Strategic Distortions in Analyst Target Prices in the Presence of Short-Term Institutional Investors

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ABSTRACT

This study identifies a new source of conflicts of interest in analyst research that originates from the ownership composition of a stock. We document an economically and statistically significant increase in bias in analyst target prices, but not in earnings estimates, in the presence of short-term institutional investors. Analysts bias target prices, but not earnings estimates, because this strategy reduces the likelihood the market will recognize their catering behavior. Correspondingly, we find that the market fails to see through analyst incentives and reacts favorably to target price revisions for stocks with high short-term ownership. Short-term institutional investors take advantage of temporary stock overpricing to offload their holdings to retail traders. They also reward brokers engaging in this catering activity by increasing their ownership in other companies covered by these brokers.

JEL classifications: G14; G24; G29; D82; D83

Keywords: Target prices; Earnings forecasts; Strategic distortions; Forecast bias

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1. Introduction

Studies document that institutional investors curb optimism in analyst forecasts as they channel "soft dollars" in trade commissions through brokers offering less biased research (Frankel et al. 2006; Ljungqvist et al. 2007).[1] However, previous research ignores likely heterogeneity in preferences for unbiased research among institutional investors with short-term institutional investors favoring optimistically biased research that facilitates profitable trades. To please short-term investors, analysts can engage in strategic distortions where they channel their optimism through target prices (TPs), but not earnings-per-share estimates (EPS). Analysts bias their TPs, but not EPS forecasts, because (1) it is easier to channel the bias through a forecast with *ex-ante* lower expected accuracy[2], and (2) this strategy reduces the likelihood the market will recognize that analysts cater to short-term institutional investors.[3] If the market fails to see through analyst behavior, optimistically biased TPs will lead to temporary increases in stock valuations that benefit short-term investors when they sell their holdings.

[1] "Soft dollar" payments is a standard practice where institutional investors commit to (1) allot their trading volume to brokers where sell-side analysts provide valuable service and (2) pay a fixed five to six cent-per-share commission fee that is higher than the typical marginal cost of trading (Goldstein et al. 2009; Juergens and Lindsey 2009; Maber et al. 2014). Buy-side institutions that manage portfolios for their clients favor "soft dollars", rather than explicit payments for research reports, since the cost of the former is born by the client, whereas the latter would have to be paid from the buy-side institution's own capital (Maber et al. 2014). The Security and Exchange Commission (SEC) estimates that that the value of third-party research purchased annually with soft dollars exceed $1 billion (SEC 1998). Section 28(e) of the Securities and Exchange Act permits bundling of trade execution and research service costs, though this practice has attracted regulatory concerns (SEC 1998; SEC 2006). Juergens and Lindsey (2009) confirm that investors channel trades through brokers where analysts provide valuable research services as they find an abnormal increase in the volume of trade executed by the market maker following a recommendation change by the analyst working at the same firm.

[2] Bias in TPs should be more difficult to identify than in EPS forecasts as the average TP accuracy is much lower than that of earnings estimates. Bilinski et al. (2013) compare the accuracy of analyst TPs to that of earnings forecasts and document that in the US the mean absolute TP forecast error is 49.5% of the share price. The absolute EPS forecasts error is only 1.56% of the share price, which means that even small positive deviations in forecasted EPS are more likely to reflect a bias than error. Thus, *ex-ante*, investors will find it more difficult to distinguish between bias and a genuine error for TPs than for EPS forecasts. Despite lower average accuracy, investors consider TPs to be informative and the average price reaction to TP revisions is similar in magnitude to that for stock recommendations and higher than for EPS revisions (Brav and Lehavy 2003; Asquith et al. 2005).

[3] As analysts factor EPS forecasts into their target prices (Bradshaw 2002; Gleason et al. 2013), issuing optimistic EPS forecasts would reveal bias in target prices. Thus, unbiased EPS forecasts lend credibility to analyst TPs.

To examine the proposition that analysts cater to short-term investors by strategically biasing their TPs, but not EPS estimates, we divide the analysis into two parts. In the first part, we examine whether high stock ownership by short-term institutional investors affects the bias in analyst TPs. Empirical tests confirm a statistically and economically significant relation between TP bias and the institutional investor holding period. Specifically, a one standard deviation reduction in the holding period increases bias in TPs by 5.03%. This effect is opposite to and economically stronger than the negative relation between TP bias and the percentage share ownership by institutional investors documented by Frankel et al. (2006) and Ljungqvist et al. (2007). There is little evidence that analysts bias their EPS estimates in the presence of short-term investors. Together, the results confirm that analysts distort their TPs, but not EPS forecasts, in the presence of short-term institutional investors.

Further tests reveal that it is analysts employed by brokers not affiliated with investment banks (IB) who are more likely to issue biased TPs. This evidence reflects that the pursue of trade commissions is more important for non IB-affiliated brokers than brokers with an investment banking arm,[4] and that the marginal cost of reputation loss from issuing biased forecasts is higher for IB-affiliated brokers. To support the latter prediction, we also examine analyst *Institutional Investor* All-America Research Team rankings. All-America (i.e., Star) analysts are more likely to be employed by investment banks because their presence has a bearing on the choice of the investment advisor in security offerings (Hong and Kubik 2003; Hong et al. 2000; Ljungqvist et al. 2006; Loughran and Ritter 2004; Dunbar 2000). We find that Star analysts are less likely to

[4] Rhee (2010) reports that investment banking and asset management services accounted for around 40% of revenue at large investment banks over the period 1996–2008. Thus, brokers that do not have investment banking divisions have stronger incentives to facilitate (profitable) trading by short-term institutional investors to maximize "soft dollar" compensation.

bias TPs; any catering to short-term investors primarily comes from non-Star analysts. This evidence reinforces the reputation cost explanation.

Robustness tests show that our conclusions are unchanged when we use alternative measures of TP bias, and when we control for the endogeneity in the choice of stocks short-term investors hold. The latter evidence alleviates the concern that our results reflect cases where short-term investors select firms with more biased TPs in the hope of exploiting potential stock misvaluation. Furthermore, we document that regulatory changes introduced in the early 2000s that aimed to limit conflicts of interest in analyst research arising from investment banking transactions, i.e., NASD Rule 2711 and NYSE Rule 472, even though they reduced TP bias on average, they did not decrease analyst propensity to bias TPs in the presence of short-term investors. Finally, we demonstrate that our results are robust to alternative explanations and different model specifications.[5]

In the second part of the study, we show that investors fail to see through analyst incentives to bias TPs for stocks with high short-term ownership. The market reacts more favorably to TP revisions for these stocks and the effect is economically significant. A one unit revision in a TP for stocks with a high presence of short-term investors increases the three-day abnormal returns around the forecast announcement by 94% (from 9.3% to 18%) compared to stocks with a high presence of long-term investors. There is no incremental price reaction to EPS revisions for stocks with a large ownership by short-term investors. The price reaction results confirm that biased TPs lead to temporary increases in valuations of stocks with high short-term ownership.

[5] Importantly, sensitivity tests show that our results do not reflect analysts' attempts to maximize trade commission by issuing optimistic forecasts for high turnover stocks (Jackson 2005).

The evidence that biased TPs lead to temporary increases in stock valuations suggests that analysts create "windows of opportunities" for short-term investors to sell their holdings. In the second part of the study, we show that short-term institutional investors take advantage of these favorable conditions and sell their holdings to retail investors. Specifically, an increase in TP bias by one percent reduces future institutional holdings by 1.7%, but if the stock is currently owned mainly by short-term investors, the reduction in future ownership is 9.6%. This evidence confirms that biased TPs facilitate more profitable trades by short-term investors. We also show that short-term investors respond to analyst strategic distortions of TPs by increasing their holdings of other stocks covered by the broker the analyst works for.[6]

This study adds important new evidence to the literature that examines properties of analyst forecasts. Firstly, we identify a new source of conflicts of interest in analyst research that originates from the ownership composition of a stock. Our evidence questions the conclusions in Frankel et al. (2006) and Ljungqvist et al. (2007) that institutional investors curb analyst propensity to issue biased research. Rather, our findings suggest that non IB-affiliated analysts cater to the needs of short-term institutional investors and issue biased forecasts that facilitate profitable trades by these investors at a disadvantage of retail investors. We recommend that future research that examines properties of analyst forecasts, such as accuracy, bias and price impact controls for the average investor holding horizon in a stock to ensure validity of tests.

Second, our evidence adds to the emerging literature on strategic distortions channeled through analyst forecasts. Malmendier and Shanthikumar (2014), the only other paper that studies analyst

[6] Our results do not depend on analysts privately communicating their actions to short-term investors. Rather, short-term investors time stock sales to "windows of opportunities", such as created by analysts. With hindsight, short-term investors recognize analyst behaviour and reward analysts for facilitating trades. Over time, we can expect a tacit relation to develop between analysts and short-term investors where the latter can expects analysts to create favourable conditions for stocks trades.

strategic distortions, examine bias in analyst stock recommendations and earnings forecasts for affiliated and unaffiliated analysts and find that affiliated analysts issue more biased stock recommendations, but not EPS forecasts. However, regulatory changes introduced in early 2000s largely eliminated conflicts of interest in analyst research originating from underwriter and advisory transactions (Barber et al. 2006; Kadan et al. 2009). Our tests show that this regulation has not reduced analyst propensity to strategically bias their TPs in the presence of short-term institutional investors. With the increasing growth in ownership by short-term investors, such as hedge funds (Fung and Hsieh 2006), our evidence points to a need for a closer scrutiny of target prices by investors and regulators.[7]

Third, our results are important for regulators as they add to the concerns of the Securities and Exchange Commission that certain market mechanisms create incentives for abusive market practices. Our results suggest that "soft dollar" payments create incentives for certain brokers to issue research benefiting a small group of institutional investors at a disadvantage of retail investors. SEC investigations to date focused on the impact of "soft dollar" regulation on money managers (SEC 1998; 2006), not on broker behavior. Our results suggest this area may require a closer scrutiny to prevent undesirable market behavior.[8] Our findings are topical given the recent argument by Juergens and Lindsey (2009) that, following regulation Fair Disclosure and the Global Research Analyst Settlement, brokers might have stronger incentives to extract revenue from trade commissions.[9]

[7] Confidence in our results is further strengthened by discussions with former analysts, who confirm that some brokers engage in catering behaviour with short-term investors, such as hedge funds.

[8] The UK's Financial Conduct Authority recognized conflicts of interest resulting from "soft-dollars" and endorsed European proposals that would stop banks from charging investors for research out of share dealing commissions (www.ft.com/cms/s/0/b5d608ba-0e94-11e4-a1ae-00144feabdc0.html).

[9] To illustrate, in January 2007 Goldman Sachs launched the Asymmetric Service Initiative where a group of 180 hedge funds and investment management clients were offered privileged access to the bank's analyst stock research. The initiative was designed to increase trade commissions and generated additional $199m in commissions before it

Fourth, our evidence that analysts channel their optimism through target prices, but not through earnings estimates, adds to the nascent literature on the properties and the usefulness of analyst target prices (Asquith et al. 2005; Bradshaw et al. 2013; Bilinski et al. 2013).[10] Thus, our study responds to a call by Ramnath et al. (2008, 68), who in their review of the analyst forecasting literature emphasized that "further research is required to describe the behavior of the forecasts that have higher price impacts, such as long-term growth forecasts and target prices".

2. Research design

Recent studies highlight the importance of investors' investment horizon in capital markets. Prior work identifies a significant role for investment horizons in shaping firm decision making (Attig et al. 2013; Bushee 1998, 2001; Chen et al. 2007; Derrien et al. 2014; Gaspar et al. 2005, 2013), as well as the stock price formation process (Cremers and Pareek 2011; Zhang 2011). Following the extant literature, we calculate the institutional investor investment horizons using the Churn Ratio measure

$$CR_{i,q} = \frac{\sum_{k=1}^{Q_q} | N_{k,i,q}P_{k,q} - N_{k,i,q-1}P_{k,q-1} - N_{k,i,q-1}\Delta P_{k,q} |}{\sum_{k=1}^{Q_q} \frac{N_{k,i,q}P_{k,q} + N_{k,i,q-1}P_{k,q-1}}{2}} \quad (1)$$

where $CR_{i,q}$ is the churn ratio of investor i in quarter q, $N_{k,i,q}$ is the number of shares in firm k, held by investor i in quarter q; $P_{k,q}$ is the stock price of firm k in quarter q; Δ denotes the quarterly change operator; Q_q is the number of firms in investor's i portfolio in quarter q. The idea behind the *CR* measure is that we can classify an investor as short term if she churns her overall portfolio

was stopped by the SEC (www.forbes.com/sites/halahtouryalai/2012/04/12/goldman-sachs-fined-22-million-for-favoring-select-clients).

[10] The review of analyst forecasting literature in Bradshaw (2011) identifies only 14 papers on analyst target prices listed in ABI/INFORM, and only three that look at target prices and earnings forecasts together.

frequently. Inversely, we can classify an investor as long term if she holds her stock positions unchanged for a considerable period of time.

Using the *CR* measure we then estimate Investor Turnover at the firm level as

$$Inv\_TR_{k,q} = \sum_{i \in S_{k,q}} w_{k,i,q} \left(\frac{1}{4}\sum_{r=1}^{4} CR_{i,q-r}\right) \tag{2}$$

which is defined as the weighted average of the time-averaged portfolio of churn rates of all the investors who have shares in firm *k* in quarter *q*. Equation 2 illustrates that using the churn ratios for each institutional investor with positive shareholdings in a firm, we can characterize firms based on their average institutional shareholder profile in terms of investment horizon.

In terms of our main dependent variable, we follow prior studies that examine bias in analyst earnings forecasts and measure TP bias, $TP\ bias_{a,k,d}$, as the signed difference between the target price issued by analyst *a* for firm *k* on day *d* and the actual stock price at the end of the 12-month forecast horizon, $P_{k,12}$, scaled by the stock price at the TP issue date $P_{k,d}$,

$$TP\ bias_{a,k,d} = \frac{TP_{a,k,d} - P_{k,12}}{P_{k,d}}. \tag{3}$$

Positive values of *TP bias* indicate optimistic target prices. We also calculate an alternative TP bias measure (*TP bias_2*) based on a 6-month forecast horizon.

We use a regression model to examine the association between bias in analyst TPs and share holdings by short-term investors. Our main model specification is the following:

$$
\begin{aligned}
TP\,bias_{a,k,d} = {} & \beta_0 + \beta_1 Inv\_TR_{k,q} + \beta_2 IO_{k,q} + \beta_3 Inv\_bank_{a,d} \\
& + \beta_4 Inv\_bank_{a,d} * Inv\_TR_{k,q} + \sum_{j=0}^{2} \beta_{5+j} A_{a,d} + \sum_{j=0}^{6} \beta_{8+j} F_{k,y-1} \\
& + \sum_{j=0}^{9} \beta_{15+j} Industry\ dummies + \sum_{j=0}^{11} \beta_{25+j} Year\ dummies + e_{k,a,d}
\end{aligned}
\tag{4}
$$

The coefficient on *Inv_TR* should be positive if analysts bias their TPs to cater to the needs of short-term investors. *IO* is the level of institutional ownership in a firm. We expect a negative relation between institutional ownership level and TP bias consistent with the evidence in Frankel et al. (2006) and Ljungqvist et al. (2007) that institutional ownership moderates bias in analyst forecasts. *Inv_bank* captures whether the analyst is affiliated with an investment bank (IB) and the interaction term *Inv_bank*Inv_TR* captures the effect of analyst IB affiliation for stocks with high ownership by short-term investors. We expect analysts at non IB-affiliated brokers to be more likely to engage in strategic distortion in their TPs in the presence of short-term investors.

We use a number of analyst (A) and firm (F) characteristics to capture other predictors of TP bias. Analyst characteristics include analyst firm-specific forecasting experience (*Ana_experience*), which measures analyst forecasting skill and knowledge an analyst has gained over time (Clement 1999). We calculate the number of firms (*Ana_firm_followed*) an analyst follows as Clement (1999) suggests that it is more onerous and complex to actively follow and produce research reports for a large number of companies. We expect more experienced analysts and analysts who follow fewer firms to issue less optimistic TPs.

Firm characteristics include firm market capitalization (*MV*) and the number of analysts following a firm (*Firm_following*), which proxy, respectively, for the quality of the firm's information environment and the competition among analysts. We expect analysts to produce less biased forecasts for firms with a rich information environment and when the competition among

analysts is high. *BM* is the book-to-market ratio and *MOM* is the price momentum. Analysts are likely to be more optimistic about firms with higher growth options and firms that experienced recent price run-ups. We use stock price volatility scaled by the mean price level to measure firm total risk (*COV*). We expect higher TP bias for more risky stocks. To control for time and industry effects, we include ten industry dummies (*Industry dummies*) based on the Fama and French industry definitions and a set of annual dummies (*Year dummies*) for the TP issue year. Investor turnover and the level of institutional ownership in a firm are measured in the last quarter before the TP issue. Analyst characteristics are measured at the TP issue date. Firm characteristics, other than analyst following, are measured at the end of the previous fiscal year *y*. *Firm_following* is measured at the TP issue date. Table 1 provides detailed variable definitions. All continuous dependent and explanatory variables are winsorized at the 1% level (two-tail).

Insert Table 1 around here

3. Data

We collect EPS and target prices from IBES Detail files from January 1999 to March 2011.[11] To calculate our TP bias measure, we select only target prices with a 12-month forecast horizon and for firms where the actual stock price is non-missing 12 months after the forecast issue date. Analyst and broker characteristics are constructed using both IBES TP and EPS Detail files starting from January 1995, which avoids eliminating observations in the early sample when constructing our explanatory variables and produces more reliable measures (Clement 1999).

[11] The other commonly used source of target price data, First Call, was acquired by Thomson Reuters in June 2001 and was subsequently merged with IBES. First Call target price data was discontinued in 2004. We use target prices, not stock recommendations in our tests because only TPs are directly comparable to EPS estimates since both forecasts reflect firm-level performance. Stock recommendations derive from target prices and reflect how the stock's ex-dividend return (TP/P) compares to a benchmark, which is usually the expected ex-dividend return of industry peers. Thus, bias in analysts' stock recommendations can be driven either by the analyst optimism about the stock (as reflected in the TP) or perception of the peer performance, which can lead to confounding effects affecting our inferences. In our sensitivity analyses, we formally test the relation between TP bias, Inv_TR and Optimistic Stock Recommendations.

Information on quarterly institutional holdings is from Thomson-Reuters Institutional Holdings (13F) database. Thomson-Reuters collects all the information contained in Form 13F proxy statement filed with the Securities and Exchange Commission (SEC). All institutional investors with $100m or more in assets under management are by law required to file a 13F form with the SEC. Daily stock price data and the number of shares outstanding used to calculate firm market capitalization are from CRSP. Accounting information is from the CRSP/Compustat merged database. Our final sample includes 374,615 target prices for 4,326 firms issued by 6,734 analysts employed by 433 brokers.

4. Evidence on Strategic Bias in Analyst Target Prices

4.1 DESCRIPTIVE STATISTICS AND UNIVARIATE RESULTS

Panel A of Table 2 presents summary statistics for the firms in our sample. The average TP bias is 8.4% (11.6%) of the share price for a 12-month (6-month) forecast period. The average analyst in our sample has almost 7 years of experience and follows 16 firms. The majority of the analysts (53%) are affiliated with an investment bank. Institutional investors hold 64% of the firm's equity and on average hold on to this investment for 28 months.[12] The average firm has $3.7 billion in market value, its book-to-market stands at 0.58, and it is followed by 12 analysts. The coefficient of variation for the share price is 0.098, and the three-month price appreciation before the TP issue is 6.5%.

Insert Table 2 around here

[12] The average investor turnover is 0.213. This means that 10.7% (0.213/2 = 0.107) of the average investor's portfolio is turned over in a quarter, which approximately translates to 42.8% of the position being turned over in a given year. Therefore, institutional investors hold an average stock in their portfolio for around 28 months (12/0.428 = 28.04).

Panel B of Table 2 reports the average *TP bias* for quartile portfolios sorted by investor turnover. *TP bias* increases monotonically as we move from the portfolio with the lowest *Inv_TR* (−0.006) to the highest *Inv_TR* (0.206). The differences in *TP bias* between extreme turnover portfolios are both statistically and economically significant, consistent with our proposition that higher ownership by short-term investors increases optimism in analyst TPs.

Panel C of Table 2 presents statistics based on portfolios that double sort our firms using *Inv_TR* and *IO*. *TP bias* increases monotonically as we move from high *IO* to low *IO* portfolios. This result is consistent with the findings of prior studies, which highlight the mitigating effect of institutional ownership on analyst optimism (Frankel et al. 2006; Ljungqvist et al. 2007).[13] However, the positive effect *Inv_TR* has on *TP bias* remains in all portfolios. In particular, there is a significant monotonic increase in *TP bias* as we move from low to high *Inv_TR* portfolios. This happens whether we concentrate on high or low *IO* firms. Thus, we conclude that the investor turnover effect is above and beyond the previously documented institutional ownership one. Overall, the univariate results are consistent with our conjecture that analysts strategically bias their target prices to cater to the needs of frequently trading investors.

4.2 MULTIVARIATE RESULTS ON THE EFFECT OF INVESTOR TURNOVER ON TARGET PRICE BIAS

Table 3 presents regression results for equation (4) that models the effect of investor turnover on TP bias. The reported p-values are based on heteroskedasticity-robust standard errors clustered at

[13] Frankel et al. (2006) and Ljungqvist et al. (2007) document a moderating effect institutional ownership has on optimism in analyst stock recommendations. Our evidence in Table 2 shows that this effect extends to analyst target prices.

the firm and analyst level (Petersen 2009). We also report standardized coefficients to facilitate the direct comparison of the economic effect of each covariate on the dependent variable.[14]

Model 1 in Table 3 reports the effect shorter holding periods have on *TP bias* after controlling for several analyst and firm characteristics. The *Inv_TR* coefficient is positive and highly significant (1.174; $p<0.000$) and the economic impact of investor turnover on target price bias is the highest compared to the effect of any other covariate. In particular, a one standard deviation increase in investor turnover is associated with a 5.03% increase in *TP bias*. Thus, we conclude that the effect of investor turnover on *TP bias* is both statistically and economically significant.

Insert Table 3 around here

The signs and significance of the control variables are in line with prior studies. In particular, institutional ownership has a negative effect on TP bias. This result corroborates the evidence presented in Table 2 that institutional investors moderate the bias in analyst TPs. Analysts affiliated with investment banks produce less biased TP forecasts, consistent with these analysts building a reputation for accurate research (Jackson 2005). In addition, the coefficients on analyst following and on the book-to-market ratio are negative, suggesting that higher competition among analysts reduces bias in analyst TPs and that analysts tend to be less optimistic about the prospects of firms with lower growth options. Higher stock return volatility and firm size have a positive effect on *TP bias*, which is consistent with the evidence for stock recommendations in Agrawal and Chen (2008). The former result indicates that bias in analyst TPs may be more difficult to detect when uncertainty is high, and the latter result suggests analysts may be more willing to issue biased forecasts to please managers from larger firms (Lim 2001).

[14] Standardized coefficients measure the effect one standard deviation increase in the independent variable has on the dependent variable.

Next, we examine if higher TP bias is concentrated among analysts working for non IB-affiliated brokers, where (1) the desire for trade commissions is likely to be stronger than at brokers with investment banking arms, and (2) where the reputation cost of issuing biased forecasts is likely to be lower (Jackson 2005). For that purpose, we interact *Inv_bank* and *Inv_TR*. Consistent with our proposition, the interaction term in Model 2 is negative indicating that analysts from IB-affiliated brokers are less likely to bias their TPs in the presence of short-term investors.

In Models 3 and 4, we use an alternative proxy for analyst target price bias, i.e., *TP bias_2*, which captures the TP bias for a 6-month forecast period.[15] Our results remain qualitatively unchanged. Overall, Table 3 results show strong evidence that analysts seem to cater to short-term investors by issuing more biased target prices.[16]

5. Further and Sensitivity Tests

In this section, we first show that our results from Section 4 capture strategic distortions and not genuine over-optimism in analyst target prices. Next, we address the concerns that our results may reflect the endogeneity in the choice of stocks short-term investors invest in or unobserved heterogeneity in analyst behavior. In addition, we show that the regulatory changes, introduced in the aftermath of the internet bubble burst, to curb optimism in analyst research resulting from investment banking transactions did not address the conflicts of interest that arise in the presence

[15] In untabulated results, we also use the forecasted annual ex-dividend stock return (TP/P). Using TP/P as the dependent variable leaves our conclusion on the positive association between TP bias and holdings by short-term investors unchanged.

[16] An alternative explanation for the results in Table 3 is that our findings are simply a manifestation of the low analyst following effect, i.e., TPs for firms with low analyst following are more biased and these firms have more short-term investors. However, this explanation is unlikely as (1) we control for analyst following in all our models and (2) we also interact *Inv_TR* with analyst following and the coefficient of the resulting variable is insignificant (untabulated result). Thus, we conclude that our results are not consistent with the low analyst following explanation.

of short-term investors. Finally, we present several specifications which confirm that our results are not driven by alternative explanations.

5.1 STRATEGIC DISTORTIONS VS. INHERENT BIAS IN ANALYST TARGET PRICES

Our findings in the previous section may be the result of analyst genuine over-optimism about stocks with high holdings by short-term investors, rather than strategic distortions. To distinguish between the two explanations, we compare bias in analyst TPs to that in EPS forecasts. If our findings in Table 3 are manifestations of inherent biases in analyst forecasts, that is, genuine optimism about prospects of firms with high short-term investors, then both TP and EPS bias should increase for stocks with high ownership by short-term investors. If our findings reflect strategic distortions, we should observe a positive bias in analyst target prices, but not in earnings estimates.

To distinguish between strategic distortions and genuine over-optimism in analyst target prices, we select target prices issued jointly with EPS forecasts. This reduces the sample to 132,367 forecasts. We follow previous literature (Das et al. 1998; Richardson et al. 2004) and measure EPS bias, *EPS bias,* as the signed difference between the forecasted earnings, $f\_EPS_{a,k,d}$ issued on day d and actual EPS for firm k, EPS_k, scaled by the stock price at the end of the previous fiscal year, $P_{s,k}$,

$$EPS\,bias_{a,k,d} = \frac{f\_EPS_{a,k,d} - EPS_k}{P_{s,k}}. \quad (5)$$

Higher values of *EPS bias* reflect more optimistic EPS estimates. We use the broker translation file to match broker names between IBES target price and EPS files.[17]

Table 4 reports regression results for the model specification of equation (4) where the dependent variable is either the TP or EPS bias. We continue to find a positive effect of short-term holdings on *TP bias*, particularly among analysts from non IB-affiliated brokers. However, *Inv_TR* has little impact on *EPS bias* and the interaction term between *Inv_TR* and *Inv_bank* is not significant in the *EPS bias* regression. These results indicate that the type of institutional investor has no effect on analyst propensity to issue biased EPS. Together, the findings are consistent with our proposition that analysts channel their bias through TPs, but not EPS forecasts, as this strategy reduces the likelihood investors will recognize that analysts cater to short-term investors by issuing biased forecasts.

Insert Table 4 around here

5.2 ENDOGENEITY CONCERNS

We acknowledge that our results can reflect different investment strategies of short-term compared to long-term investors. In particular, short-term investors may select firms where analysts tend to issue more biased TPs in the hope of exploiting potential stock misvaluation. To address this concern, in Table 5 we report the results of 2SLS regressions, which we run to control for endogeneity in the choice of stocks by short-term investors. We use two instrumental variables, one firm-related and one investor-related. The firm-related instrument is a dividend dummy that takes the value of one if a firm pays a dividend, and zero otherwise. We expect a

[17] The broker translation file is from 2005, which eliminates broker houses covered by IBES after that date. We lose less than 5% of target price forecasts due to this limitation.

firm's payout policy to be a significant determinant of investor stock choices.[18] However, we cannot see any reason why it should be related to *TP bias*. Thus, we feel that the dividend dummy is a valid instrument in our setting.

Following Edmans et al. (2012) and Michaely and Vincent (2013), our investor-related instrument is *MFFlow*. *MFFlow* captures the implied mutual fund trades, which are induced by flows by their own investors. Specifically, *MFFlow* for firm *k* in quarter *q* is:

$$MFFlow_{k,q} = \sum_{f=1}^{m} \frac{F_{f,q} \times Shares_{k,f,q-1} \times P_{k,q-1}}{TA_{f,q-1} \times VOL_{k,q}} \tag{6}$$

where $F_{f,q}$ is the total outflow from fund *f* in quarter *q*, $TA_{f,q-1}$ is the fund *f*'s total assets at the end of the previous quarter, $Shares_{k,f,q-1} \times P_{k,q-1}$ is the dollar value of fund *f*'s holdings of stock *k*, and $VOL_{k,q}$, is the total dollar trading volume of stock *k* in quarter *q*. The sum of flows is over funds for which quarterly investor outflows equal or exceed 5% of fund *f*'s total assets.[19] The idea behind this instrument is that significant investor outflows will force mutual funds to liquidate a portion of their holdings to repay their investors. This will affect a firm's *Inv_TR* but for reasons unrelated to the firm. Hence, *MFFlow* is an ideal instrument in our setting.[20]

The 2SLS results in Table 5 confirm our previous findings. In particular, the *Inv_TR* coefficient is positive in both models but only significant for analysts working for non IB-affiliated brokers. Thus, our conclusions are robust to endogeneity in the choice of firms by short-term investors.

[18] Some long-term investors such as public and corporate pension funds, colleges and universities, labor unions, foundations, and other corporations are either fully or largely exempt from dividend taxes, which increases their incentive to hold dividend-paying stocks (Allen et al. 2000).

[19] The definition of *MFFlow* follows Edmans et al. (2012), Appendix A. We have downloaded this variable from Alex Edman's website: http://faculty.london.edu/aedmans/ (accessed March 2014).

[20] The two instruments are valid in our tests. For both models presented in Table 5, the Sargan-Hansen test of overidentifying restrictions does not reject the null that the instruments are valid. Also, the first stage F-statistic comfortably rejects the hypothesis that the instruments are weak.

Insert Table 5 around here

In an additional (untabulated) test, we find that unobserved heterogeneity in the analyst behavior does not affect our main conclusions. To illustrate, our results in Table 3 may reflect that analysts with past experience working for short-term investors, such as hedge funds, may be prone to issue more optimistic target prices for stocks with high ownership by short-term investors. Thus, it could be (unobserved) past analyst experience that explains higher bias, and not short-term holdings. Though our joint analysis of the bias in analyst target prices and in earnings forecasts in Table 4 largely mitigates the concern that unobserved analyst characteristics explain our main results, we repeat regression (4) but now include analyst fixed effects. In unreported results, we continue to find a significant relation between investor turnover and TP bias after controlling for analyst fixed effects, which corroborates our conclusions.

5.3 DID REGULATORY CHANGES IN EARLY 2000S REDUCE THE STRATEGIC DISTORTIONS IN ANALYST TPS?

In 2002, the Securities and Exchange Commission (SEC) introduced sweeping changes to the rules related to the production, utilization and compensation for analyst research. The goal was to increase transparency and objectivity in equity research. NASD Rule 2711 and NYSE Rule 472 are of particular importance to our setting since they implemented basic reforms to reduce conflicts of interest arising from investment banking transactions in analyst research that led to unduly optimistic recommendations during the internet bubble period (Boni and Womack 2003; Barber et al. 2006). However, the regulation may have been ineffective in moderating the conflicts of interest non IB-affiliated brokers face when issuing TPs for stocks with higher ownership by short-term investors. To test this proposition, we include a dummy variable for

forecasts issued after the introduction of the regulation, *Rule2711-472*, and interactions between this dummy and *Inv_TR* and *Inv_TR*Inv_bank*. If the new regulation reduced the incentives analysts have to issue more favorable TPs for stocks with higher short-term ownership, particularly among analysts from non IB-affiliated brokers, the interaction terms should both be negative and significant.

Model 1 in Table 6 shows that the average bias in analyst TPs reduces following the introduction of NASD Rule 2711 and NYSE Rule 472, consistent with previous findings on the positive effect the regulation had on limiting optimism in analyst forecasts (Boni and Womack 2003; Barber et al. 2006). However, the *Inv_TR* coefficient remains positive and highly significant after including the *Rule2711-472* indicator variable. Also, the interaction term *Inv_bank*Inv_TR* remains negative and significant consistent with our prior findings. The broadly insignificant coefficients for the interaction terms *Rule2711-472*Inv_TR* and *Rule2711-472*Inv_TR*Inv_bank* show that the regulatory changes did not affect the catering behavior we report in this paper. Therefore, we conclude that our strategic distortions represent a new group of conflicts of interest that have not been affected by the regulation introduced in early 2000s aimed at limiting analyst propensity to produce biased research.

Insert Table 6 around here

5.4 ALTERNATIVE EXPLANATIONS AND ADDITIONAL TESTS

We run a battery of tests to confirm our conjectures, dismiss alternative explanations and showcase the robustness of our results. We present these tests in turn below.

In this paper we argue that a significant factor limiting the analysts' catering activity is reputational concerns. Consistent with prior literature (Ljungqvist et al. 2006; Loughran and

Ritter 2004; Dunbar 2000), we hypothesize higher reputation costs for IB-affiliated brokers and, indeed, find that the strategic distortions are primarily driven by analysts working for non IB-affiliated brokers. In the first two models of Table 7 we examine analyst-specific reputation costs and test whether they are complimentary or substitute to broker reputational concerns. In particular, we investigate the role of Star analysts and whether they cater to short-term investors. We hypothesize that Star analysts have higher reputational concerns compared to non-Star analysts whether they work for IB-affiliated brokers or not. We identify Star analysts, *Star*, as the analysts classified as members of the *Institutional Investor* All-America Research Team in the October issue of the *Institutional Investor* magazine ranking.[21]

Model 1 in Table 7 confirms that Star analysts issue less biased TP estimates compared to non-Star analysts, consistent with the reputation costs hypothesis. Furthermore, the Model 2 results show that any catering to short-term investors is primarily driven by non-Star analysts. More importantly, the main findings of this paper remain unchanged after controlling for Star status, which indicates that analyst reputational concerns are complimentary to the broker ones.

Insert Table 7 around here

Prior literature indicates that analysts produce more biased TPs for high momentum stocks. Therefore, our findings could be driven by momentum chasing short-term investors as opposed to the strategic distortions we hypothesize here. The endogeneity analysis presented in Section 5.2 addresses to a degree this alternative explanation. However, in Model 3 we explicitly test for it by

[21] To combine analyst names from I/B/E/S with *Institutional Investors* magazine rankings, we require the I/B/E/S translation file, which is only available for the 2005 I/B/E/S edition. Using the 2005 I/B/E/S translation file could potentially misclassify top ranked analysts that started reporting on I/B/E/S after 2005. More recent versions of the I/B/E/S translation file are unavailable since Thomson-Reuters suspended access to the translation file for academic research.

interacting *Mom* with *Inv_TR*. The interaction term is insignificant and our main findings remain changed. Thus, we conclude that momentum chasing is not driving our results.

One could argue that our *Inv_TR* measure is highly positively correlated with stock liquidity hence our results are simply a manifestation of a confounding effect, namely the correlation between stock liquidity and TP bias. In order to investigate the validity of this possible explanation in our sample, we calculate a proxy of stock liquidity, *TR*, which is a firm's number of shares traded over a quarter scaled by the firm's number of shares outstanding. The univariate correlation between *TR* and *Inv_TR* is low (0.128) mitigating any concerns of a confounding effect. Still, we introduce *TR* to our main regression model (Model 4); its coefficient is insignificant and our results remain unchanged. Hence, we conclude that our findings are not a manifestation of a stock liquidity – TP bias relation.

Recent studies identify incentives to gain management access as a source of forecast bias (e.g., Kadan 2009; Koch et al. 2013). In order to control for this potential source of bias, we identify firm-quarters when the firms' management issued EPS guidance. An analyst who wishes to please managers should issue more favourable TPs after management guidance, either to reinforce the good news guidance or moderate the negative effect of bad news guidance. In Model 5 we include the *EPS Guidance* indicator variable; its coefficient is negative and significant indicating less TP bias during quarters where the management issues EPS guidance. More importantly, our main results remain unchanged indicating that the source of bias we identify in this paper is a distinct one.

Model 6 in Table 7 confirms that our focus on TPs, as opposed to stock recommendations, is appropriate in our setting. As we explain in footnote 8 above, looking at the bias in analysts'

stock recommendations would lead us to the examination of a joint hypothesis, that is, analyst optimism could be either about the stock (as reflected in the TP) or perception of the peer performance, or both. In any case, stock recommendations derive from TPs hence one should focus on TP bias in order to provide evidence of the hypothesized catering activity. In Model 6, we investigate the likelihood (probit model) of having an Optimistic Stock Recommendation. Consistent with the above, we find evidence that the larger the TP bias the greater the probability of having a stock recommendation above consensus is. Investor horizon does not appear to be related to the probability of having an Optimistic Stock Recommendation.[22]

Finally, in untabulated results, we use five additional tests to ensure robustness of our conclusions. First, we re-run equation (4) but now control for past TP bias. Controlling for past TP bias, *Inv_TR* remains positively and significantly related to current TP bias. Further, including an interaction term between past TP bias and current quarter *Inv_TR*, the coefficient on this interaction is indistinguishable from zero. Together, this evidence shows that the positive association between investor turnover and TP bias is not because short-term investors pick stocks analysts are generally more optimistic about.[23]

Second, we run an alternative specification based on changes in the variables rather than levels, that is, we regress changes in TP bias on changes in *Inv_TR*.[24] Regressions based on variable changes are typically less likely to capture spurious relationships. We find that our main findings remain unchanged. Third, we average all our observations to firm level and re-run our main

[22] The reverse is not true. So, controlling for optimism in stock recommendations does not affect our main findings on investor horizon and TP bias.

[23] Intuitively, investing in stocks analysts are an average more optimistic about reduces the profitability of short-term investor trades as they purchase shares at inflated prices. Thus, it is unlikely that our results reflect instances where short term investors pick stocks for which analysts are optimistic for relatively long periods.

[24] We do not include controls in the regressions for changes in TP bias since compared to *IO* and *Inv_TR*, controls show virtually no variation between quarters.

regressions but now at the firm level, as opposed to analyst-forecast level. Fourth, we re-estimate model (4) when we include an interaction term between *Inv_TR* and an indicator variable for the first quarter of the fiscal year. We do not find that analysts issue incremetnaly optimistic target price in the first quarter of the year. Repeating model (4), but now with an interaction term between *Inv_TR* and an indicator variable for the last quarter of the fiscal year produces similar results. Thus, our results do not reflect clustering of biased TPs over the fiscal year. Together, sensitivity analysis provides strong support for our prediction that higher holdings by short-term investors incentivize analysts to optimistically bias their TPs.

6. The Market Implications of Strategic Distortions in Analyst TPs

Our evidence suggests that analysts strategically bias their TPs for stocks with high short-term institutional ownership. Next, we examine if investors see through analyst incentives and discount TPs issued for these firms. If the catering strategy is successful and investors do not see through the bias, we expect higher incremental market reactions for TP revisions in firms with higher levels of investor turnover. To examine this proposition, we consider price reactions to percentage earnings (ΔEPS) and target price (ΔTP) forecast revisions by analyst *i* for firm *k* at time *t*, and how these vary with investor turnover. Our model has the form:

$$\begin{aligned} CAR_{i,k,t} = {} & \alpha_0 + \alpha_1 \Delta TP_{i,k,t} + \alpha_2 \Delta EPS_{i,k,t} + \alpha_3 \Delta TP_{i,k,t} * Inv\_TR_{k,t} \\ & + \alpha_4 \Delta EPS_{i,k,t} * Inv\_TR_{k,t} + \alpha_5 Downgrade_{i,k,t} + \alpha_6 Upgrade_{i,k,t} \\ & + \alpha_7 Upgrade_{i,k,t} * Inv\_TR_{k,t} + u_{i,k,t} \end{aligned} \tag{7}$$

We use a three-day cumulative abnormal return (*CAR*) centred on each TP forecast announcement date to measure the price response to EPS and target price forecast revisions.[25] We

[25] We use the CRSP value-weighted index as the benchmark to measure abnormal returns. Similarly to past studies (e.g., Keung 2010), we assume that the EPS forecast revision is zero for stand-alone TPs. We require that the forecasts used to calculate revisions are no more than 300 days apart and that the revisions in EPS are for the same

expect the coefficient on Δ*TP* to be positive if target price forecasts have incremental information content to earnings forecasts. Further, if analysts' strategy of biasing target prices for stocks with high ownership by short-term investors is successful, the interaction term Δ*TP*Inv_TR* should also be positive. However, Δ*EPS*Inv_TR* should be zero since analysts do not attempt to bias their EPS forecasts for stocks with high holdings by short-term investors. Since prior studies have shown that changes in stock recommendations also lead to significant market reactions (Asquith et al. 2005) we also control for negative (Downgrade) and positive (Upgrade) change in stock recommendations as well as its interaction with *Inv_TR*.

Table 8 shows results for the price reaction regressions. Panel A provides descriptive statistics on positive (Panel A1) and negative (Panel A2) revisions during our sample period as well as the associated 3-day market reaction to these revisions. The average positive target price (earnings) revision is 15.27% (3.30%) and associates with a market reaction of 2.31%. In contrast, the average negative target price (earnings) revision is approximately −16.35% (−8.35%) and associates with a market reaction of −3.11%.

Insert Table 8 around here

The first regression result in Panel B of Table 8 shows that positive TP and EPS revisions lead to greater CARs with the impact of TP revisions being almost 4 times greater than that of EPS revisions, consistent with prior results (Asquith et al. 2005). More importantly, Model 2 illustrates that the effect of *Inv_TR* on market reaction is channeled only through TP revisions, not EPS announcements. In particular, the interaction term Δ*EPS*Inv_TR* is insignificant, whereas the Δ*TP*Inv_TR* term is significant. Furthermore, controlling for changes in stock

fiscal year. The former criterion eliminates infrequently revised forecasts and the latter ensures forecast revisions reflect only analyst new information for a fiscal year. These additional selection criteria reduce the sample size to 283,763 observations.

recommendations does not affect our conclusions (Model 3). Overall, Panel B illustrates that there is a greater market reaction to analyst TP forecast revisions in firms with higher investor turnover. These findings provide further support to our arguments.

Next, we assess the economic significance of the effect revisions in analyst TPs have on stock prices in the presence of short-term investors. A one unit revision in analysts TPs leads to a 9.3% increase in abnormal returns around the forecast announcement for stocks with a high presence of long-term investors. A similar magnitude revision in TPs in the presence of short-term investors increases price reactions by 94% (from 9.3% to 18%). This result suggests that analysts TPs can lead to temporary price increases in stocks held predominantly by short-term investors.[26]

6.1 DO BIASED TPS AFFECT FUTURE HOLDINGS BY SHORT-TERM INVESTORS?

Our findings suggest that analysts strategically bias their TPs to cater to the needs of short-term investors and that investors seem to fail on average to see through analyst incentives and do not discount biased TPs issued for stocks with high short-term ownership. Next, we examine if short-term investors act on biased TPs and exit from stocks where analysts' optimistic TPs lead to temporary price increases.

The new regression model, which we estimate at firm level, has the form

[26] One could argue that short-term investors may benefit more from privileged private disclosure of analyst TPs rather than from the analyst attempt to "pump" the market. Three facts counter this argument. First, using daily volume data, Juergens and Lindsey (2009) do not find evidence that analysts working for a market-maker pre-release reports on their stock upgrades to benefit privileged clients. Second, market regulation, e.g. Nasdaq Rule 2110-4 that governs trades in anticipation of analyst reports, may limit private disclosure if this activity can attract regulator's attention. Third, private disclosure only does not guarantee profitable trades if the market price does not change. Also, it is unclear how short-term investors benefit from private disclosure of overly biased TPs. Rather, it is public disclosure of optimistic TPs that temporarily increase stock valuations that maximizes the likelihood of beneficial trade for short-term investors.

$$IO_{k,q+1} = \varphi_0 + \varphi_1 \text{Avg } TP\,bias_{k,q} + \varphi_2 \text{Avg } TP\,bias_{k,q} * Inv\_TR_{k,q} + \varphi_3 Inv\_TR_{k,q} + \varphi_4 IO_{k,q} + \varphi_5 \text{Avg } Inv\_bank_{k,q} + \sum_{j=0}^{2} \varphi_{6+j} \text{Avg } A_{k,q} + \sum_{j=0}^{6} \varphi_{10+j} F_{k,y-1} + \sum_{j=0}^{9} \varphi_{17+j} Industry\ dummies + \sum_{j=0}^{11} \varphi_{27+j} Year\ dummies + v_{k,q+1} \quad (8)$$

where the dependent variable for the regression is the one-quarter ahead *IO*, and the prefix "Avg" indicates a firm-quarter average. We regress future institutional ownership on the mean TP bias for a firm plus explanatory variables. The variables of interest is the interaction term between Avg *TP bias* and *Inv_TR*. We expect to find a negative coefficient on Avg *TP bias*Inv_TR* if the reduction in future institutional holdings is higher among stocks owned by short-term investors.

Panel A of Table 9 shows that the coefficient on Avg *TP bias* is negative and significant indicating that high TP bias today translates into lower *IO* next quarter. Specifically, an increase in TP bias by one percent reduces future holdings by institutional investors by 1.7%. This is consistent with the evidence in Frankel et al. (2006) and Ljungqvist et al. (2007) that institutional investors reduce holdings in stocks where analysts issue misleading reports. Examining the interaction term between Avg *TP bias* and *Inv_TR*, we observe that higher TP bias among stocks held by short-term investors leads to an incremental reduction in future institutional holdings, consistent with our proposition that short-term investors exit from these stocks. Specifically, for stocks owned by short-term investors, higher TP bias leads to an incremental reduction in future institutional holdings of 9.6%. Hence, Panel A of Table 9 suggests that short-term institutional investors take advantage of TP bias to offload their equity positions to retail investors.

Insert Table 9 around here

The main premise of this paper is that analysts from non-IB affiliated brokers cater to short-term investors by strategically biasing their TP estimates, which facilitates short-term investors'

profitable exits. We argue that they do so in order to encourage short-term investors to trade through the broker. Our findings so far confirm the former conjecture. In Panel B of Table 9, we now turn our attention to the latter. In particular, we investigate whether the analyst catering activity for the stock of firm *i* results in short-term investors increasing their holdings of other stocks covered by the broker the analyst works for. The dependent variable is the average one-quarter ahead institutional ownership of all stocks (excluding firm *i*) covered by the broker. More importantly, we also distinguish between future ownership of short-term vs long-term investors. In all models, we control for the contemporaneous level of institutional ownership in these stocks and include the main independent variables from our equation (4). The results support our prediction: Analyst TP bias for firm *i* in the presence of short-term investors leads to higher future IO in the stocks covered by the broker (Model 1). This relationship is driven by short-term investors as indicated by the differences in significance of the Avg *TP Bias*Inv_TR* coefficient between Models 2 and 3, that is, the interaction term is significant only when future short-term ownership is the dependent variable.

7. Conclusions

This study examines the effect of the investment horizon of institutional investors on bias in analyst target prices and earnings forecasts. We document that for stocks with high short-term institutional ownership, analysts strategically bias their TPs, but not their earnings estimates. We attribute this finding to a lower likelihood that investors will recognize that analysts cater to short-term investors by issuing biased TPs, but not EPS estimates. Further, we find that bias in TPs in the presence of short-term investors is largely concentrated among analysts working for brokers that are not affiliated with investment banks. This evidence reflects lower marginal cost

of reputation loss from issuing biased TPs for these brokers. Investors fail on average to see through analyst incentives and react more strongly to target price revisions issued for stocks with high short-term ownership, particularly when these forecasts are issued by non IB-affiliated brokers. Short-term investors take advantage of temporary stock price increases and sell their shares to retail investors.

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Table 1. Variables definition

Variable	Definition
1. Analyst forecast bias measures	
EPS bias	EPS bias is the signed difference between the forecasted earnings for the year and actual EPS scaled by the stock price at the end of the previous fiscal year.
Optimistic stock recommendation	An indicator variable taking the value of one when the analyst issues a stock recommendation above consensus, and zero otherwise. The consensus recommendation is estimated over the previous 12 months.
TP bias	Bias in the analyst's target price (TP), which is the difference between the target price and the stock price at the end of the 12-month forecast period scaled by the stock price at the forecast issue date.
TP bias_2	Alternative measure of bias in the analyst's target price (TP), which is the difference between the target price and the stock price at the end of the 6-month forecast period scaled by the stock price at the forecast issue date.
Upgrade/Downgrade	Upgrade (Downgrade) indicates a positive (negative) change in stock recommendation.
2. Institutional ownership and holding period measures	
Current IO of other stocks	The average current institutional ownership for all stocks (excluding firm i) covered by the broker the analyst works for.
Future IO	The level of institutional holdings in a stock measured one quarter after the TP issue.
Future IO of other stocks	The average one-quarter ahead institutional ownership for all stocks (excluding firm i) covered by the broker the analyst works for.
Inv_TR	Following Gaspar et al. (2005, 2013), this is the weighted average churn ratio of institutional shareholders holding equity in a firm during the quarter. The investor turnover ratio is measured one quarter prior to the TP issue.
IO	The level of institutional holdings in a stock measured one quarter prior to the TP issue.
MFFlow	This variable captures the hypothetical annual change in mutual fund holdings implied by previously disclosed holdings and quarterly mutual fund outflows≥5% of total fund assets (Edmans et al., 2012).
3. Analyst and broker characteristics	
Ana_experience	The number of years an analyst has issued at least one TP or EPS forecast for a given firm.
Ana_firm_followed	The number of companies for which an analyst issued at least one TP or EPS forecast over the previous 12 months.
Inv_bank	An indicator variable taking the value of one for analysts affiliated with an investment bank, and zero otherwise. To identify investment banks we use the Carter-Manaster (1990) list as updated by Loughran and Ritter (2004).
Star	An indicator variable for analysts selected to the All-America Research Team by the Institutional Investor magazine in the previous year. We use the Institutional Investor magazine ranking from the October issue of year t to identify forecasts issued by star analysts over the subsequent 12-months.
4. Firm characteristics	
BM	Book-to-market ratio, which is the book value of common equity scaled by the market capitalization measured at the previous fiscal year-end.
CAR (-1,1)	This is the 3-day cumulative abnormal return around the forecast revision day.
Cov	Stock price standard deviation measured over 90-days before the previous fiscal year-end scaled by the mean price level over this period.
Div_dummy	A dummy variable taking the value of one if the firm pays a dividend, and zero otherwise.
EPS Guidance	A dummy variable taking the value one if the management of the firm issued earnings guidance during the previous 12 months, and zero otherwise.
Firm_following	The number of analysts issuing at least one TP or EPS forecast for a firm over the previous 12 months.

Industry effect	Ten industry dummies based on Fama and French industry definitions.
Mom	Buy-and-hold stock returns for 90-days prior to the previous fiscal year-end.
MV	Firm market capitalization measured at the previous fiscal year-end.
Rule2711-472	A dummy variable taking the value of one for forecasts issued after the introduction of the regulation (post-2002), and zero otherwise.
TR	Stock turnover measured as the number of shares traded over the quarter scaled by the number of shares outstanding.
Year effect	A set of annual dummies for the TP issue year.

The table provides definitions of the dependent and independent variables used in the study.

Table 2. Descriptive statistics

Panel A: Descriptive statistics					
	Mean	*Median*	*STD*	*Q1*	*Q3*
TP bias	0.084	0.075	0.669	-0.259	0.403
TP bias_2	0.116	0.092	0.590	-0.181	0.358
Inv_TR	0.213	0.207	0.047	0.183	0.236
IO	0.642	0.686	0.230	0.492	0.825
Inv_bank	0.528	1.000	0.499	0.000	1.000
Ana_experience	6.781	6.000	3.512	4.000	9.000
Ana_firm_followed	15.685	15.000	8.343	11.000	19.000
Firm_following	11.561	9.000	8.590	5.000	16.000
Cov	0.098	0.077	0.074	0.050	0.121
BM	0.584	0.447	0.544	0.261	0.724
MV	3,664.150	822.075	7,362.620	280.654	2,847.690
Mom	0.065	0.045	0.302	-0.099	0.193

Panel B: Mean *TP bias* split by *Inv_TR*				
	Mean Inv_TR	*Mean TP bias*	*STD*	*p-value*
High Inv_TR	0.268	0.206	0.732	0.000
2	0.214	0.080	0.658	0.000
3	0.182	0.003	0.615	0.076
Low Inv_TR	0.148	−0.006	0.617	0.089

Panel C: Mean *TP bias* for dual sorts on *IO* and *Inv_TR*				
	High IO	*2*	*3*	*Low IO*
High Inv_TR	0.151	0.299	0.368	0.446
2	0.047	0.157	0.226	0.389
3	−0.026	0.046	0.142	0.297
Low Inv_TR	−0.047	0.001	0.062	0.176

Panel A presents the descriptive statistics of the main variables used in this study. All variables are defined in Table 1. The sample includes 374,615 analyst forecasts for 72,629 firm-quarters. STD denotes the standard deviation. *Q1* and *Q3* denotes the 25th and75th percentiles. Panel B presents the average *Inv_TR* and *TP bias* of quartile portfolios sorted by *Inv_TR*. Panel C presents the average *TP bias* for portfolios double sorted by *Inv_TR* and *IO*.

Table 3. Main regression results: the relation between TP bias and investor turnover

	TP bias			*TP bias*			*TP bias_2*			*TP bias_2*		
	Coeff.	*Std. Coeff.*	*p-value*	*Coeff.*	*Std. Coeff.*	*p-value*	*Coeff.*	*Std. Coeff.*	*p-value*	*Coeff.*	*Std. Coeff.*	*p-value*
Intercept	−0.069		0.320	−0.092		0.184	0.198		0.001	0.170		0.006
Inv_TR	1.174	5.03%	0.000	1.283	5.49%	0.000	0.650	2.78%	0.000	0.779	3.34%	0.000
IO	−0.203	−4.00%	0.000	−0.203	−3.98%	0.000	−0.213	−4.18%	0.000	−0.212	−4.16%	0.000
Inv_bank	−0.018	−0.88%	0.010	0.031	1.56%	0.212	−0.016	−0.79%	0.009	0.042	2.10%	0.053
*Inv_bank*Inv_TR*				−0.228	−2.51%	0.047				−0.270	−2.97%	0.006
ln *Ana_experience*	−0.013	−0.66%	0.118	−0.013	−0.66%	0.114	0.003	0.16%	0.670	0.003	0.15%	0.686
ln *Ana_firm_followed*	0.010	0.60%	0.222	0.010	0.61%	0.215	0.003	0.18%	0.693	0.003	0.19%	0.676
Cov	0.666	4.61%	0.000	0.667	4.61%	0.000	0.717	4.96%	0.000	0.718	4.97%	0.000
ln *Firm_following*	−0.063	−4.41%	0.000	−0.063	−4.41%	0.000	−0.053	−3.72%	0.000	−0.053	−3.72%	0.000
ln *BM*	−0.018	−1.48%	0.077	−0.018	−1.48%	0.077	−0.005	−0.44%	0.566	−0.005	−0.44%	0.566
ln *MV*	0.015	2.52%	0.052	0.015	2.50%	0.054	0.003	0.57%	0.624	0.003	0.54%	0.640
Mom	−0.016	−0.44%	0.459	−0.016	−0.44%	0.464	−0.034	−0.96%	0.065	−0.034	−0.95%	0.067
Industry effect	Yes			Yes			Yes			Yes		
Year effect	Yes			Yes			Yes			Yes		
N	374,615			374,615			374,615			374,615		
F-test	559.73			542.38			594.89			576.86		
p-value	0.000			0.000			0.000			0.000		
R^2	11.82%			11.82%			11.61%			11.62%		

This table presents regression results examining the relation between TP bias and investor turnover. All variables are defined in Table 1. We report the coefficient estimate (*Coeff.*), the standardized coefficient (*Std. Coeff.*) and the p-value (*p-value*) for each covariate. Standardized coefficients measure the effect one standard deviation increase in the independent variable has on the dependent variable. The reported p-values are based on heteroskedasticity-robust standard errors clustered at the firm and analyst level. ln indicates a natural logarithm. All models include industry and year dummies.

Table 4. Joint issues of analyst target prices and earnings forecasts

	TP bias | EPS issues		*EPS bias*		*EPS bias*	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	−0.163	0.037	0.026	0.000	0.026	0.000
Inv_TR	1.344	0.000	−0.016	0.103	−0.016	0.097
IO	−0.133	0.001	−0.004	0.069	−0.004	0.069
Inv_bank	0.044	0.162	0.000	0.733	0.000	0.905
*Inv_bank *Inv_TR*	−0.296	0.043			0.000	0.966
ln *Ana_experience*	−0.020	0.052	0.000	0.831	0.000	0.830
ln *Ana_firm_followed*	0.019	0.095	−0.001	0.314	−0.001	0.314
Cov	0.389	0.001	0.014	0.061	0.014	0.061
ln *Firm_following*	−0.051	0.003	0.000	0.738	0.000	0.738
ln *BM*	−0.011	0.289	0.001	0.072	0.001	0.072
ln *MV*	0.015	0.075	−0.002	0.000	−0.002	0.000
Mom	0.032	0.201	−0.005	0.000	−0.005	0.000
Industry effect	Yes		Yes		Yes	
Year effect	Yes		Yes		Yes	
N	132,367		132,367		132,367	
F-test	256.01		39.51		38.33	
p-value	0.000		0.000		0.000	
R^2	10.90%		3.73%		0.0373	

This table presents regression results examining the relation between TP and EPS bias and investor turnover using a sample of joint issues of analyst TP and EPS forecasts. All variables are defined in Table 1. We report the coefficient estimate and p-value for each covariate. The reported p-values are based on heteroskedasticity-robust standard errors clustered at the firm and analyst level. ln indicates a natural logarithm. All models include industry and year dummies.

Table 5. Robustness tests: instrumental variables regressions

	Inv_bank = 0				*Inv_bank = 1*			
	1st stage		*2nd stage*		*1st stage*		*2nd stage*	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	0.244	0.000	−0.473	0.232	0.241	0.000	−0.492	0.279
Inv_TR			3.283	0.043			2.814	0.132
IO	0.022	0.000	−0.200	0.003	0.022	0.000	−0.179	0.016
ln *Ana_experience*	−0.001	0.000	−0.002	0.865	−0.001	0.003	0.010	0.317
ln *Ana_firm_followed*	−0.001	0.000	0.015	0.211	−0.001	0.001	0.001	0.950
Cov	0.074	0.000	0.805	0.000	0.070	0.000	0.931	0.000
ln *Firm_following*	0.007	0.000	−0.062	0.004	0.006	0.000	−0.070	0.003
ln *BM*	−0.008	0.000	−0.011	0.578	−0.007	0.000	−0.014	0.491
ln *MV*	−0.009	0.000	0.025	0.180	−0.008	0.000	0.034	0.101
Mom	0.014	0.000	−0.134	0.000	0.014	0.000	−0.146	0.000
Div_dummy	−0.010	0.000			−0.011	0.000		
MFFlow	0.002	0.000			0.001	0.005		
Industry effect	Yes		Yes		Yes		Yes	
Year effect	Yes		Yes		Yes		Yes	
N	97,673		97,673		120,404		120,404	
F-test/Wald Chi2	1,884.87		1,314.62		3,110.82		1,247.89	
p-value	0.000		0.000		0.000		0.000	
R^2	36.12%		10.31%		44.04%		11.22%	

The table reports regression results from the first and second stage of a 2SLS model that examines the relation between TP bias and investor turnover. All variables are defined in Table 1. The dependent variable in the first stage regression is *Inv_TR*. The instruments in the 2SLS model are *Div_dummy* and *MFFlow*. In all models, we report the coefficient estimate and p-value for each covariate. The reported p-values are based on heteroskedasticity-robust standard errors clustered at the analyst level. ln indicates a natural logarithm. All models include industry and year dummies. F-test is the model specification F-test for the first stage regression. Wald Chi2 is the model specification Chi2-test for the for second stage regression.

Table 6. Robustness tests: the effect of NASD Rule 2711 and NYSE Rule 472

	Model 1		*Model 2*		*Model 3*	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	0.427	0.000	0.352	0.000	0.355	0.000
Inv_TR	1.209	0.000	1.680	0.000	1.690	0.000
IO	−0.196	0.000	−0.199	0.000	−0.199	0.000
Inv_bank	0.033	0.179	0.040	0.113	0.037	0.130
*Inv_bank *Inv_TR*	−0.243	0.034	−0.270	0.019	−0.298	0.024
Rule2711-472	−0.497	0.000	−0.382	0.000	−0.384	0.000
*Rule2711-472*Inv_TR*			−0.579	0.105	−0.596	0.099
Rule2711-472 Inv_TR*Inv_bank*					0.048	0.551
Controls	Yes		Yes		Yes	
Industry effect	Yes		Yes		Yes	
Year effect	Yes		Yes		Yes	
N	374,615		374,615		374,615	
F-test	566.190		550.290		534.780	
p-value	0.000		0.000		0.000	
R^2	12.64%		12.66%		12.66%	

The table reports regression results on the relation between TP bias and investor turnover when we control for the introduction of the NASD Rule 2711 and NYSE Rule 472. All variables are defined in Table 1. In all models, we report the coefficient estimate and *p*-value for each covariate. The *p*-values are based on heteroskedasticity-robust standard errors clustered at the firm and analyst level. All models include the firm-level controls used in the main regressions (Table 3), industry and year dummies but are not reported to conserve space.

Table 7. Sensitivity analyses: analyst reputation and alternative explanations

	Star Analysts		Star Analysts		Momentum Chasing		Stock Liquidity		EPS Guidance		Optimistic Stock Recommendation	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	−0.096	0.165	−0.100	0.148	−0.082	0.232	−0.065	0.352	−0.094	0.175	−1.572	0.000
Inv_TR	1.285	0.000	1.294	0.000	1.237	0.000	1.230	0.000	1.282	0.000	0.256	0.353
IO	−0.203	0.000	−0.203	0.000	−0.203	0.000	−0.213	0.000	−0.202	0.000	−0.085	0.058
Inv_bank	0.033	0.188	0.027	0.273	0.030	0.224	0.034	0.170	0.033	0.185	−0.225	0.009
*Inv_bank*Inv_TR*	−0.233	0.043	−0.205	0.073	−0.223	0.051	−0.240	0.035	−0.234	0.041	0.497	0.168
Star	−0.038	0.053	0.261	0.003								
*Star*Inv_TR*			−1.499	0.001								
*Mom*Inv_TR*					0.535	0.138						
TR							0.017	0.215				
EPS Guidance									−0.039	0.000		
TP bias											0.164	0.000
Controls	Yes		Yes		Yes		Yes		Yes		Yes	
Industry effect	Yes		Yes		Yes		Yes		Yes		Yes	
Year effect	Yes		Yes		Yes		Yes		Yes		Yes	
N	374,615		374,615		374,615		374,615		374,615		374,615	
F-test	526.21		510.93		526.09		526.62		530.13		2,462.55	
p-value	0.000		0.000		0.000		0.000		0.000		0.000	
R^2	11.83%		11.84%		11.83%		11.83%		11.85%		1.36%	

This table presents several sensitivity analyses. The first five regression models examine the relation between TP bias and investor turnover, after controlling for a variety of explanations. For these models, we run OLS regressions where the dependent variable is TP bias. The last model (probit regression) examines the impact of investor turnover and TP bias on the likelihood of an analyst issuing a stock recommendation above consensus. The dependent variable is Optimistic Stock Recommendation. All variables are defined in Table 1. In all models, we report the coefficient estimate and *p*-value for each covariate. The *p*-values are based on heteroskedasticity-robust standard errors clustered at the firm and analyst level. All models include the firm-level controls used in the main regressions (Table 3), industry and year dummies but are not reported to conserve space.

Table 8. Price reaction regressions

Panel A: Descriptive Statistics					
	Mean	*STD*	*p-value*	*Q1*	*Q3*
Panel A1: positive forecast revisions					
CAR (−1,1)	2.31%	6.44%	0.000	−1.15%	5.06%
Δ*TP*	15.27%	14.50%	0.000	5.71%	20.00%
Δ*EPS*	3.30%	19.75%	0.000	0.00%	2.69%
Panel A2: negative forecast revisions					
CAR (−1,1)	−3.11%	8.90%	0.000	−7.10%	1.63%
Δ*TP*	−16.35%	13.05%	0.000	−22.22%	−6.58%
Δ*EPS*	−8.35%	32.63%	0.000	−4.82%	0.00%

Panel B: Price reaction regressions						
	CAR (−1,1)		*CAR* (−1,1)		*CAR* (−1,1)	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	−0.001	0.000	−0.001	0.000	−0.001	0.012
Δ*TP*	0.120	0.000	0.106	0.000	0.093	0.000
Δ*EPS*	0.033	0.000	0.040	0.000	0.040	0.000
Δ*TP*Inv_TR*			0.063	0.091	0.087	0.018
Δ*EPS*Inv_TR*			−0.032	0.204	−0.033	0.181
Downgrade					−0.038	0.000
Upgrade					0.016	0.001
*Upgrade*Inv_TR*					0.023	0.345
N	283,763		283,763		283,763	
F-test	8,409.12		4,250.57		2,770.49	
p-value	0.000		0.000		0.000	
R^2	12.55%		12.56%		13.42%	

Panels A1 and A2 present descriptive statistics on the price reaction to analyst forecast revisions and on the level of the revisions. All variables are defined in Table 1. Δ*TP* and Δ*EPS* denote revisions in TP and EPS forecasts, respectively. *STD* denotes the standard deviation. *Q1* and *Q3* denotes the 25th and 75th percentiles. Panel B presents regression results on the price reaction to TP and EPS forecast revisions. In all models, we report the coefficient and p-value for each covariate. The reported p-values are based on heteroskedasticity-robust standard errors clustered at the firm and analyst level.

Table 9. The relation between future institutional holdings and bias in analyst target prices

Panel A. Impact of TP bias on Future IO

	Future IO		Future IO	
	Coeff.	*p-value*	*Coeff.*	*p-value*
Intercept	0.068	0.000	0.062	0.000
Avg *TP Bias*	−0.017	0.000	0.004	0.520
Avg *TP Bias*Inv_TR*			−0.096	0.000
Inv_TR	0.112	0.000	0.141	0.000
IO	0.822	0.000	0.822	0.000
Avg *Inv_bank*	−0.003	0.336	−0.003	0.337
Controls	Yes		Yes	
Industry effect	Yes		Yes	
Year effect	Yes		Yes	
N	67,163		67163	
F-test	1,295.25		1267.44	
p-value	0.000		0.000	
R^2	75.19%		75.19%	

Panel B Impact of TP bias on Future IO of stocks covered by the broker the analyst works for

	Future IO of other stocks		Future ST-IO of other stocks		Future LT-IO of other stocks	
	Coeff.	*p-value*	*Coeff.*	*p-value*	*Coeff.*	*p-value*
Intercept	0.159	0.000	0.211	0.000	0.176	0.000
Current IO of other stocks	0.742	0.000	0.664	0.000	0.665	0.000
Avg *TP Bias*	−0.003	0.005	−0.007	0.002	−0.004	0.164
Avg *TP Bias*Inv_TR*	0.011	0.032	0.019	0.030	0.020	0.171
Inv_TR	−0.023	0.000	−0.052	0.000	0.067	0.001
IO	0.000	0.428	−0.002	0.000	−0.002	0.000
Inv_bank	0.005	0.001	0.009	0.000	0.007	0.002
Industry effect	Yes		Yes		Yes	
Year effect	Yes		Yes		Yes	
N	269,374		133,737		133,375	
F-test	645.02		333.58		439.21	
p-value	0.000		0.000		0.000	
R^2	73.65%		61.41%		68.22%	

This table presents regression results on the relation between TP bias and future institutional ownership. In Panel A the dependent variable is the one-quarter ahead institutional ownership. The "Avg" prefix indicates a firm-quarter average. Panel A regressions also include the firm-level controls used in the main regressions (Table 3), but are not reported to conserve space. In Panel B, the dependent variable is the average one-quarter ahead institutional ownership for all stocks (excluding firm *i*) covered by the broker the analyst works for. We also run separate regressions where the dependent variable is the average future short-term (long-term) institutional ownership ST-IO (LT-IO). The "Avg" prefix indicates a broker-quarter average. We report the coefficient and p-value for each covariate. The reported p-values are based on heteroskedasticity-robust standard errors clustered at the firm level. All models include industry and year dummies. All variables are defined in Table 1.