage least squares regression that uses family specialization in prime MMFs from a pre-sample period as instrument for the time-varying endogenous relative price in the regression sample.

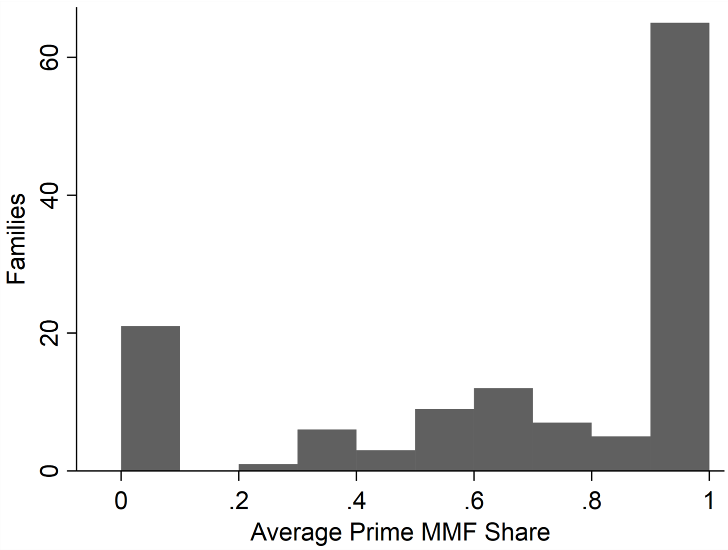
Our proxy for prime MMF specialization is the average share of a family's prime MMF business in its total MMF business in a pre-sample period.[29] The top panels of Figure 9 show its distribution across families in 2012 (left) and in 2013 (right), roughly three and two years before investors started reacting to the SEC reform.[30] In both years, the distribution is widely dispersed and clearly bi-modal: about 40% of the families offer only prime MMFs, about 20% offer only government MMFs, and the rest are evenly distributed between these two extremes. Moreover, our proxy for prime MMF specialization is stable over time; that is, it does not fluctuate

[28] This is equivalent to treating a MMF share as a zero-coupon bond with a face value of \$1 and yield y; its price is then $p = 1/(1+y)$; for small yields, $\log(p^P/p^G) \approx y^G - y^P$.

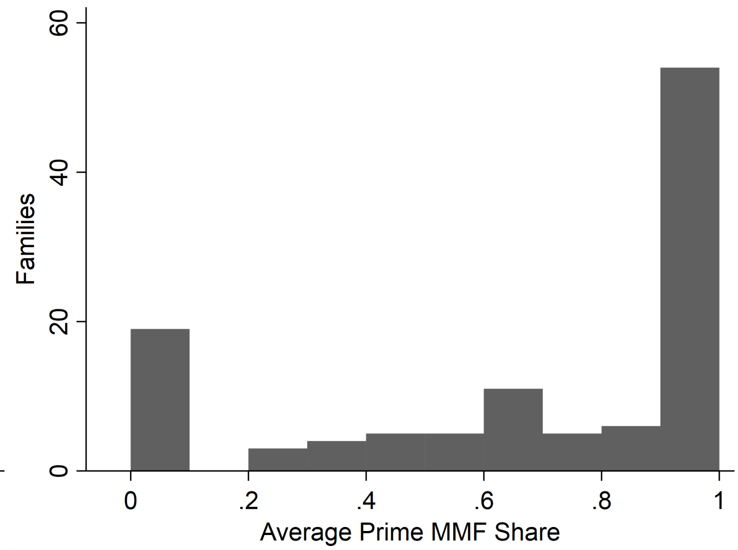
[29] This instrument in similar in spirit to the Bartik instruments used in the empirical labor literature (see Goldsmith-Pinkham *et al.*, 2018).

[30] The specialization proxy is computed estimating the share of a family prime business across both institutional and retail share classes because it represents a family's ability to manage a prime versus a government MMF portfolio.

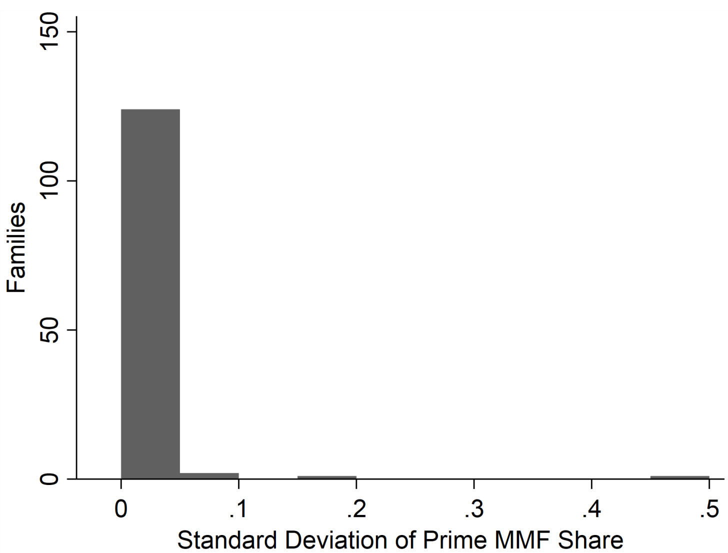
significantly within-family. The bottom panels of Figure 9 show the distribution of the within-family standard deviation of the share prime MMF business in 2012 and 2013: for more than 95% of the MMF families, the standard deviation was less than 5% in both years.



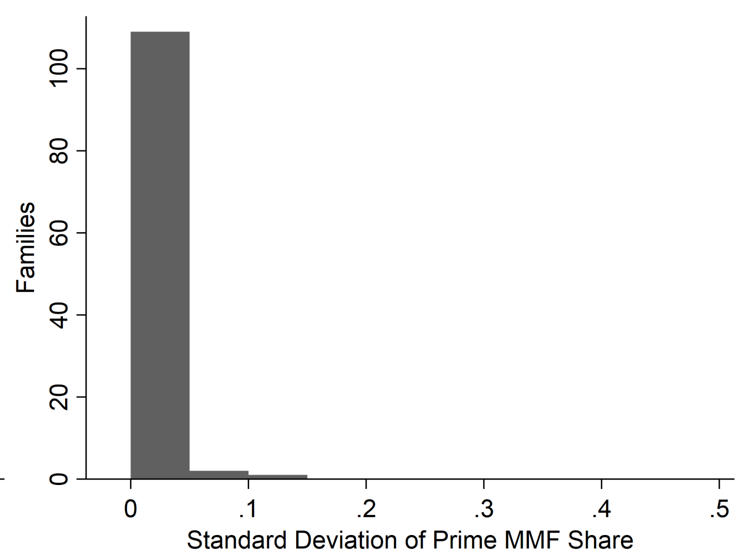
(a) Average Prime Share in 2012



(b) Average Prime Share in 2013



(c) Standard Deviation of Prime Share in 2012



(d) Standard Deviation of Prime Share in 2013

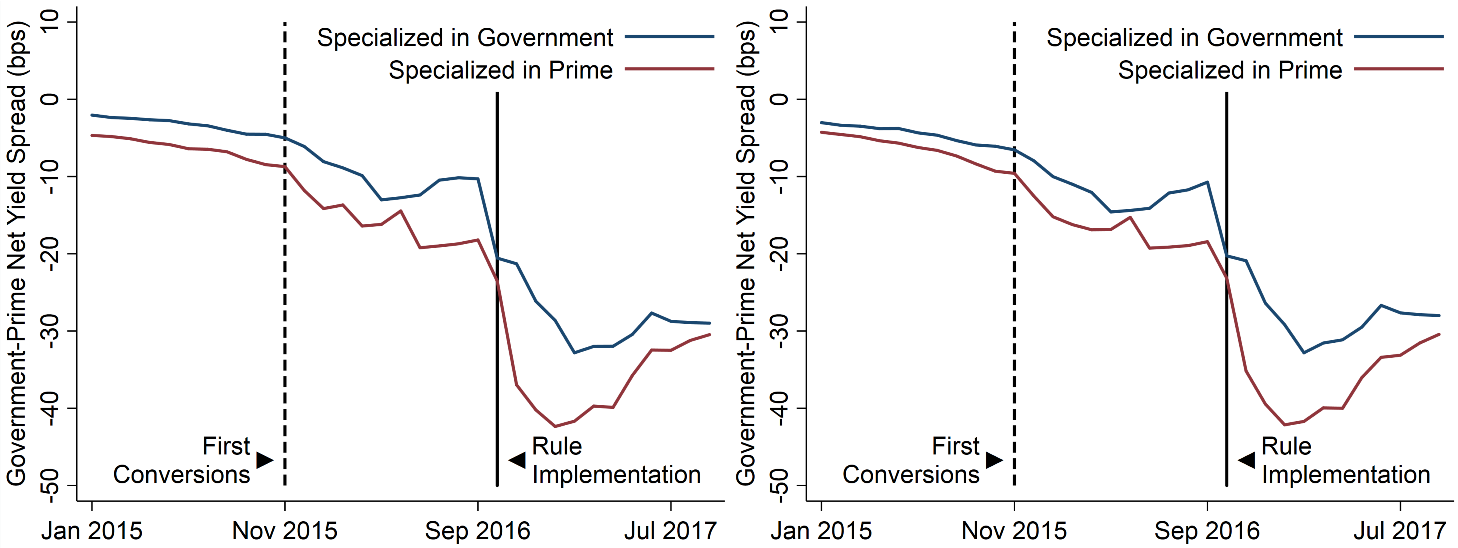
Figure 9. Specialization in the Prime Sector across Money Market Fund (MMF) Families in 2012 (left) and 2013 (right). The sample is all US MMF families ever active in 2012 and 2013, respectively. Top panel: yearly average of the share of prime MMFs in a family's total MMF business. Bottom panel: yearly standard deviation of the share of prime MMFs in a family's total MMF business.

The exclusion restriction assumption underlying our identification strategy is that the unobserved component of the within-family demand for prime versus government MMFs in the regression sample is uncorrelated with the equilibrium quantities in the period in which family specialization is measured. In particular, this assumption rules out the presence of family fixed effects in Equation (5); that is, the average investor in one family does not have a stronger idiosyncratic preference for prime relative to government MMFs than the average investor in the other families. In other words, we assume that families' specialization affects investors' preference for prime relative to government MMFs only through its effect on the relative price that the families are able to offer. Our exclusion restriction assumption is reasonable given that most MMF families started their business and specialized in the 1990s (more than 98% of MMF TNA in January 2015 belongs to families that entered the industry before 2000), long before the reform implementation, and each MMF family pools thousands of investors with arguably different idiosyncratic preferences that are likely to cancel out in the aggregate.

Finally, the relevance of our instrument stems from the fact that family specialization (e.g., the experience of their manager) appears to be persistent over time. Specialization affects the relative net yield that families can offer, and as a result of its persistence, some families offer prime-government spread that are persistently higher. Because informational and relationship frictions make the market non-perfectly competitive, heterogeneity of family specialization generates heterogeneity in equilibrium spreads, hence the validity of our instrument.[31]

Before presenting the results of the two-stage regression, let us provide some graphical evidence in support of our identification strategy. The left panel of Figure 10 shows the net-yield spread between government and prime institutional MMFs from January 2015 to September 2017 for MMF families with different levels of prime MMF specialization. The red line is for the families in the top 33% of the distribution of prime MMF specialization in 2012; the blue line is for those in the bottom

[31]In Appendix D, we show the histogram of the prime-government spread across families in 2013, separately for institutional and retail asset classes. The chart for institutional share classes shows the heterogeneity of spreads offered across families, a deviation from perfect competition. Our identification strategy does not work for retail share classes because retail investors are less sophisticated and not price sensitive (e.g., Chernenko and Sunderam, 2014); because of this, as the chart in Appendix **D** shows, there is precious little variability in the government-prime spread across families; as a result, our first-stage regression has very little explanatory power (indeed, the F statistic is always below 1.5, showing the instrument to be very week). Nevertheless, for completeness's sake, the results of the demand estimation for retail share classes are reported in Appendix **D**.



(a) Specialization as in 2012 (b) Specialization as in 2013

Figure 10. Net-Yield Spread between Government and Prime Money Market Funds (MMFs) by Family Specialization. The sample is all US MMF families that have both government and prime institutional funds in any month from January 2015 to September 2017. Specialization in the prime MMF sector is measured as the share of a family's prime MMF business in the family's total MMF business in 2012 (left panel) and in 2013 (right panel). The blue line is the net-yield spread of families more specialized in government MMFs (i.e., in the bottom 33% of the prime-share distribution); the red line is the net-yield spread of families more specialized in prime MMFs (i.e., in the top 33% of the prime-share distribution).

33% of the same distribution. Our interpretation is that, since families in the first group are more specialized in prime MMF products, they have a lower marginal cost of producing prime MMFs and can offer them at a better price. Hence, we should expect the government-prime yield spread of the first group to be always below that of the second group and the differential to increase around the reform implementation. This is what we observe in the charts and what underpins our identification strategy. The right panel of Figure 10 shows the same government-prime yield spreads when MMF families are ranked based on their specialization in prime MMFs during 2013 instead of 2012. Results are almost identical.

Regression (5) is estimated on the unbalanced panel of MMF families with institutional share classes in both the prime and the government segment of the industry in any month from January 2015 to September 2017; in the baseline specification, we exclude the transition period November 2015–September 2016, when the relation between prices and quantities adjusts to its new (post-SEC regulation) steady state.

Table 14 reports the results of the second stage estimation for our baseline specification. Standard errors are heteroskedasticity, autocorrelation, and spatial correlation (HACSC) robust to account for both correlations within and across families.[32] First-stage and reduced-from regressions are in Appendix D. The coefficients of the reduce-form regression are consistent with those presented here and statistically significant.[33]

Column 1 shows the results of the second-stage estimation when the instrument is the 2013 prime MMF share in a family's total MMF business. The F statistic from the first stage is 20, indicating that the instrument is strong. The slope of the demand curve before the SEC rule (δ_1) is, as expected, negative, quantitatively relevant, and statistically significant (p–value = 0.000): when the government-prime spread in institutional share classes (i.e., the relative price of prime MMFs for institutional investors) increases by 1 bp, prime-MMF holdings by institutional investors decrease by 50% relative to their government-MMF holdings. In other words, before the regulatory change, the relative demand for prime MMFs was quite elastic, that is, prime and government MMFs were highly substitutable. Such a high elasticity is not surprising if one considers that, during most of 2015, all money market rates were very compressed, investors scrambled in search of higher yields, and prime and government MMFs offered identical liquidity services.

After the reform implementation, in contrast, the relative demand curve significantly shifts downwards ($\delta_0 = -4.3$, with p–value = 0.007), indicating that institutional investors now demand relatively fewer prime MMF shares. Moreover, as expected, the new regulation also changes the steepness of the relative demand curve, making it less downward sloping: indeed, the coefficient representing the change in the slope of the demand curve (δ_2) is positive, economically important, and statistically significant (p–value = 0.000): because of this, the relative demand for prime versus government MMFs by institutional investors has become much less elastic, with the elasticity of

[32]Specifically, as in the previous sections, we use Driscoll and Kraay (1998) standard errors with a three-lag autocorrelation structure, as suggested by Newey and West (1994) plug-in procedure (see footnote 15). Since our instruments are measured more than one year ahead of the regression sample, allowing the residuals in the structural relative demand equation to be correlated within-family for up to three months is consistent with our identification strategy.

[33]To achieve identification, the number of instruments needs to be equal to the number of endogenous variables. In our second-stage regression, we have two endogenous variables: the spread and the additional spread after October 2016. Hence, we use two instruments in our first-stage regression: the share of prime MMFs in the family and the share of prime MMFs in the family interacted with a dummy for the post-October 2016 period. Note that we do not interact the first-stage fitted value of the spread itself with the dummy to avoid the forbidden regression problem.

substitution decreasing from 0.50 to 0.11.

The change in both the position and the slope of the demand curve highlights the importance of the reduction in the information insensitivity of prime MMFs caused by the introduction of redemption gates and fees and the adoption of the floating NAV: not only are investors less willing to hold their shares in prime MMFs for any given spread in government-prime yield, but they are also less willing to substitute from government to prime as the spread increases.

In Columns 2 to 7 of Table 14, we report a series of robustness checks: i) using the 2012 share of prime MMFs in the family as instrument (Column 2); ii) using a longer panel going back to January 2012 and calculating family specialization on 2011 data (Column 3); iii) including the transition period November 2015–October 2016 (Columns 4 and 5); and iv) excluding treasury MMFs (Columns 6 and 7). The estimates are qualitatively and quantitatively similar to those from the baseline specification.

				$\log(q_{it}^P/q_{it}^G)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Spread_{it}	-0.50***	-0.41***	-0.29***	-0.28***	-0.24***	-0.36***	-0.34***
	(0.03)	(0.03)	(0.06)	(0.06)	(0.05)	(0.04)	(0.04)
$\text{Spread}_{it} \times 1_{t\geq\text{Oct. 2016}}$	0.39***	0.32***	0.17*	0.17**	0.14*	0.23**	0.23***
	(0.05)	(0.04)	(0.08)	(0.06)	(0.06)	(0.07)	(0.06)
$1_{t\geq\text{Oct. 2016}}$	-4.33***	-4.33***	-5.58***	-4.13***	-4.10***	-5.63**	-4.99***
	(1.09)	(1.05)	(1.31)	(1.09)	(1.07)	(1.64)	(1.27)
Constant	-1.96***	-1.58***	-0.99***	-2.16***	-1.80***	-0.75***	-0.64***
	(0.12)	(0.10)	(0.13)	(0.15)	(0.14)	(0.03)	(0.03)
Instrument	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$	$\text{Share}_{i,2011}$	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
CD F-statistic	19.9	24.0	70.5	17.4	19.7	16.6	22.6
Observations	491	491	1634	775	775	459	459

Table 14. The Relative Demand Function of Institutional Investors for Prime versus Government Money Market Funds (MMFs): a Regression Analysis. $\log(q_{it}^P/q_{it}^G)$ is the log ratio of the TNA of prime and government institutional MMF share classes of family i in month t; $\log(p_{it}^P/p_{it}^G)$ is measured as the spread between the (value-weighted) net yield of government and prime institutional classes of family i in month t; $1_{t\geq\text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government institutional classes in any month of the regression sample. The table reports the estimates of the second stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq\text{Oct. 2016}}$ as instruments for the family's Spread_{it} and $\text{Spread}_{it} \times 1_{t\geq\text{Oct. 2016}}$ (the first stage is reported in Appendix **D**). A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business. In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

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Appendix

A Fund Conversions

In this appendix, we report descriptive statistics on fund conversions, that is, instances in which a family decides to convert one or more of its prime money market funds (MMFs) into government MMFs. Form N-MFP does not directly report data on conversions. We identify conversions as all instances in which, in Form N-MFP, a fund (as uniqly identified by the SEC identifier) is classified as prime in one month and government in the following month. As Table 15 shows, between November 2015 and October 2016, flows from prime to government MMFs due to conversions totalled around $336 bn, representing over a quarter of the overall flow from the prime to the government sector.

[billions]	Mean	SD	Median	N	Total
Converted Volume	$3.58	$12.41	$0.68	94	$336.38
Monthly Percent	31.75%	41.29%	13.98%	12	28.19%

Table 15. Summary Statistics for Money Market Fund (MMF) Conversions. The sample is all MMFs between November 2015 and October 2016 that are classified as prime in one month and government in the next. The top row reports summary statistics for the TNA held by these funds in the month after the conversion, and the bottom row reports the same summary statistics as a percentage of the the monthly change in industry-wide government TNA. The rightmost column reports the total converted volume both in dollars and as a percentage of the the overall change government TNA over the sample.

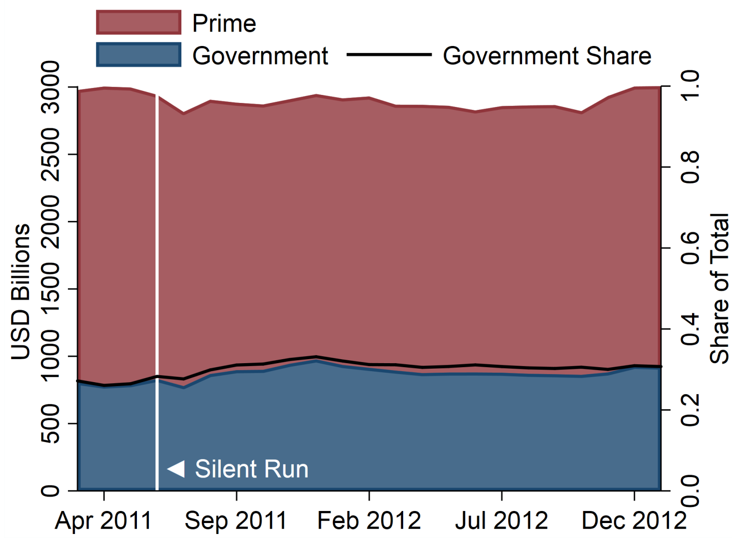
B The 2011 MMF Silent Run

In this appendix, we we describe investors' behavior during the 2011 run on prime MMFs, the so-called Silent Run, caused by concerns about the safety of prime MMFs at the height of the European debt crisis. Investors' behavior is similar to what we observed in the 2008 run: when investors leave the prime MMF industry in response to safety concerns, (i) the size of the MMF industry shrinks, (ii) flows to government MMFs are smaller than those observed in 2015—2016, (iii) a significant portion of prime-to-government flows occurs across families and is directed towards treasury

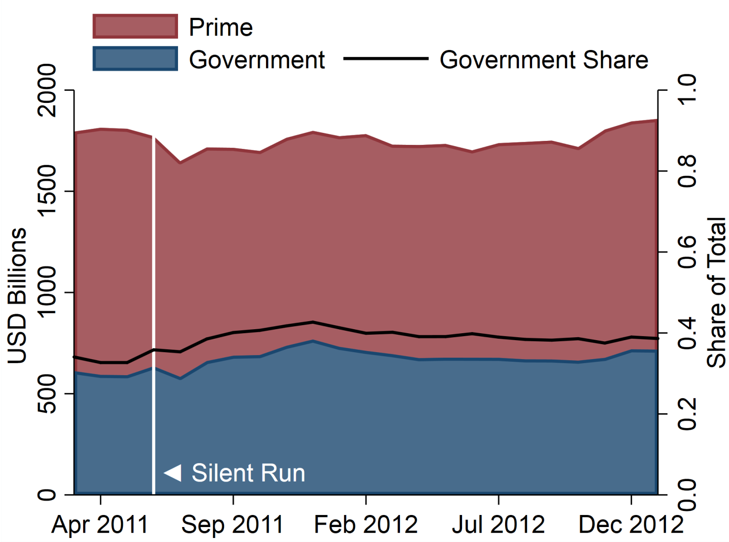
MMFs, (iv) retail share classes are largely unaffected, (v) outflows from prime MMFs revert once the safety concerns subside.

Figure 11 and Table 16 show MMF TNA from March 2011 to January 2013. From May to December 2011, when investors were most skeptical of the viability of European debt, investors only redeem \$233 bn from prime MMFs and invest \$184 bn in government MMFs. The share of government-MMF assets jumps by only a few percentage points during 2011 and remains stable afterwards.

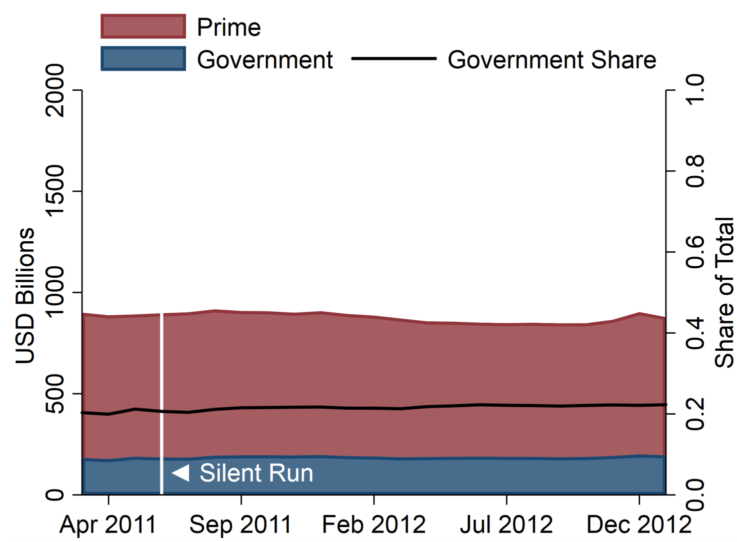
Moreover, similarly to the 2008 run, the relation between outflows from prime and inflows to government MMFs around the 2011 run is much less tight than it is ahead of the implementation of the new SEC rule (see Panel (a) of Figure 12). The slope from an OLS regression of inflows to government MMFs between May and December 2011 against the corresponding outflows from prime MMFs in the same family is only 0.53 (p–value = 0.000). Furthermore, as panel (b) of Figure 12 shows, there is little difference between inflows to agency and treasury MMFs; the OLS coefficients are 0.23 (p–value = 0.011) and 0.30 (p–value = 0.000), respectively.



(a) All Share Classes



(b) Institutional Share Classes

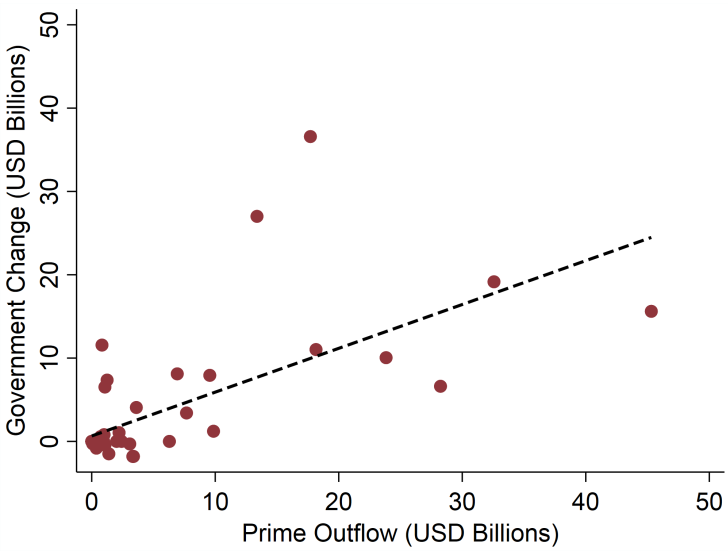


(c) Retail Share Classes

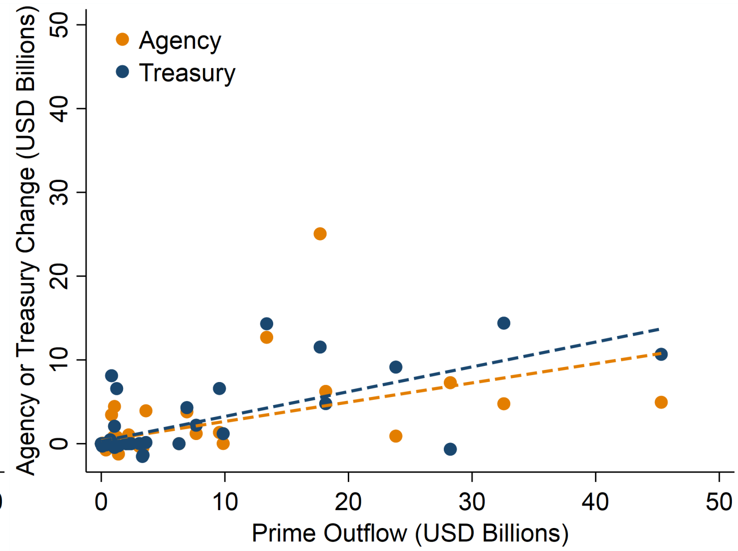
Figure 11. Money Market Funds (MMFs) Total Net Assets by Fund and Investor Type (bottom panel) around the 2011 European Debt Crisis. The sample is all US MMFs. The solid black line is share of government MMFs in the industry or in the relevant segment (right y-axis). The vertical white line represents the month of the 2011 Silent Run, i.e., June 2011.

[billions]	May 2011	December 2011	Δ	January 2013	Δ
Total	\$2,997	\$2,948	-\$49	\$3,007	+\$10
Prime	\$2,204	\$1,971	-\$233	\$2,083	-\$121
Government	\$793	\$977	+\$184	\$924	+\$131
Government Share	26.4%	33.1%	+6.7pp	30.7%	+4.3pp

Table 16. Total Net Assets by Money Market Fund (MMF) Type around the 2011 Debt Crisis. The sample is all US MMFs.



(a) All Government MMFs



(b) Government MMFs by Type

Figure 12. Within-family Flows around the 2011 European Debt Crisis. The sample is all US MMF families with a reduction in prime MMF TNA between May and December 2011. x-axis: total outflows from a family's prime MMFs. y-axis: total changes in the TNA of the family's government MMFs, in panel (a), and total changes in the TNA of the family's agency and treasury MMFs separately, in panel (b). The dashed lines are the OLS regression lines of y against x. The slope for inflows to government MMFs is 0.53 (0.13), with $R^2 = 0.45$. The slope for inflows to agency MMFs is 0.23 (0.09), with $R^2 = 0.27$, and that for inflows to treasury MMFs is 0.30 (0.07), with $R^2 = 0.50$.

C The Premium for money-likeness

In this appendix, we present robustness checks for the estimation of the premium for money-likeness.

Tables 17 and 18 show the results of regressions (3) and (4) when we exclude treasury

	Net Yield$_{ijkt}$		
	(1)	(2)	(3)
Prime$_k$ × $1_{t \geq \text{Nov. 2015}}$	0.44	1.70	0.81
	(0.84)	(1.19)	(0.83)
Prime$_k$ × $1_{t \geq \text{Oct. 2016}}$	19.46***	17.92***	19.93***
	(2.02)	(2.11)	(1.95)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Nov. 2015}}$	3.67***	8.23***	2.75***
	(0.85)	(1.76)	(0.83)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Oct. 2016}}$	2.97	1.34	4.03***
	(1.65)	(1.68)	(1.15)
Prime$_k$ × $\sum_s 1_{t \geq s}$	19.91***	19.61***	20.74***
Inst$_j$ × Prime$_k$ × $\sum_s 1_{t \geq s}$	6.64***	9.57***	6.78***
Balanced		Yes	
Nov. 2010 - Sep. 2017			Yes
Adj. R^2	0.92	0.92	0.90
Adj. Within R^2	0.26	0.29	0.25
Observations	4977	3003	14771

Table 17. The Premium for Money-likeness: Excluding Treasury Money Market Funds (MMFs). These regressions are the same as those in Table 11 but without treasury MMFs. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or agency) in month t. Prime$_k$ is a dummy for k ="prime." Inst$_j$ is a dummy for j ="institutional." $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; and fixed effects for the interaction of class-type and time. Column 1 reports the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Column 2 reports the results for the balanced panel of families continuously active from January 2015 to September 2017. Column 3 reports the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

MMFs from the sample. As mentioned in the paper, the rationale for these robustness checks is that the vast majority of prime-MMF investors flow to agency MMFs, the riskier sub-type of government MMFs. Results are consistent with those reported in the paper (see Tables 11 and 13).

Tables 19 and 20 show the results of regressions (3) and (4) when we control for fund risk-taking. The rationale for these robustness checks is that the observed increase in the spread between the net yield of prime and government MMFs could be due to changes in their risk-taking rather than to changes in their money-likeness. Following the recent literature on MMF risk-taking (Kacperczyk and Schnabl, 2013; La Spada, 2018), we proxy for risk-taking with the weighted average portfolio maturity

	Net Yield$_{ijkt}$		
	(1)	(2)	(3)
$\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Nov. 2015}}$	3.76^{***}	8.23^{***}	2.83^{***}
	(0.83)	(1.77)	(0.80)
$\text{Inst}_j \times \text{Prime}_k \times 1_{t \geq \text{Oct. 2016}}$	2.80	1.34	3.81^{***}
	(1.65)	(1.69)	(1.17)
$\text{Inst}_j \times \text{Prime}_k \times \sum_s 1_{t \geq s}$	6.56***	9.57***	6.65***
Balanced		Yes	
Nov. 2010 - Sep. 2017			Yes
Adj. R^2	0.92	0.92	0.91
Adj. Within R^2	0.01	0.02	0.01
Observations	4977	3003	14771

Table 18. The Premium for Money-likeness for Institutional Investors: Excluding Treasury Money Market Funds (MMFs). These regressions are the same as those in Columns 1-3 in Table 13 but without treasury MMFs. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or agency) in month t. Prime$_k$ is a dummy for $k =$"prime." Inst$_j$ is a dummy for $j =$"institutional." $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; fixed effects for the interaction of MMF-type and time; and fixed effects for the interaction of class-type and time. Column 1 reports the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Column 2 reports the results for the balanced panel of families continuously active from January 2015 to September 2017. Column 3 reports the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

(Columns 1–3) and the portfolio share of risky assets (Columns 4–6), where risky assets are certificates of deposits and commercial papers.[34] We lag our risk-taking controls by one month to mitigate endogeneity issues. The results are qualitatively and quantitatively similar to those reported in the paper.

D Elasticity of Substitution between Prime and Government MMFs

In this appendix, we present some descriptive statistics on the net yield of prime and government MMFs and some robustness checks for the estimation of the change in elasticity of substitution between prime and government MMFs.

The Distribution of the Net-Yield Spread for Retail and Institutional Asset Classes

Figure 13 shows histograms of the average net-yield spread between government and prime MMFs in 2012 (top) and 2013 (bottom) across families, separately for institutional (left panel) and retail (right panel) share classes. As discussed in the paper, the charts for institutional classes show significant heterogeneity of spreads across families, a deviation from perfect competition, with values ranging from −23 to 1 bps. In contrast, in retail share classes, there is precious little variability in spreads across families, with values ranging from −4 to 1 bps; this lack of variation in retail net-yield spreads is the reason why, when we estimates our relative demand model with retail share classes, the first-stage regression has very little explanatory power.

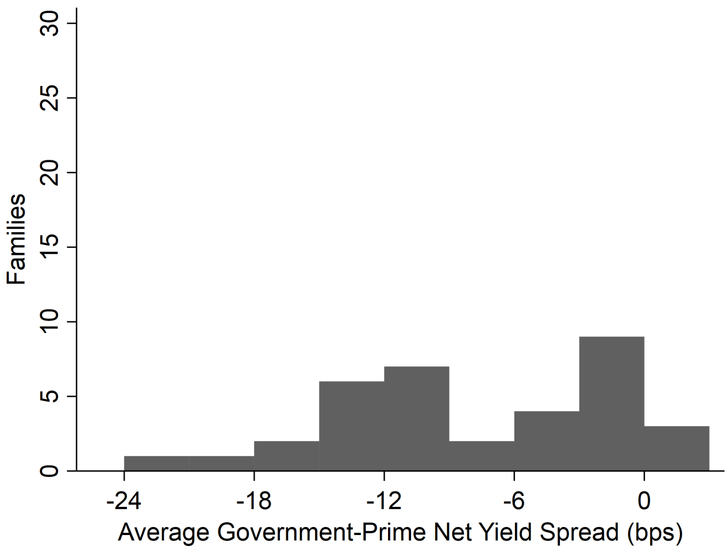
[34]Since the regressions run are at the family, MMF-type, investor-type level, we average class-level observations using class TNA as weights.That is, given a risk-taking variable x in the underlying securities portfolio, x_{ijkt} is month t's weighted average of x across classes of type j in MMFs of type k within family i, using class TNA as weights.

	Net Yield$_{ijkt}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Prime$_k$ × $1_{t\geq \text{Nov. 2015}}$	0.94	2.46	0.93	1.20	2.54	1.01
	(0.90)	(1.48)	(0.73)	(0.98)	(1.42)	(0.78)
Prime$_k$ × $1_{t\geq \text{Oct. 2016}}$	19.57***	18.85***	19.73***	19.67***	18.99***	19.84***
	(1.99)	(2.20)	(1.86)	(1.94)	(2.10)	(1.88)
Inst$_j$ × Prime$_k$ × $1_{t\geq \text{Nov. 2015}}$	4.63***	9.44***	4.25***	4.27***	8.82***	4.13***
	(0.82)	(1.82)	(0.85)	(0.74)	(1.65)	(0.83)
Inst$_j$ × Prime$_k$ × $1_{t\geq \text{Oct. 2016}}$	2.82	0.78	4.06***	2.41	0.48	3.98***
	(1.63)	(1.58)	(1.18)	(1.57)	(1.43)	(1.13)
WAPM$_{i,k,t-1}$	0.08***	0.12***	-0.00			
	(0.02)	(0.02)	(0.01)			
Risk Share$_{i,k,t-1}$				12.25**	15.90***	3.41**
				(3.69)	(4.29)	(1.55)
Prime$_k$ × $\sum_s 1_{t\geq s}$	20.51***	21.31***	20.66***	20.87***	21.53***	20.86***
Inst$_j$ × Prime$_k$ × $\sum_s 1_{t\geq s}$	7.45***	10.22***	8.31***	6.68***	9.29***	8.11***
Balanced		Yes			Yes	
Nov. 2010 - Sep. 2017			Yes			Yes
Adj. R^2	0.92	0.92	0.90	0.92	0.92	0.90
Adj. Within R^2	0.26	0.30	0.26	0.27	0.30	0.26
Observations	5029	3232	15435	5029	3232	15435

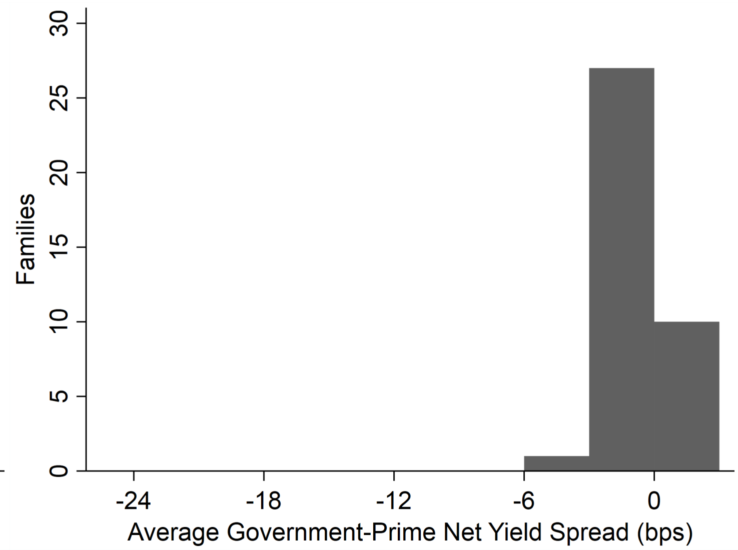
Table 19. The Premium for Money-likeness: Controlling for Portfolio Characteristics Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or government) in month t. Prime$_k$ is a dummy for $k =$"prime." Inst$_j$ is a dummy for $j =$"institutional." $1_{t\geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; and fixed effects for the interaction of class-type and time. Columns 1 to 3 (4 to 6) include last month's weighted average portfolio maturity (portfolio share of risky assets). Columns 1 and 4 report the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Columns 2 and 5 report the results for the balanced panel of families continuously active from January 2015 to September 2017. Columns 3 and 6 report the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

	Net Yield$_{ijkt}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Nov. 2015}}$	4.72***	9.53***	4.31***	4.36***	8.81***	4.17***
	(0.79)	(1.81)	(0.83)	(0.71)	(1.65)	(0.80)
Inst$_j$ × Prime$_k$ × $1_{t \geq \text{Oct. 2016}}$	2.63	0.80	3.86***	2.23	0.47	3.76***
	(1.64)	(1.57)	(1.22)	(1.56)	(1.43)	(1.14)
WAPM$_{i,k,t-1}$	0.09***	0.14***	-0.00			
	(0.02)	(0.03)	(0.01)			
Risk Share$_{i,k,t-1}$				12.23**	16.51***	3.95**
				(3.69)	(4.51)	(1.44)
Inst$_j$ × Prime$_k$ × $\sum_s 1_{t \geq s}$	7.35***	10.33***	8.17***	6.58***	9.28***	7.94***
Balanced		Yes			Yes	
Nov. 2010 - Sep. 2017			Yes			Yes
Adj. R^2	0.92	0.92	0.90	0.92	0.92	0.90
Adj. Within R^2	0.01	0.03	0.01	0.02	0.03	0.01
Observations	5029	3232	15435	5029	3232	15435

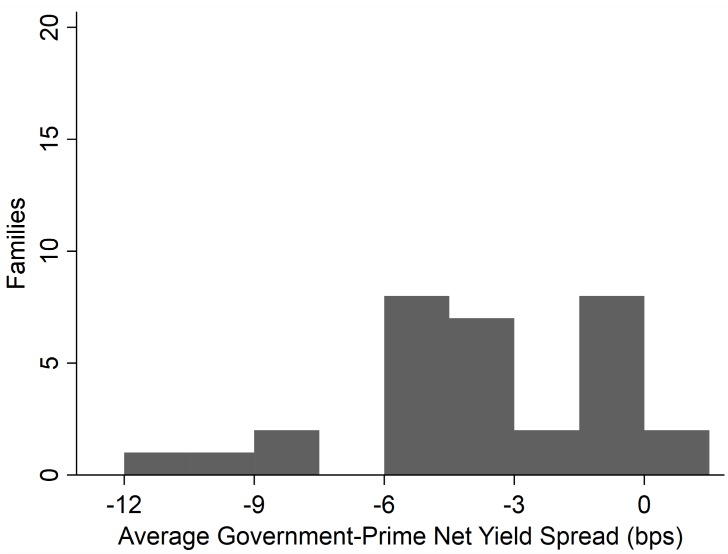
Table 20. The Premium for Money-likeness for Institutional Investors: Controlling for Portfolio Characteristics. Net Yield$_{ijkt}$ is the weighted average net yield of family i's share classes of type j (institutional or retail) in MMFs of type k (prime or government) in month t. Prime$_k$ is a dummy for $k =$"prime." Inst$_j$ is a dummy for $j =$"institutional." $1_{t \geq \text{Nov. 2015}}$ is a dummy for November 2015 onward and $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. All regressions include fixed effects for the interaction of family, MMF-type, and class-type; fixed effects for the interaction of MMF-type and time; and fixed effects for the interaction of class-type and time. Columns 1–3 (4-6) include last month's weighted average portfolio maturity (portfolio share of risky assets). Columns 1 and 4 report the results for the unbalanced panel of MMF families active in any month from January 2015 to September 2017. Columns 2 and 5 report the results for the balanced panel of families continuously active from January 2015 to September 2017. Columns 3 and 6 report the results for the unbalanced panel of MMF families active in any month from November 2010 to September 2017. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.



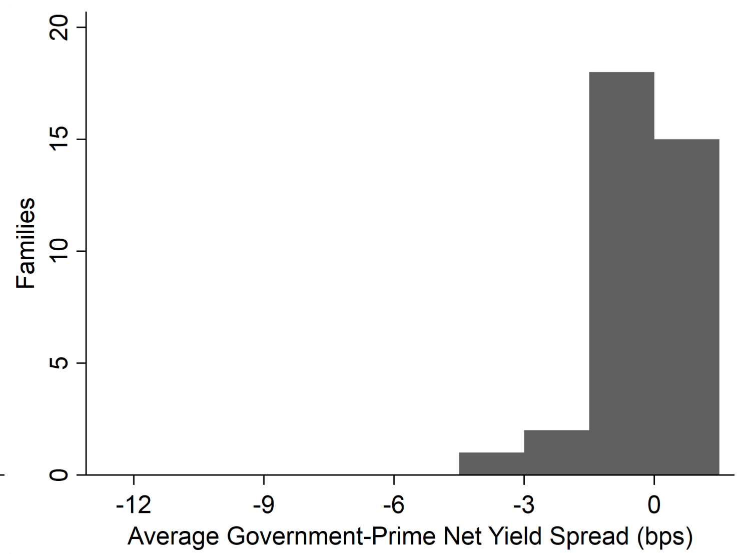
(a) Institutional Share Classes in 2012



(b) Retail Share Classes in 2012



(c) Institutional Share Classes in 2013



(d) Retail Share Classes in 2013

Figure 13. Histograms of the Average Net-Yield Spread between Government and Prime Money Market Funds (MMFs) in 2012 (top) and 2013 (bottom) across Families, separately for Institutional (left) and Retail (right) Investors. The sample is all US MMF families that offer both prime and government funds in any month. Data on one-month annualized net yields are from iMoneyNet; weighted averages computed across share classes of the same type within a family use TNA as weights.

First-Stage and Reduced-Form Regressions for Institutional Share Classes

Tables 21 and 22 show the results of the first stage of regression (5) for all the specifications in Table 14. The coefficients on the instruments are consistent with our identification hypothesis that families more specialized in prime MMFs offer lower government-prime yield spreads.

Table 23 shows the results of the reduced-form regression for the regressions in Table 14; in all specifications, the coefficients on the instruments have the expected sign and magnitude and are statistically significant at least at the 5% level (except the instrument that interacts prime-MMF specialization with the reform dummy in the regression in Column 3). Moreover, the F-statistic on the instruments is greater than 200 in all specifications.

Descriptive Statistics and Regression Results for Retail Share Classes

Figure 14 is the analog of Figure 10 in the paper for retail share classes. The figure shows the net-yield spread between government and prime retail MMF classes from January 2015 to September 2017 for families with different levels of prime MMF specialization. The red line is for the families in the top 33% of the distribution of prime MMF specialization in 2012; the blue line is for those in the bottom 33% of the same distribution. Consistent with the fact that retail investors are less price-sensitive than institutional ones, the red and the blue line are practically indistinguishable until a few months after the implementation of the new rule; this implies that our identification strategy cannot work for retail share classes. Analogously to 10, the right panel of Figure 14 shows the same statistics as the left panel when MMF families are ranked based on their specialization in prime MMFs during 2013 instead of 2012. Results are almost identical.

Tables 24 and 25 report the first-stage regressions for all the specifications discussed in the paper, run on retail class data. The results show the weakness of our suggested instruments for retail share classes.

Table 26 reports the results of the second-stage regressions for all the specification discussed in the paper, run on retail share classes. Coefficients, both on the

	Spread$_{it}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$1_{t\geq \text{Oct. 2016}}$	-18.87***	-18.97***	-18.48***	-17.64***	-17.85***	-21.98***	-20.18***
	(3.63)	(3.88)	(4.22)	(3.72)	(3.95)	(5.02)	(5.29)
Share$_{i,2013}$	-7.48***			-11.53***		-12.44***	
	(0.60)			(1.60)		(1.42)	
Share$_{i,2013}$ × $1_{t\geq \text{Oct. 2016}}$	-13.37			-9.32		-4.43	
	(6.06)			(6.13)		(6.75)	
Share$_{i,2012}$		-8.26***			-12.46***		-12.76***
		(0.52)			(1.67)		(1.31)
Share$_{i,2012}$ × $1_{t\geq \text{Oct. 2016}}$		-13.10			-8.90		-6.88
		(6.37)			(6.45)		(7.14)
Share$_{i,2011}$			-9.03***				
			(2.01)				
Share$_{i,2011}$ × $1_{t\geq \text{Oct. 2016}}$			-12.39				
			(6.73)				
Constant	0.01	0.52	0.81	-1.21	-0.59	4.41***	4.70***
	(0.19)	(0.24)	(0.58)	(0.98)	(0.95)	(0.46)	(0.39)
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
Adj. R^2	0.82	0.82	0.73	0.59	0.59	0.79	0.79
Observations	491	491	1634	775	775	459	459

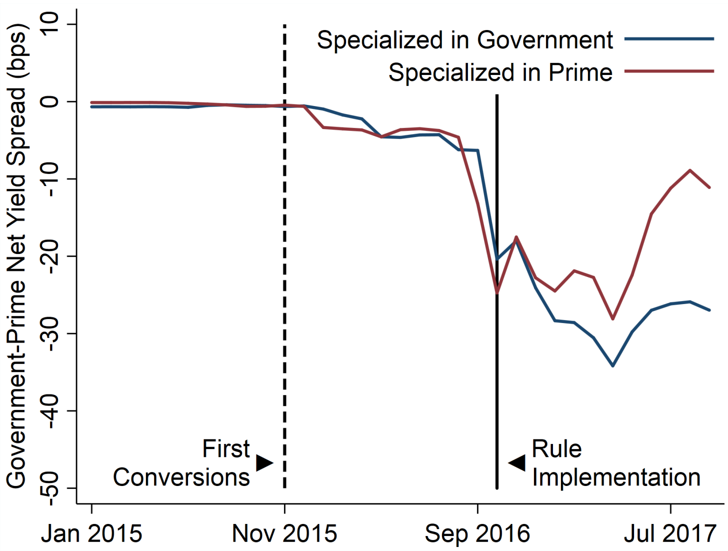
Table 21. The Relative Demand Function of Institutional Investors for Prime versus Government Money Market Funds (MMFs): First-stage Regression for the Spread. $\log(p^P_{it}/p^G_{it})$ is measured as the spread between the (value-weighted) net yield of government and prime institutional classes of family i in month t; $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government institutional classes in any month of the regression sample. The table reports the estimates of the first stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq \text{Oct. 2016}}$ as instruments for the family's Spread$_{it}$ and Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$. Specifically, the table reports estimates for when the dependent variable in the family's Spread$_{it}$. A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share$_{it}$). In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

	Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$1_{t\geq \text{Oct. 2016}}$	-18.86***	-18.44***	-17.67***	-18.86***	-18.44***	-17.57**	-15.48**
	(3.63)	(3.87)	(4.18)	(3.63)	(3.87)	(5.00)	(5.27)
Share$_{i,2013}$	0.00			0.00		0.00	
	(0.00)			(0.00)		(0.00)	
Share$_{i,2013}$ × $1_{t\geq \text{Oct. 2016}}$	-20.86**			-20.86***		-16.86*	
	(6.03)			(6.03)		(6.60)	
Share$_{i,2012}$		0.00			0.00		0.00
		(0.00)			(0.00)		(0.00)
Share$_{i,2012}$ × $1_{t\geq \text{Oct. 2016}}$		-21.36**			-21.36***		-19.65**
		(6.35)			(6.35)		(7.02)
Share$_{i,2011}$			0.00				
			(0.00)				
Share$_{i,2011}$ × $1_{t\geq \text{Oct. 2016}}$			-21.42***				
			(6.42)				
Constant	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
Adj. R^2	0.89	0.89	0.92	0.91	0.91	0.86	0.86
Observations	491	491	1634	775	775	459	459

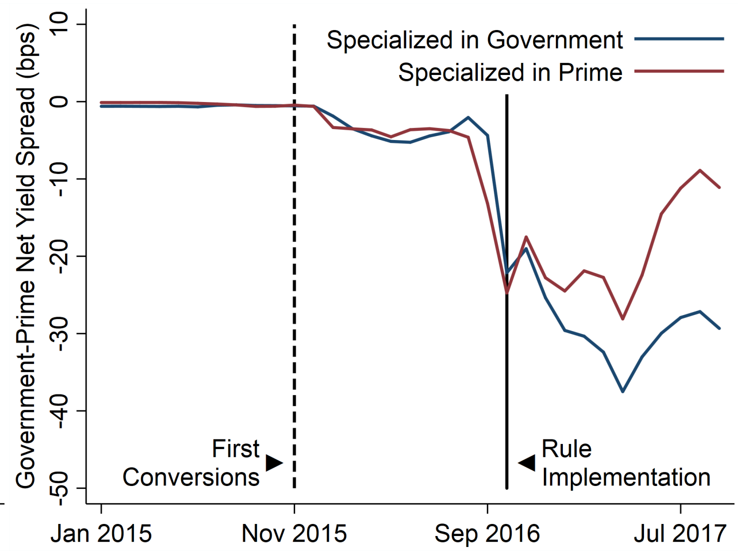
Table 22. The Relative Demand Function of Institutional Investors for Prime versus Government Money Market Funds (MMFs): First-stage Regression for the Spread Interacted with the Regulation Dummy. $\log(p^P_{it}/p^G_{it})$ is measured as the spread between the (value-weighted) net yield of government and prime institutional classes of family i in month t; $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government institutional classes in any month of the regression sample. The table reports the estimates of the first stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq \text{Oct. 2016}}$ as instruments for the family's Spread$_{it}$ and Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$. Specifically, the table reports estimates for when the dependent variable in the family's Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$. A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share$_{it}$). Estimated coefficients on Share$_{i,2013}$, Share$_{i,2012}$, and Share$_{i,2011}$are mechanically zero and thus are omitted. In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

	$\log(q^P_{it}/q^G_{it})$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$1_{t\geq \text{Oct. 2016}}$	-2.22***	-2.28***	-3.23***	-2.37***	-2.42***	-1.71***	-1.75***
	(0.06)	(0.06)	(0.08)	(0.12)	(0.13)	(0.04)	(0.07)
$\text{Share}_{i,2013}$	3.73***			3.21***		4.50***	
	(0.07)			(0.26)		(0.02)	
$\text{Share}_{i,2013} \times 1_{t\geq \text{Oct. 2016}}$	-1.41***			-0.89**		-2.27***	
	(0.13)			(0.27)		(0.09)	
$\text{Share}_{i,2012}$		3.42***			2.93***		4.30***
		(0.04)			(0.23)		(0.06)
$\text{Share}_{i,2012} \times 1_{t\geq \text{Oct. 2016}}$		-1.31***			-0.81**		-2.19***
		(0.15)			(0.26)		(0.14)
$\text{Share}_{i,2011}$			2.60***				
			(0.05)				
$\text{Share}_{i,2011} \times 1_{t\geq \text{Oct. 2016}}$			-0.03				
			(0.18)				
Constant	-1.97***	-1.80***	-1.22***	-1.82***	-1.66***	-2.35***	-2.23***
	(0.03)	(0.03)	(0.03)	(0.10)	(0.10)	(0.02)	(0.05)
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
F-statistic for Instruments	409.1	217.3	223.7	416.6	221.2	593.0	258.9
Adj. R^2	0.68	0.67	0.55	0.59	0.57	0.71	0.70
Observations	491	491	1634	775	775	459	459

Table 23. The Relative Demand Function of Institutional Investors for Prime versus Government Money Market Funds (MMFs): Reduced-form Regression. $\log(q^P_{it}/q^G_{it})$ is the log ratio of the TNA of prime and government institutional MMF share classes of family i in month t; $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government institutional classes in any month of the regression sample. The table reports the estimates of the reduced-form regression for a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq \text{Oct. 2016}}$ as instruments for the family's Spread_{it} and $\text{Spread}_{it} \times 1_{t\geq \text{Oct. 2016}}$, where Spread_{it} is the spread between the (value-weighted) net yield of government and prime institutional classes of family i in month t, which is used to measure $\log(p^P_{it}/p^G_{it})$. A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share_{it}). In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.



(a) Specialization as in 2012



(b) Specialization as in 2013

Figure 14. Net-Yield Spread between Government and Prime Retail Money Market Funds (MMFs) by Family Specialization. The sample is all US MMF families that have both government and prime retail funds in any month from January 2015 to September 2017. Specialization in the prime MMF sector is measured as the share of a family's prime MMF business in the family's total MMF business in 2012 (left panel) and in 2013 (right panel). The blue line is the net-yield spread of families more specialized in government MMFs (i.e., in the bottom 33% of the prime-share distribution); the red line is the net-yield spread of families more specialized in prime MMFs (i.e., in the top 33% of the prime-share distribution).

	Spread$_{it}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$1_{t\geq\text{Oct. 2016}}$	-25.39***	-29.04***	-35.82***	-25.16***	-28.70***	-14.53**	-21.00***
	(3.45)	(3.81)	(4.93)	(3.34)	(3.73)	(4.23)	(5.23)
Share$_{i,2013}$	0.74			-1.32		0.03	
	(0.41)			(1.42)		(0.06)	
Share$_{i,2013}$ × $1_{t\geq\text{Oct. 2016}}$	5.31			7.38		-8.97	
	(5.89)			(5.57)		(5.30)	
Share$_{i,2012}$		0.37			-1.49		0.01
		(0.20)			(1.36)		(0.05)
Share$_{i,2012}$ × $1_{t\geq\text{Oct. 2016}}$		10.32			12.18		-1.25
		(6.49)			(6.16)		(6.82)
Share$_{i,2011}$			-0.27				
			(0.21)				
Share$_{i,2011}$ × $1_{t\geq\text{Oct. 2016}}$			19.11**				
			(7.87)				
Constant	-0.88**	-0.64***	-0.25*	-1.10	-0.97	-0.20***	-0.18***
	(0.25)	(0.12)	(0.12)	(0.85)	(0.91)	(0.02)	(0.02)
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
Adj. R^2	0.43	0.43	0.55	0.42	0.42	0.42	0.42
Observations	555	555	1794	860	860	485	485

Table 24. The Relative Demand Function of Retail Investors for Prime versus Government Money Market Funds (MMFs): First-stage Regression for the Spread. $\log(p_{it}^P/p_{it}^G)$ is measured as the spread between the (value-weighted) net yield of government and prime retail classes of family i in month t; $1_{t\geq\text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government retail classes in any month of the regression sample. The table reports the estimates of the first stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq\text{Oct. 2016}}$ as instruments for the family's Spread$_{it}$ and Spread$_{it}$ × $1_{t\geq\text{Oct. 2016}}$. Specifically, the table reports estimates for when the dependent variable in the family's Spread$_{it}$. A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share$_{it}$). In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

	Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$1_{t\geq \text{Oct. 2016}}$	-26.26***	-29.68***	-36.08***	-26.26***	-29.68***	-14.73**	-21.18***
	(3.44)	(3.81)	(4.93)	(3.44)	(3.81)	(4.23)	(5.23)
Share$_{i,2013}$	0.00			0.00		0.00	
	(0.00)			(0.00)		(0.00)	
Share$_{i,2013}$ × $1_{t\geq \text{Oct. 2016}}$	6.06			6.06		-8.94	
	(5.88)			(5.88)		(5.30)	
Share$_{i,2012}$		0.00			0.00		0.00
		(0.00)			(0.00)		(0.00)
Share$_{i,2012}$ × $1_{t\geq \text{Oct. 2016}}$		10.69			10.69		-1.24
		(6.49)			(6.49)		(6.82)
Share$_{i,2011}$			0.00				
			(0.00)				
Share$_{i,2011}$ × $1_{t\geq \text{Oct. 2016}}$			18.83**				
			(7.86)				
Constant	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
Adj. R^2	0.44	0.44	0.56	0.50	0.51	0.42	0.42
Observations	555	555	1794	860	860	485	485

Table 25. The Relative Demand Function of Retail Investors for Prime versus Government Money Market Funds (MMFs): First-stage Regression for the Spread Interacted with the Regulation Dummy. $\log(p^P_{it}/p^G_{it})$ is measured as the spread between the (value-weighted) net yield of government and prime retail classes of family i in month t; $1_{t\geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government retail classes in any month of the regression sample. The table reports the estimates of the first stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t\geq \text{Oct. 2016}}$ as instruments for the family's Spread$_{it}$ and Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$. Specifically, the table reports estimates for when the dependent variable in the family's Spread$_{it}$ × $1_{t\geq \text{Oct. 2016}}$. A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share$_{it}$). Estimated coefficients on Share$_{i,2013}$, Share$_{i,2012}$, and Share$_{i,2011}$are mechanically zero and thus are omitted. In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

government-prime net-yield spread and on the exogenous covariates, are almost never significant and often have the opposite sign than what we expect; the first-stage F-statistic across the different specifications never exceeds 2, confirming the weakness of our identification strategy and the unreliability of second-stage results for retail classes.

E Data construction

We download all N-MFP forms filed with the SEC for the months between November 2010 and September 2017 from the EDGAR database. We construct four intermediate datasets from the XML portion of the forms: a fund-information dataset, a share-class information dataset, a portfolio-information dataset (containing information at the security level), and a repo-information dataset (containing information on the collateral backing the repos in the funds' portfolios). To match observations across these datasets, we use the unique accession number assigned by the SEC to each N-MFP filing.

Money market funds (MMFs) can amend their N-MFP filings after the initial submission. As of May 31, 2018, for the November 2010–September 2017 period, we identify $3,255$ amended filings out of a total of $51,119$ (i.e., 6%). For each fund-month (identified using the report date), we retain only observations associated with the accession number of the most recent filing (identified using the filing date) and drop filings that are later amended.

We identify 254 filings submitted by unmarked feeder funds (Item A.7). Feeder funds are funds that invest 100% of their assets in another fund, called the master fund. In total, from November 2010 to September 2017, we identify $4,830$ feeder fund-months, i.e., 9.6% of the total number of unique fund-months and 7.9% of the total MMF TNA. Consistent with the literature (e.g., Chernenko and Sunderam, 2014), we drop feeder funds to avoid double-counting.

After dropping amended filings and feeder funds, the fund-general information dataset contains $45,467$ fund-month observations with the following fields: accession number, month, fund (SEC Series ID; Item 4), fund type (Item A.10), family name (Item A.2), total net assets (TNA; Item A.16), total liabilities (Item A.15), and weighted average portfolio maturity (WAM; Item A.11).

				$\log(q_{it}^P/q_{it}^G)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Spread_{it}	5.03	12.66	-21.88	-2.61	-2.79	138.04	424.67
	(2.72)	(6.62)	(16.40)	(2.84)	(2.57)	(247.55)	(1940.29)
$\text{Spread}_{it} \times 1_{t \geq \text{Oct. 2016}}$	-4.17	-12.16	22.16	3.47	3.29	-138.58	-428.50
	(2.85)	(6.63)	(16.40)	(2.68)	(2.48)	(247.55)	(1940.41)
$1_{t \geq \text{Oct. 2016}}$	15.50	4.65	14.52*	22.88	15.36	-37.68	-160.94
	(20.18)	(8.26)	(7.40)	(19.36)	(7.91)	(49.43)	(584.16)
Constant	2.90*	5.87	-8.54	-4.48	-4.84	25.44	75.67
	(1.12)	(2.75)	(6.59)	(4.68)	(4.39)	(48.99)	(356.80)
Instrument	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$	$\text{Share}_{i,2011}$	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$	$\text{Share}_{i,2013}$	$\text{Share}_{i,2012}$
Long Sample			Yes				
With Transition				Yes	Yes		
No Treasury Funds						Yes	Yes
CD F-statistic	0.9	1.4	1.5	1.0	1.1	0.0	0.0
Observations	555	555	1794	860	860	485	485

Table 26. The Relative Demand Function of Retail Investors for Prime versus Government Money Market Funds (MMFs): Second-stage Regression. $\log(q_{it}^P/q_{it}^G)$ is the log ratio of the TNA of prime and government retail MMF share classes of family i in month t; $\log(p_{it}^P/p_{it}^G)$ is measured as the spread between the (value-weighted) net yield of government and prime retail classes of family i in month t; $1_{t \geq \text{Oct. 2016}}$ is a dummy for October 2016 onward. The panel is the unbalanced panel of MMF families with both prime and government retail classes in any month of the regression sample. The table reports the estimates of the second stage of a two-stage least square regression that uses a family's specialization in the prime MMF business and its interaction with $1_{t \geq \text{Oct. 2016}}$ as instruments for the family's Spread_{it} and $\text{Spread}_{it} \times 1_{t \geq \text{Oct. 2016}}$ (the first stage is reported in Appendix **D**). A family's specialization in prime MMFs is measured as the share of prime MMFs in the family's total MMF business (Share_{it}). In Columns 1 and 2, the sample is January 2015–September 2017 excluding the transition period November 2015–October 2016 and family specialization is measured as in 2013 and 2012, respectively. In Column 3, the sample is January 2012–September 2017 excluding the transition period and family specialization is measured as in 2011. Columns 4 and 5 replicate Columns 1 and 2 but include the transition period. Columns 6 and 7 replicate Columns 1 and 2 but exclude treasury MMFs. Standard errors (in parentheses) are HACSC robust from Driscoll and Kraay (1998) with 3-month lags. Significance values are computed according to critical values from fixed-b asymptotics derived by Vogelsang (2012). ***, **, and * represent 1%, 5%, and 10% statistical significance.

The share-class information dataset contains 123, 674 class-month observations with the following fields: accession number, class (SEC Class ID; Item B.1), and TNA (Item B.3); we manually fix 92 incorrectly reported TNA values.[35]

The portfolio-information portfolio dataset contains 5, 106, 515 security-month observations with the following fields: accession number, asset class (e.g., US Treasury debt, certificate of deposit; Item C.6), and the share of the fund's TNA invested in the security (Item C.19); we drop 1, 717 security-month duplicates from the dataset. Kacperczyk and Schnabl (2013) and La Spada (2018) show that certificates of deposit (CDs) and commercial papers (CPs) are the riskiest asset classes available to MMFs; because of this, we define CDs and CPs as the risky assets in a fund's portfolio.

We match each repo in the portfolio-information dataset with the corresponding collateral assets in the repo-information dataset. The repo-information dataset contains the following fields: accession number, repo identifier (the repo's ordinal number in the list of portfolio securities as reported in the XML file), collateral category (Item C.8.h), and collateral value (Item C.8.g). For each repo contract, we classify the collateral based on the category of the individual collateral with the highest dollar value.

We also download data on US MMFs from iMoneyNet, a commonly-used private provider of information about MMFs. In particular, we use share-class level data at the monthly frequency for the March 2008–September 2017 period, with the following fields: month, SEC Series ID, SEC Class ID, fund type (Category Historical and SubCategory Historical), family name (Historical Fund Complex), investor type (Investor Categories Historical), inception date, TNA (Share Class Assets), one-month annualized simple gross yield (1-Mo GSAY), and one-month annualized simple net yield (1-Mo NSAY).

We use only iMoneyNet data for the analysis of the 2008 MMF run because Form N-MFP is not available before November 2010. Moreover, for the more recent analysis (November 2010 onward), we merge the N-MFP data with the iMoneyNet dataset based on month, SEC Series ID, and SEC Class ID so as to be able to classify a particular share-class into institutional and retail (this classification is available in iMoneyNet, in the Investor Categories Historical field, but not in form N-MFP). When merging the data, we drop iMoneyNet data with missing SEC identifiers (16

[35] In 12 cases, the share-class TNA was negative (and we set it as zero); in 80, the sum of the share class TNA did not match the TNA from the fund-information dataset.

observations out of 121,392). The iMoneyNet database also contains 1,948 duplicate class-month observations; that is, multiple entries for the same EDGAR class identifier in the same month; to match these duplicates with the N-MFP dataset, we collapse them by taking the sum of their TNA, weighted averages of yields using TNA as weights, the inception date of the oldest duplicate, and the type (i.e., institutional or retail) of the duplicate with the largest TNA.[36] Overall, iMoneyNet data matched with form N-MFP covers 108,194 of the 123,674 class-month observations in the N-MFP data, that is, 87% of class-month information. In terms of dollar value, the matched data covers 91% of the overall MMF TNA from November 2010 to September 2017; this coverage is stable over time, varying between 89% and 92% each month. Observations that cannot be matched to iMoneyNet are not included in all the analyses that distinguish between institutional and retail investors.

Finally, we manually consolidate MMF family names from N-MFP data and iMoneyNet into a standardized family identifier. From November 2010 onwards, we identify 139 distinct MMF families. For the March 2008–October 2008 period (i.e., around the 2008 MMF run), we identify 137 distinct MMF families. Family names from iMoneyNet tend to be cleaner than those from Form N-MFP; that is, the same MMF family shows up in iMoneyNet with only one name rather than several slightly different variants.[37] Hence, when available, we use iMoneyNet family names to assign standardized family identifiers to share classes.

To classify funds as prime, municipal, treasury, or agency MMFs, we use the type as reported in Form N-MFP (Item A.10). For those government funds that do not explicitly report if they are a treasury or an agency MMF, we use the iMoneyNet classification, and, when that is not available, a rule based on portfolio holdings[38] When neither form N-MFP nor iMoneyNet allow us to classify a fund, we classified a fund as a treasury MMF if it invests at least 80% of its TNA in Treasuries or repos

[36] The median relative error between the sum of iMoneyNet duplicates' TNA and their N-MFP counterparts is only 0.27%.

[37] E.g., the N-MFP dataset has the following names for the same family: "The Dreyfus Corporation", "Dreyfus Corporation," and "Dreyfus Corp;" iMoneyNet only has "Dreyfus".

[38] Before April 2016, the N-MFP form allowed government funds to self-report as "Treasury" or "Agency" funds. Starting from April 2016, the N-MFP form has included the options "Exempt Government," "Government/Agency" and "Treasury." Funds that self-reported as "Treasury" are classified as treasury funds. For funds that self reported as "Exempt Government" or "Government/Agency," we use the iMoneyNet classification, or, when not available, the portfolio rule. We do so because the distinction between "Exempt Government" and "Government/Agency" was only meant to to capture the difference between government MMFs that decide not to adopt a system of redemption gates and fees and those that do adopt gates and fees (as allowed by the 2014 SEC reform); that is, it did not aim to classify funds based on portfolio holdings.

backed by Treasuries; if not, the fund is classified as agency.[39]

The dataset on which we run our empirical analysis is at the monthly share class-level; it contains the following fields: month, class, fund, family, fund type, investor type, inception date, TNA, one-month annualized gross yield, one-month annualized net yield, the fund's WAM, and the share of risky assets in the fund's portfolio. For TNA, we use N-MFP data because they are cleaner and more precise; for yields, we use iMoneyNet data for the same reasons. Whenever we collapse class-level variables to higher levels of aggregation, we weight them by class-level TNA and compute averages.

We download month-end values of the VIX and of the Effective Federal Funds Rate from FRED; we use month-end values since the data reported in Form N-MFP are reported as of the last business day of the month.

[39]This is consistent with the so-called Names Rule (Rule 35d-1 of the Investment Company Act), which requires a fund to adopt a policy to invest (under normal circumstances) at least 80% of the value of its TNA in the particular type of investments suggested by the fund's name.