Online Appendix to Accompany "Do Individual Investors Ignore Transaction Costs?"

This Online Appendix includes Tables A1, A2, A3, A4 and A5 that we refer to in the main body of our paper "Do Individual Investors Ignore Transaction Costs?" In these tables we conduct further robustness tests to verify our findings in the paper.

A.1. Holding Period Decisions for Equities in the Most Illiquid Quintile

In Table A1, we rank all stocks by the Amihud illiquidity ratio and create a dummy variable (AdjIlliq Dum) that takes on a value of one if the stock belongs to the highest illiquidity quintile. This makes it easier to interpret our results. The hazard ratios corresponding to the dummy variables have an intuitive interpretation. They indicate the probability of a sale (conditional upon no sale up to that point) given that the underlying stock belongs to the highest illiquidity group divided by the probability of a sale given that the stock does not belong to that group. We find that a stock in the highest illiquidity group is approximately 0.8 times as likely (20% less likely) to be sold as a stock not belonging to that group. In alternative specifications in models (1) through (4), we control for investor characteristics, stock characteristics and in some cases use household stratification to control for household-specific effects. We obtain quantitatively and qualitatively similar results in all specifications. The average investor is cognizant of liquidity and pays attention to the transaction costs of the stocks she trades. We refer to Table A1 and discuss its findings in page 20 of the main text as well as in footnote 8 on page 15.

Table A1: Hazard Regressions with Transaction Costs Dummy in the US

This table reports hazard ratios from the holding period regressions where the conditional probability of sale is the dependent variable for the US sample. Independent variables consist of a transaction's costs measure and a set of investor demographic and trade variables as defined in Table 2. Calendar month dummies (not reported) are twelve dummy variables that equal one if the sale transaction happens during the specific month. Year dummies (not reported) equal one for the year during which a transaction happens. Robust standard errors are adjusted as in Lin and Wei (1989). Ties are handled using the Efron procedure. The Wald test is used for each additional set of regressors. The *p*-values are reported below each coefficient. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Hazard Regressions with Transaction Costs Dummy				
	(1)	(2)	(3)	(4)
AdjIlliq Dum	0.866***	0.772***	0.818***	0.794***
	<.0001	<.0001	<.0001	<.0001
Firm Characteristics	No	No	Yes	Yes
Demographic Variables	No	No	No	Yes
Trade Variables	No	No	No	Yes
Household stratification	No	Yes	Yes	No
Firm stratification	No	Yes	Yes	Yes
Calendar month dummies	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes
Observations	799,469	799,469	589,794	115,147
Wald test	<.0001	<.0001	<.0001	<.0001

A.2. Controlling for the Impact of Day-Traders on Our Findings

To address the possibility that our results are driven by day traders, we repeat our analyses excluding holding periods of 1 day as well as 1 and 2 days in our sample. The results are reported in Table A2 below. Panel A reports results excluding 1-day holding periods and Panel B reports results excluding 1- and 2-day holding periods. Overall, our results are similar to those reported earlier. We refer to our findings in A.2. in footnote 12 in the main text on page 19.

Table A2: Controlling for the Impact of Day-Traders

This table examines the impact of transaction costs on individual investors' holding periods in the US using a hazard model framework. To reduce the potential impact day traders and day trading have on our results, we exclude observations with one-day holding periods in Panel A and exclude observations with one-day and two-day holding periods in Panel B. In both Panels A and B, the conditional probability of sale is the dependent variable. The proxy for transaction costs is the adjusted Amihud illiquidity ratio (AdjIlliq) as defined in Table 2. Other independent variables include a set of firm characteristics, demographic controls, and trade variables. All of the control variables are also defined as in Table 2. Calendar year and month dummies (not reported) are included in all specifications. Robust standard errors are adjusted as in Lin and Wei (1989). Ties are handled using the Efron procedure. The Wald test is used for each additional set of regressors. The *p*-values are reported below each coefficient. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Panel A: Excluding observations with one-day holding periods

	(1)	(2)	(3)	(4)
AdjIlliq	0.982***	0.979***	0.980***	0.982***
	<.0001	<.0001	<.0001	<.0001
Firm Characteristics	No	No	Yes	Yes
Demographic Variables	No	No	No	Yes
Trade Variables	No	No	No	Yes
Household Stratification	No	Yes	Yes	No
Firm Stratification	No	Yes	Yes	Yes
Calendar year/month dummies	Yes	Yes	Yes	Yes
Observations	793,182	793,182	585,274	114,021
Wald test	<.0001	<.0001	<.0001	<.0001

Panel B: Excluding observations with one-day and two-day holding periods

	(1)	(2)	(3)	(4)
AdjIlliq	0.982***	0.979***	0.979***	0.982***
	<.0001	<.0001	<.0001	<.0001
Firm Characteristics	No	No	Yes	Yes
Demographic Variables	No	No	No	Yes
Trade Variables	No	No	No	Yes
Household effects	No	Yes	Yes	No
Firm fixed effects	No	Yes	Yes	Yes
Calendar year /month dummies	Yes	Yes	Yes	Yes
Observations	783,500	783,500	578,126	113,061
Wald test	<.0001	<.0001	<.0001	<.0001

A.3. Impact of Transaction Costs at the Time of Purchase or Sale on Holding Period Decisions in the United States

In the paper, we examine the impact of average transaction costs on households' holding period decisions. Our measures are meant to capture both buy- and sell-related costs. It is possible that individual investors may care more about the trading costs incurred at the time of purchase rather than at the time of sale. In order to better understand whether there is asymmetry in how purchase and sale transaction costs incurred are incorporated in holding period decisions, we investigate the impact of buy and sell transactions separately in the hazard regression.

In particular, following Barber and Odean (2000), for each trade we calculate the closing price spread for purchases and sales separately. *SprBuy* is the spread for purchases and *SprSell* is the spread for sales. *SprSell* is calculated as (closing price from CRSP / actual sale price) - 1. *SprBuy* is calculated as -1 * (closing price from CRSP / actual buy price - 1). We run our main hazard specification using the two transaction costs separately. We report the results in Table A3.

Panel A of Table A3 uses *Sprbuy*, while Panel B uses *SprSell*. In column (1) of Panel A, we show that the estimated hazard ratio for *SprBuy* is 0.992 without controlling for stock or investor characteristics. It is less than one and statistically significant, suggesting that the sale probability of a stock declines with higher transaction costs calculated at the time of the purchase. This would mean that an individual investor that acquires a more illiquid stock is more likely to continue holding that stock. Controlling for heterogeneity among households and stocks leads to stronger results as the hazard ratio is reduced in all specifications in columns (2) through (6), to as low as 0.963 in column (4), suggesting that a one standard deviation increase in *SprBuy* would lead to an up to 11% reduction in the likelihood of a subsequent sale. These results are consistent with our analyses in Tables 2 and 3 in the paper, confirming that investors' holding periods are longer for stocks with higher transaction costs incurred at the time of the purchase. In Panel B of Table A3, we use transaction costs at the time of the sale (*SprSell*) and confirm earlier results reported in Panel A as well as results reported in Tables 2 and 3 from the paper.

We discuss our findings in Table A3 on page 21 of the main text.

Table A3: Impact of Buy / Sell Transaction Costs on Holding Period Decisions

This table examines the impact of transaction costs measured at the time of purchase and sales on individual investors' holding periods in the US between 1991 and 1996 using a hazard model framework. In both Panels A and B, the conditional probability of sale is the dependent variable. Panel A uses transaction costs realized at the time of purchase. Sprbuy is estimated following Barber and Odean (2000) as -1 * (closing price from CRSP/actual buy price - 1) and captures the transaction costs of stocks at the time of purchase. Panel B uses transaction costs realized at the time of the sale, which is also estimated following Barber and Odean (2000) as (closing price from CRSP/actual sale price) -1. Other independent variables include a set of firm characteristics, demographic controls, and trade variables. All of the control variables are as defined in Table 2. Calendar year and month dummies (not reported) are included in all specifications. Robust standard errors are adjusted as in Lin and Wei (1989). Ties are handled using the Efron procedure. The Wald test is used for each additional set of regressors. The *p*-values are reported below each coefficient. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Panel A: Impact of Buy-related Transaction Costs on US Households' Holding Period Decisions						
	(1)	(2)	(3)	(4)	(5)	(6)
SprBuy	0.992***	0.966***	0.985***	0.963***	0.985***	0.987***
	<.0001	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Demographic Variables	No	No	No	No	Yes	Yes
Trade Variables	No	No	No	No	Yes	Yes
Household Stratification	No	Yes	No	Yes	No	No
Firm Stratification	No	Yes	No	No	No	Yes
Calendar year/month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	778,052	778,052	575,111	575,111	111,353	111,353
Wald test	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Panel B: Impact of Sell-related Transaction Costs on US Households' Holding Period Decisions						
	(1)	(2)	(3)	(4)	(5)	(6)
SprSell	0.997***	0.993***	0.993***	0.992***	0.988***	0.986***
	<.0001	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Demographic Variables	No	No	No	No	Yes	Yes
Trade Variables	No	No	No	No	Yes	Yes
Household Stratification	No	Yes	No	Yes	No	No
Firm Stratification	No	Yes	No	No	No	Yes
Calendar year/month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	530,214	530,214	399,945	399,945	80,003	80,003
Wald test	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

A.4. Impact of Transaction Costs at the Time of Purchase (Sale) on Holding Period Decisions in Finland

In Panels A and B of Table A4, we repeat analyses to those conducted in Panels A and B of Table A3 using the individual-level trading data from Finland instead of the individual-level trading data from the US. We find results consistent with our findings in the US. We discuss our findings in Table A4 on page 21 of the main text.

Table A4: Impact of Buy / Sell Transaction Costs on Holding Period Decisions, Finland

This table examines the impact of transaction costs on individual investors' holding periods in Finland using a hazard model framework as above. In both Panels A and B, the conditional probability of sale is the dependent variable. Panel A uses SprBuy to measure transaction costs captured at the time of purchase, while Panel B uses SprSell to measure transaction costs realized at the time of sales. Both SprBuy and SprSell are defined as in Table A3. Independent variables include firm characteristics, a set of demographic controls, and trade variables. All variables are defined as in Table 2 of the paper. We further control for calendar year and month dummies. For brevity, estimated hazard ratios on the year and month dummy variables are not reported. Robust standard errors are adjusted as in Lin and Wei (1989). Ties are handled using the Efron procedure. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Panel A: Impact of Buy-related Transaction Costs on Finnish Households' Holding Period Decisions

	(1)	(2)	(3)	(4)	(5)	(6)
SprBuy	0.986***	0.963***	0.987***	0.962***	0.987***	0.986***
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Demographic Variables	No	No	No	No	Yes	Yes
Trade Variables	No	No	No	No	Yes	Yes
Household Stratification	No	Yes	No	Yes	No	No
Firm Stratification	No	Yes	No	No	No	Yes
Calendar year/month dummies	Yes	Yes	Yes	Yes	Yes	Yes
N Observation	1,804,860	1,804,860	1,440,182	1,440,182	865,758	865,758
Wald test	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Panel B: Impact of Sell-related Transaction Costs on Finnish Households' Holding Period Decisions

	(1)	(2)	(3)	(4)	(5)	(6)
SprSell	0.998***	0.999	0.995***	0.998**	0.995***	0.998***
	<.0001	0.168	<.0001	<.0001	<.0001	<.0001
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Demographic Variables	No	No	No	No	Yes	Yes
Trade Variables	No	No	No	No	Yes	Yes
Household Stratification	No	Yes	No	Yes	No	No
Firm Stratification	No	Yes	No	No	No	Yes
Calendar year/month dummies	Yes	Yes	Yes	Yes	Yes	Yes
N Observation	1,727,388	1,727,388	1,271,717	1,271,717	823,468	823,468
Wald test	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

A.5. Changes in Transaction Costs after Stock Splits

We verify empirically that stock splits increase liquidity and reduce transaction costs for the sample of stocks in our dataset. We identify a total of 3,586 stock splits that took place in the US between 1991 and 1996 for our sample. We remove reverse splits and splits that have a split factor of less than 0.25 (717 in total). Our final sample includes 2,869 forward split events. To examine how transaction costs change following stock splits, we regress the monthly transaction cost measure (*AdjIlliq*) on a time-period indicator, *After-Split Dummy*, which equals one if a month falls within the 6-month, 9-month, or 12-month period subsequent to the split event, and zero otherwise. We examine how transaction costs change within a certain period subsequent to stock splits, as we expect the effect of splits on transaction costs to decline over time. We discuss our findings in Table A5 on page 24 of the main text.

Table A5 presents the results. In columns (1) and (2), we report the results for the 6-month event window. In columns (3) and (4) we report results for the 9-month event window, and finally in columns (5) and (6) we report results for the 12-month event window. Regressions reported in columns (2), (4) and (6) include stock-level controls for size, book-to-market, and momentum.

We find that the estimated coefficient on the *After-Split Dummy* is always negative and statistically significant, suggesting that transaction costs, proxied by the adjusted Amihud illiquidity ratio *AdjIlliq*, decrease after stock splits. For example, in column (2), we observe that the coefficient on the *After-Split Dummy* is -0.186 after controlling for stock characteristics. Considering that the median US stock has an adjusted Amihud illiquidity ratio of 1.36 (from Table 1 Panel B), the estimated -0.186 coefficient on the *After-Split Dummy* suggests that transaction costs decrease by about 14% for the median stock after a split. Likewise, the estimated coefficient reported in column (4) (-0.248) suggests that transaction costs decrease by about 18% within nine months after a split.

Table A5: Change in Transaction Costs around Stock Splits

This table reports the changes in transaction costs for splitting stocks in the US around their ex-split dates. The final sample includes 2,869 forward stock splits during our sample period with a split factor larger than or equal to 0.25. We estimate an OLS regression of stock transaction costs on a time period indicator, After-Split Dummy, controlling for size, book-to-market, and momentum. The dependent variable is the monthly adjusted Amihud illiquidity ratio (AdjIlliq). Size, book-to-market, and momentum are estimated monthly. We look at the changes in transaction costs in specific event windows, namely 6, 9, and 12 months after stock splits. The time period indicator After-Split Dummy equals one for splitting stocks in months that fall within the specified event window subsequent to the splits, otherwise zero. Each coefficient reported below for the After-Split Dummy comes from an individual OLS regression. For brevity, the coefficients for size, book-to-market and momentum are excluded. For each event window, we first report OLS results without firm controls and followed by results with firm controls in the adjacent columns. The *p*-values are reported below each estimated coefficient. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

Window	6 months		9 months		12 months	
	(1)	(2)	(3)	(4)	(5)	(6)
After-Split Dummy	-0.193*** <.0001	-0.186*** <.0001	-0.250*** <.0001	-0.248*** <.0001	-0.293*** <.0001	-0.289*** <.0001
Stock Controls	No	Yes	No	Yes	No	Yes
Observations	31,652	27,703	47,271	40,488	62,744	52,484
Adj. R^2	0.005	0.044	0.008	0.046	0.011	0.048