Internet Appendix **for "**Mutual Fund Incubation**"***

This appendix contains supplementary results for the paper "Mutual Fund Incubation." The appendix has three sections. The first section documents the impact of the incubation bias on tests of the flow-performance and performance-size relationships. The second section discusses the ticker creation date data and instructions for using the data. The third section contains a robustness check for the difference in incubated and non-incubated fund performance results.

A. The Impact of Incubation Bias on Fund Size, Flow, and Performance Inferences

The incubation strategy has important implications for researchers who work with mutual fund data. Because incubated funds have upward-biased returns during incubation but average returns post-incubation, including incubated fund data can affect inferences regarding mutual fund performance. To illustrate this effect, I reexamine two key results in the literature: the positive relationship between fund flow and performance (Sirri and Tufano (1998)) and the negative relationship between fund size and performance (Chen et al. (2004)).

A.1. Incubation and Tests of the Fund Flow-Performance Relationship

In this subsection, I revisit the Sirri and Tufano (1998) analysis of fund flow and performance, including and excluding incubation-period observations. I follow the framework used by Sirri and Tufano (1998), with two exceptions. First, Sirri and Tufano (1998) examine nonoverlapping annual observations from 1971 to 1990, whereas my analysis consists of overlapping monthly observations from 1998 to 2005. Although I use the same Fama and Macbeth (1973) cross-sectional regression framework as Sirri and Tufano, I calculate Newey-West (1987) standard errors with a 12-month lag to account for the overlapping observations. Second, the Sirri and Tufano fund sample only includes domestic equity funds from the aggressive growth, growth and income, and long-term growth investment objectives. Because the investment objective codes change during the sample period, I use the procedure described in Section II of the paper to identify a domestic equity sample. The results of this analysis are included in Table IA.I.

* Citation format: Evans, Richard B., 2010, Internet Appendix for "Mutual Fund Incubation," *Journal of Finance* 65, 1581-1611, http://www.afajof.org/supplements.asp. Please note: Wiley-Blackwell is not responsible for the content or functionality of any supporting information supplied by the author. Any queries (other than missing material) should be directed to the author of the article.

Table IA.I
Net Flows and Performance—Full Sample versus Incubation Filtered Sample

Table IA.I contains the average coefficient from a Fama and Macbeth (1973) regression of annual net flows into a mutual fund on fund characteristics. The sample consists of U.S. domestic equity funds in the CRSP sample from 1998 to 2005. The cross-sectional regressions are monthly, and Newey-West (1987) standard errors with 12 lags are calculated for the coefficients. Two different samples are run for each specification: the full sample (Full Sample), and the sample with the incubation-period data removed (No Incubated). The independent variables include the previous year's fund size (Log(FundTNA)), contemporaneous annual flows to the fund's investment objective (InvObjFlow), the fund's expenses (TotalExp) calculated as the expense ratio plus the value-weighted fund load amortized over seven years, and the standard deviation of the fund's monthly returns (StdDev) calculated for the previous 12 months. Also included are fractional performance ranks using the fund's total return over the previous year (TotRet) and the fund's one-Factor or Jensen's (1968) alpha (1-FactorAlpha). The performance measures are calculated as the fractional performance rank (i.e., the percentile rank of a fund's performance relative to all other funds in the sample for that date). Performance measures are separated into high (top or quintile 1), medium (middle or quintiles 2 to 4), and low (bottom or quintile 5) categories. The performance measures are calculated to give a piece-wise linear specification: TotRetRankLow = min(0.2,TotRetRank), TotRetRankMed = min(0.6, TotRetRank-TotRetRnkLow), and TotRetRankHigh = min(0.2, TotRetRank-TotRetRankMed-TotRetRankLow). The table reports the number of cross-sections from the Fama and Macbeth (1973) approach as well as the average number of observations per cross-section and the average adjusted-R^2 of the cross-sectional regressions.

	Full Sample		No Incubated		*p*-Value	Full Sample		No Incubated		*p*-Value
Variable	Estimate	*t*-stat	Estimate	*t*-stat	Coef. Diff.	Estimate	*t*-stat	Estimate	*t*-stat	Coeff. Diff.
Intercept	0.50	3.33	0.49	3.15	0.98	0.47	2.63	0.49	2.55	0.58
Log(Fund TNA)$_{i,t-1}$	–0.13	–7.59	–0.11	–6.43	0.01	–0.13	–7.71	–0.10	–6.78	0.01
InvObjFlow $_{i,t}$	0.78	3.98	0.80	3.62	0.98	0.79	3.86	0.80	4.22	0.91
TotalExp $_{i,t-1}$	0.10	0.03	–0.41	–0.19	0.45	–0.12	–0.04	–0.44	–0.20	0.49
StdDev $_{i,t-1}$	–0.78	–0.29	–1.82	–0.81	0.44	1.21	0.44	–0.07	–0.03	0.40
TotRetRankLow $_{i,t-1}$	0.26	1.00	0.37	1.08	0.47					
TotRetRankMed $_{i,t-1}$	0.63	6.94	0.57	6.34	0.28					
TotRetRankHigh $_{i,t-1}$	3.49	5.00	3.28	4.54	0.06					
1-FactorAlphaRankLow $_{i,t-1}$						0.04	0.18	–0.01	–0.03	0.64
1-FactorAlphaRankMed $_{i,t-1}$						0.66	6.19	0.61	5.25	0.06
1-FactorAlphaRankHigh $_{i,t-1}$						3.10	4.62	2.85	4.47	0.10
No. of Cross-Sections	96		96			96		96		
Avg. # Obs. Per Cross-Section	681		615			681		615		
Average Adjusted-R^2	9.3%		8.8%			9.1%		8.6%		

The dependent variable is annual percentage flow. I use two performance measures: total return and one-factor or Jensen's (1968) alpha calculated over the previous 12 months. I separate performance into high, medium, and low categories, where high refers to the top quintile of performance (quintile 1), medium to the middle three quintiles (quintiles 2 to 4), and low to the bottom quintile of performance (quintile 5). The performance measurement used in the analysis is the fund's fractional rank, where the rank is calculated using either the total return (*TotRetRank*) or Jensen's alpha (*1-FactorAlphaRank*) for all funds in the sample for a given year and month. The low-, medium-, and high-performance measures are calculated as *TotRetRankLow*=min(0.2, *TotRetRank*), *TotRetRankMed*=min(0.6, *TotRetRank-TotRetRankLow*), and *TotRetRankHigh*=min(0.2, *TotRetRank-TotRetRankMed-TotRetRankLow*) to create a piece-wise linear specification. The other independent variables in the regression include an intercept, the log of the fund's TNA, the contemporaneous annual flows to the fund's investment objective (in percentage), the total expenses of the fund (defined as the expense ratio plus the dollar-weighted average load of the fund amortized over seven years), and the standard deviation of the fund's monthly returns over the previous 12 months.

Table IA.I presents the results for the regression when incubation-period data are included (*Full Sample*) and when incubation-period fund data are removed (*No Incubated*). For non-incubated funds, flow data from the first year after inception would not be included in the regression because the independent variables include a lagged performance measure calculated over the previous year. Non-incubated flow data from the second year would be included, and it would be regressed on the performance measures calculated during the first year. For incubated funds, however, the first year of flow data post-incubation is included because they have a prior track record.

The total return results are similar in sign and statistical significance to the results reported in Sirri and Tufano (1998) except that there is a statistically significant relationship between flow and the medium-performance measures; however, the convex relationship between flow and performance is still evident. Looking at the *No Incubated* sample results, when the incubated fund data are removed, the relationship between flow and performance is not as convex. In particular, the coefficient on high performance (*TotRetRankHigh*) drops from 3.49 to 3.28, and the difference is statistically significant at the 10% level as shown by the *p*-value in the difference in coefficients column. Looking at the one-factor or Jensen's (1968) alpha results, we also see a drop in the high- (from 3.10 to 2.85) and medium-performance (from 0.66 to 0.61) coefficients that is significant at the 10% level.

Because incubated funds have upward-biased performance, the majority of the incubated observations in the regression fall into the high- and medium-performance categories. Because the average size of incubated funds immediately after incubation is small, the percentage flows are large relative to other observations. Looking at the sample statistics of the funds in the regression, the average (median) monthly net percentage flows of the incubated funds for the first year post-incubation is 14.2% (1.50%) versus 4.8% (0.18%) for all other observations. The dollar flows, however, present a very different picture. The average (median) monthly net dollar flow is $3.91 million ($0.07 million) for the incubated funds for the first year post-incubation, and it is $3.38 million ($0.17 million) for the non-incubated and the second-year or later post-incubation observations. Combining the artificially high performance of incubated funds with

the high percentage flows, the relationship between fund flow and fund performance is overstated. Removing the incubation-period fund data gives a more accurate estimate of this relationship.

A.2. Incubation and Tests of the Fund Size-Performance Relationship

In this subsection, I revisit the Chen et al. (2004) analysis of fund size and performance including and excluding incubation-period data. I follow the same methodology with two exceptions. First, while Chen et al. use the Fama and MacBeth (1973) regression approach for a monthly overlapping sample from 1962 to 1999, I use a panel regression approach, clustering standard errors by mutual fund, with yearly fixed effects interacted with investment objective for a monthly overlapping sample from 1998 to 2005.[1] Second, while I also limit my sample to domestic equity funds, the procedure for doing this is slightly different than in Chen et al. due to differences in investment objective codes over the two samples. The results from this analysis are included in Table IA.II.

Two different measures of monthly fund performance are used in the regression: one-factor alpha (Jensen [1968]) and 4-factor alpha (Fama and French [1993] and Carhart [1997]). To estimate these risk-adjusted measures, I follow the methodology of Chen et al. by separating the sample into size quintiles each month and then pooling all of the time-series and cross-sectional observations in each size quintile in order to calculate a set of factor loadings. I then use these factor loadings to calculate the monthly one- and four-factor alphas. I regress these performance measures on the past performance over the previous 12 months and lagged values of the log of the fund's total net assets (*Log(TNA)*), the log of family total net assets, the fund's turnover ratio, fund age in years, the fund's expenses, the share-class value-weighted fund load, fund flow over the previous year, and an intercept. The table contains two sets of results for each regression specification; the first uses the full sample (*Full Sample*), and the second uses the sample with incubation-period data removed (*No Incubated*). The table also reports the total number of observations, the number of clusters, the *p*-value of a test of the equivalence of the size (*Log(TNA)*) coefficient across the full sample and the incubation data-filtered sample, and the R^2 of the regression.

The results in Table IA.II are roughly consistent with the findings of Chen et al. The coefficient on lagged performance is positive and statistically significant. The coefficient on fund size is negative and statistically significant, and the coefficient on fund family size is positive and marginally statistically significant. One minor difference is that in Table IA.II the coefficient on age is positive and statistically significant, but it is negative and statistically insignificant in Chen et al.

[1] I also ran the regression using the Fama and MacBeth (1973) framework employed by Chen et al. (2004). While removing incubation-period data changes the coefficient on fund size in the same direction and by approximately the same magnitude as the panel regression analysis used here, I fail to find any statistically significant relationship between fund size and performance using either the full sample or the incubation-filtered sample. This may be due in part to the much shorter sample used here relative to the sample in Chen et al. (96 monthly cross-sections versus 432 monthly cross-sections).

Table IA.II
Fund Size and Performance—Full Sample versus Incubation Filtered Sample

Table IA.II contains the coefficients from a panel regression of fund performance on lagged fund characteristics. The reported standard errors are clustered by fund and yearly fixed effects interacted with fund investment objective are included in the regression. The sample consists of domestic equity funds from the CRSP database between 1998 and 2005. In columns 1 and 2 of the results, the one-factor or Jensen's alpha (1968) is used as the performance measure. In columns 3 and 4 of the results, the four-factor alpha (Fama and French (1993) and Carhart (1997)) is used as the performance measure. The dependent variable is a performance measure that is calculated in the same manner as Chen et al. (2004). Specifically, the sample is separated into total net assets quintiles and pooling the cross-section and time-series of observations, a set of factor loadings is calculated for each quintile. The monthly one-factor and four-factor alphas are calculated using these factor loadings. Two different samples are run for each specification: the full sample (Full Sample) and the sample with the incubation-period data removed (No Incubated). The independent variables include the past performance over the previous 12 months and lagged values of the log of the fund's total net assets (Log(TNA)), the log of family total net assets (Log(Family TNA)), the fund's turnover ratio (Turnover), fund age in years (Age), the fund's expenses (Expenses), the share class value-weighted fund load (Load), fund flow over the previous year (Flow), and an intercept. The table also reports the total number of observations, the number of clusters, the p-value of a test of the equivalence of the size (Log(TNA)) coefficient across the Full Sample and the No Incubated sample, and the R^2 of the regression.

	Full Sample		No Incubated		Full Sample		No Incubated	
Variable	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat
Intercept	–0.056	–0.48	–0.112	–0.96	–0.179	–1.54	–0.249	–2.15
1-Factor Alpha$_{i,\,t-1}$	0.013	12.61	0.011	9.33				
4-Factor Alpha$_{i,\,t-1}$					0.015	14.64	0.013	10.82
Log(TNA$_{i,\,t-1}$)	–0.069	–7.20	–0.059	–6.06	–0.054	–5.77	–0.042	–4.41
Log(Family TNA$_{i,\,t-1}$)	0.011	1.75	0.012	1.86	0.011	1.87	0.012	2.01
Turnover$_{i,\,t-1}$	–0.015	–2.36	–0.014	–2.16	–0.014	–2.33	–0.013	–2.09
Age$_{i,\,t-1}$	0.017	2.63	0.021	3.20	0.018	2.73	0.021	3.26
Expenses$_{i,\,t-1}$	–10.02	–3.41	–10.80	–3.72	–10.16	–3.53	–10.76	–3.74
Flow$_{i,\,t-1}$	0.005	1.22	0.001	0.37	0.006	1.29	0.002	0.43
Load$_{i,\,t-1}$	–0.501	–0.75	–0.561	–0.87	–0.482	–0.73	–0.572	–0.89
Number of Observations	77511		72369		77511		72369	
Number of Clusters	1395		1381		1395		1381	
p-Value Log(TNA), Full v. No Incubated	0.015				0.002			
Year*Invest.Obj. Fixed Effects	Yes		Yes		Yes		Yes	
R^2	3.0%		2.7%		3.4%		3.1%	

Comparing the fund-size coefficients between the full sample and incubation-filtered samples, we see that the negative relationship between size and performance is less pronounced once the incubation-period data are removed. As can be seen from the *p*-value of the difference in coefficients between the full and non-incubated samples, this difference is statistically significant. The impact of incubation on the fund size and performance relationship is clear from previous evidence in the paper. Table I of the paper shows that incubated funds have below-average TNA during incubation but post-incubation they have average TNA. Table II of the paper shows that incubated funds have above-average performance during incubation but average performance post-incubation. By including incubation-period data, the shift from small funds with artificially high performance during incubation to average-sized funds with average performance after incubation overstates the negative relationship between fund size and performance. Removing the incubation-period data in the analysis results in a less pronounced negative relationship between fund size and performance.

Overall, I find that including incubated funds in the analysis overstates the positive relationship between flow and performance and the negative relationship between fund size and performance. Because incubated funds have few assets under management immediately after incubation and therefore a smaller denominator in percentage calculations, these percentage-flow observations are larger in spite of having similar dollar flows to both non-incubated funds and incubated funds more than a year after incubation. The combination of these unusually large percentage flows with their upward-biased performance affects tests of the flow-performance relationship. Similarly, because incubated funds tend to be small during incubation with above-average performance but larger post-incubation with average performance, we would expect to observe a negative relationship between fund size and performance in samples of incubated funds. As a result, removing incubation-period data from the sample weakens the observed negative relationship between size and performance. This evidence points to the importance of controlling for incubation in tests of fund performance, size, and flows.

B. Ticker Creation Date Data

To identify incubated funds, I use ticker creation date data provided by the *NASD*. An Excel spreadsheet containing the raw data provided by the *NASD* is available online.[2] In this subsection, I describe the database, the filters to this data, and the procedure for merging the data with the *CRSP* mutual fund database.

The database consists of tickers and the date they were created and assigned to their respective funds by the *NASD*. The database is constructed from annual snapshots of currently active tickers taken each January from 1999 to 2006. For funds that were either merged or liquidated before 1998, the ticker creation date data may not be available. However, the data provide the ticker creation date for all funds that were alive in 1999, even if they were created much earlier.

The database has three variables: *Ticker*, *Creation Date*, and *Fund Name*. The process of merging the data with *CRSP* is as follows. First, I remove all of the observations with "TEST" in

[2]The spreadsheet is available in the Supplements & Datasets portion of the *Journal of Finance's* Website: http://www.afajof.org/supplements.asp.

the *Fund Name* variable. Second, I merge the *NASD* and *CRSP* databases by *Ticker*. Because the same ticker may be used by different funds over time, this merge may result in incorrect matches. To address this issue, I then hand check the data to make sure the *Fund Name* variable from the ticker creation data matches the fund name listed by *CRSP* for each ticker and its associated time period. Those observations for which I cannot correctly match the two fund names are removed from the sample.

While a given fund may have multiple share classes and consequently multiple tickers and ticker creation dates, the assessment of whether a fund is incubated occurs at the fund level. As a result, after merging the *NASD* and *CRSP* databases and confirming the matches, the third step is to identify the inception and end of incubation dates for the fund from the share class-level data. For all share classes of a given fund, I identify the date of the first monthly return included in the *CRSP* database.[3] I treat the earliest of these dates as the inception date of the fund. I then identify the earliest ticker creation date of all the share classes of the fund and treat this date as the end of incubation for the fund. I then use the difference between these dates as the estimate of how long the fund is incubated.

C. Incubation Bias Robustness

In Table II of the paper, I examine the difference in performance between incubated and non-incubated funds. These results show that incubated funds outperform non-incubated funds during incubation, but post-incubation, there is no statistically or economically significant difference between the two. Two results in this table, which suggest that overall market conditions may affect the analysis: the statistically significantly outperformance in total return terms for incubated funds (9.84%), and the post-incubation one-factor alpha outperformance of incubated funds (2.93%). To ensure that market conditions are not driving the results, I repeat the analysis in Table II after removing all return observations during the market downturn (August 2000 to September 2002). The results of this analysis are included in Table IA.III.

The table is separated into two panels. Panel A contains a comparison of the incubation-period performance of incubated funds with the first 36 months of performance of non-incubated funds. Panel B compares the first 36 months of performance post-incubation for incubated funds with the first 36 months of performance for non-incubated funds. Each panel has three columns. The first and second columns give the mean and median monthly performance of the incubated and non-incubated funds, respectively. The third column gives the annualized difference in the performance measure between the two.

As the table shows, even after removing the market downturn observations, there is still a statistically and economically significant difference in the four-factor and three-factor alphas between the incubated and non-incubated funds, but this difference disappears in the post-incubation-period performance results. Unlike Table II of the paper, however, there is no statistically significant difference in the means and medians of the one-factor alpha and in the total return means during and post-incubation. Only the difference in the total return medians for the incubation period is statistically significant.

[3] In previous versions of the analysis I used the *first_offer_dt* as a proxy for the fund inception date. Unfortunately, this variable has multiple reported values for some funds, and it isn't clear which value is correct.

Table IA.III
Incubated Fund Performance—Excluding Market Downturn

Table IA.III provides descriptive statistics of various return measures for incubated and non-incubated funds. The sample consists of domestic equity mutual funds from the CRSP database that were created between 1996 and 2005. The monthly return data from the analysis exclude data from the market downturn (August 2000 to September 2002). The mean, median, and asterisks that indicate the statistical significance of each value from a two-sided *t*-test and a sign test of the difference of the variable from zero are reported. The table also reports the annualized difference between the mean and median values and asterisks that indicate the statistical significance of the differences from a two-sample T-test and a non-parametric alternative, the Wilcoxon rank-sum test. The asterisks denote statistical significance as follows: *** significant at 0.1%, ** significant at 1%, and * significant at 5%. Panel A compares the incubation-period performance of incubated funds to non-incubated funds. Panel B compares the post-incubation-period performance of incubated funds to non-incubated funds. Six return measures are calculated: investment objective alpha, four-factor alpha, three-factor alpha, one-factor alpha, Sharpe ratio, and the total return. The means and medians are given in percentage per month while the differences are given in annual terms. The investment objective alpha is the fund's average return less the average return for all funds with the same investment objective as identified by CRSP. The one-factor alpha is Jensen's (1968) alpha. The three-factor alpha uses the three-factor model of Fama and French (1993). The four-factor alpha combines the three Fama-French (1993) factors with a momentum factor (Carhart (1997)). The Sharpe ratio was first proposed by Sharpe (1966).

Panel A. Incubation-period Performance

	Incubated Funds (240 Funds) *t* = Incubation Period		Non-incubated Funds (805 Funds) *t* = 1 to 36 Months		Annualized Difference in	
Variable	Mean	Median	Mean	Median	Mean	Median
Investment Obj. Alpha	0.20% **	0.14% *	0.20% ***	0.10% ***	–0.07%	0.50%
4-Factor Alpha	0.47% ***	0.24% ***	0.23% ***	0.05%	2.86% ***	2.30% ***
3-Factor Alpha	0.41% ***	0.21% ***	0.22% ***	0.02%	2.25% **	2.34% ***
1-Factor Alpha	0.17% *	0.05%	0.31% ***	0.08%	–1.77%	–0.39%
Sharpe Ratio	0.206 ***	0.217 ***	0.201 ***	0.218 ***	0.018	–0.004
Total Return	1.70% ***	1.64% ***	1.62% ***	1.40% ***	0.96%	2.86% *

Panel B. Post-incubation-period Performance

	Incubated Funds (240 Funds) *t* = 1 to 36 Months		Non-incubated Funds(805 Funds) *t* = 1 to 36 Months		Annualized Difference in	
Variable	Mean	Median	Mean	Median	Mean	Median
Investment Obj. Alpha	0.18% *	–0.01%	0.20% ***	0.10% ***	–0.25%	–1.25%
4-Factor Alpha	0.27% ***	–0.03%	0.23% ***	0.05%	0.43%	–0.91%
3-Factor Alpha	0.25% ***	–0.01%	0.22% ***	0.02%	0.37%	–0.28%
1-Factor Alpha	0.48% ***	0.12% *	0.31% ***	0.08%	1.99%	0.49%
Sharpe Ratio	0.198 ***	0.234 ***	0.201 ***	0.218 ***	–0.008	0.055
Total Return	1.60% ***	1.35% ***	1.62% ***	1.40% ***	–0.34%	–0.63%

REFERENCES

Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, 2004, Does fund size erode mutual fund performance? The role of liquidity and organization, *American Economic Review* 94, 1276–1302.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

Fama, Eugene F., and James D. MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 81, 607–636.

Jensen, Michael C., 1968, The performance of mutual funds in the period 1945–1964, *Journal of Finance* 23, 389–416.

Newey, Whitney K., and Kenneth D. West, 1987, A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, *Econometrica* 55, 703–708.

Sharpe, William F., 1966, Mutual fund performance, *Journal of Business* 39, 119–138.

Sirri, Erik R., and Peter Tufano, 1998, Costly search and mutual funds flows, *Journal of Finance* 53, 1589–1622.