Short-Sales Constraints and the Diversification Puzzle*

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Abstract

Disagreement about stock valuation, combined with short-sales constraints, can increase asset prices. We build a model showing that, so long as investor beliefs are not perfectly correlated, investors will disagree less about the value of a conglomerate than about each of its individual divisions. This generates a conglomerate discount, with disagreement and short-sales constraints being complementary in explaining its cross-sectional variation. We test these predictions empirically and find substantial support: conglomerates have lower differences of opinion and lower short-sales constraints than pure-play firms. Furthermore, greater differences of opinion and tighter short-sales constraints are significant predictors of valuation differences between conglomerates and pure plays.

JEL classification: G10, G11, G14, G18, G28, G32.

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1 Introduction

One of the basic tenets of financial economics is that arbitrage opportunities will be exploited by investors, ensuring that securities are correctly priced relative to their cash flows. This implies that the value of a portfolio of securities should be equal to the sum of the values of its individual components. However, arbitrage activity might be limited by frictions that make trading expensive or difficult to implement. The key insight of Miller (1977) is that disagreement, combined with short-sales constraints, can lead to overpricing. If pessimistic investors cannot incorporate their beliefs into prices, then the value of securities is driven by optimists. Within the context of individual asset prices, this intuition leads to clear, testable implications, many of which have been thoroughly explored in the literature.[1]

In this paper, we develop the idea that disagreement and short-sales constraints help explain the conglomerate diversification "puzzle" (e.g., Lang and Stulz (1994) and Berger and Ofek (1995)). The puzzle is why conglomerates, which can be thought of as portfolios of individual divisions, tend to trade at a discount relative to portfolios of pure-play firms operating in the same segments.[2] We formally model an argument advanced nearly forty years ago by Miller (1977): investors should disagree less about the value of a conglomerate than about the values of pure-play firms.[3] This follows for precisely the same reason that a portfolio's total variance is less than the variances of the components of the portfolio: so long as opinions about all of the divisions of a conglomerate are not perfectly correlated, opinions about the group will be less varied than opinions about each component. Meanwhile, in the presence

[1]The idea that short-sales constraints can lead to overpricing has been explored both theoretically and empirically. In addition to Miller (1977), the predictions from a theoretical perspective are explored by Hong and Stein (2003), Ofek and Richardson (2003), Hong et al. (2006), and Blocher et al. (2013). The predictions have been validated empirically by Asquith et al. (2005), Diether et al. (2002), Chen et al. (2002), and Boehme et al. (2006)

[2]A rich literature investigates the causes of the diversification discount. Existing explanations include the ideas that (i) the diversification is sub-optimal and causes low profitability, (ii) less profitable firms optimally choose to diversify, and (iii) the entire literature is a statistical mirage generated by poor matching of conglomerate and stand-alone firms. For examples of these explanations see Jensen (1986), Rajan et al. (2000), Scharfstein and Stein (2000), Maksimovic and Phillips (2002), Campa and Kedia (2002), Villalonga (2004b), Custódio (2014), and Hund et al. (2016). See Maksimovic and Phillips (2013) for a comprehensive survey.

[3]Miller (1977) says, "The existence of non-homogeneous valuations of securities among investors has implications not only for the prices of particular securities, but also for the valuation of firms formed by mergers, of conglomerates, and of closed end investment companies...the total value of the stockholders' investment might be maximized by splitting the company into several parts, and letting the value of each part be set by those investors who value its attributes."

of short-sales constraints, disagreement leads to overpricing. The greater the disagreement about the asset's value, the more severe the overpricing will be.[4] This correspondence exists because short-sales constraints prevent pessimistic views from being fully reflected in asset prices, and more disagreement implies a larger number of pessimistic investors. Combining these facts implies that conglomerates should trade at a discount relative to pure plays: the diversification discount should exist.

The model works along similar lines to Blocher et al. (2013), and its key contribution is that it allows for variation along two dimensions: disagreement among investors and endogenous short-sales constraints. There are two types of investors and two firms with publicly traded shares. Investors have downward-sloping demands for each company's shares, though they may disagree about which company they prefer. Type 1 investors weakly prefer company A and type 2 investors weakly prefer company B, though, depending on prices, either type of investor could be long or short either firm's shares.[5]

The key friction is that only a certain fraction of shares held by long investors is available for borrowing.[6] Similar to Blocher et al. (2013), this restriction in the equity lending market yields overpriced shares. We then compare the prices of each of these firms individually to the price of the merged entity and show that the merged entity's share price will be weakly lower than the prices of the stand-alone firms – a diversification discount will arise. This is precisely the intuition of Miller (1977), but we are the first to explicitly model this argument, allowing for more nuance than intuition alone can generate.

From the model, we investigate four empirical hypotheses related to how conglomerates and pure-play firms differ. First, differences of opinion should be smaller for conglomerates than for pure plays. If this assumption is not true, then the underlying intuition of the model

[4] When we use the term "overpriced," we mean that the price is higher than would arise without short-sales constraints.

[5] There is an inherent link between disagreement among investors about the valuation of a given stock, and the degree to which beliefs can "cross" regarding the valuations of different stocks, e.g., Hwang et al. (2016). For example, it is possible that investor X is bullish on both stock A and stock B, while investor Y is bearish on both. In this case, there is substantial disagreement, but beliefs do not cross. It is also possible that investor X is bullish on stock A and bearish on stock B, while investor Y has opposing beliefs. In this case, there is substantial disagreement, but beliefs cross. However, if investors do not disagree much about stock A, then there is no scope for beliefs about stock A and stock B to cross. Crossing requires disagreement, though disagreement does not require crossing.

[6] We initially assume that the fraction made available is exogenous, though we endogenize that fraction, and the associated lending fee, later in the model's development.

would be invalid.[7] Second, short-sales constraints should be lower for conglomerates than for pure plays. Third, the conglomerate discount should be larger when the conglomerate has a higher supply of shares available to borrow and lower loan fees relative to its imputed pure-play constituents. Because differential short-sales constraints are responsible for differential valuations of conglomerates and pure plays, it should not be surprising that as the relative difference in constraints grows, the pricing gap should grow. Fourth, higher differences of opinion among investors about the value of the firm increase the conglomerate discount, more so when short sales are constrained. This interaction exists because disagreement and constraints are complementary in raising prices. Without constraints, disagreement does not raise prices, and without disagreement, constraints cannot exist.

We test the first hypothesis, that investors will have larger differences in opinion about the valuation of pure plays than the valuation of conglomerates, using the standard deviation of analysts' earnings forecasts to measure differences of opinion. We find that when a firm has fewer segments, differences of opinion are higher. For instance, in a propensity-score matched sample, conglomerates exhibit almost 30% less dispersion of analysts' forecasts relative to pure-play firms.

The second hypothesis states that conglomerates should have lower short-sales constraints than pure plays. Using equity lending data from Markit from 2006 through 2015, we compute three measures of short-sales constraints: lendable supply, fee score (see Porras Prado et al. (2016)), and fee volatility (Engelberg et al. (2016)). We find that conglomerates have higher lendable supply, lower lending fees, and lower fee volatility than pure plays. For instance, conglomerates have 12% higher lendable supply than matched pure-play firms, consistent with our hypothesis. Papers such as D'Avolio (2002) have established that short-sales constraints are less binding for certain firms, such as large firms, so we are careful to show that these results are robust to including firm characteristics such as size, institutional ownership, analyst coverage, liquidity, and a number of other potential confounding factors.

The third hypothesis states that tighter short-sales constraints faced by pure-play firms

[7] In the Online Appendix, we consider a setting in which there can be greater differences of opinion regarding conglomerates. Naturally, the prediction of a conglomerate discount depends critically on whether the differences of opinion are larger or smaller for conglomerates. When we empirically confirm that conglomerates feature lower differences of opinion than pure-plays, the remaining predictions should hold as well.

should lead to larger conglomerate discounts. We measure excess valuation of a firm as the difference in the enterprise value-to-sales multiple relative to an industry benchmark. This benchmark is defined as the average of all pure-play firms operating in the same SIC industry 2-digit code. If the firm is a conglomerate, we calculate an imputed value using the sales-weighted average of the pure-play firms operating in each of the conglomerate's segments, similar to the approach by Lang and Stulz (1994) and Berger and Ofek (1995). We also use the same approach to compute measures of short-sales constraints for each firm and show that, when it is more difficult to short the benchmark pure plays, the excess valuation decreases. For example, we find a 10% difference in the excess valuation measure relative to its mean due to interquartile range (IQR) variation in imputed lendable supply.[8] These results are robust to a range of possible diversification measures and proxies for short-sales constraints. Overall, the results show that short-sales constraints affect the cross-section of the conglomerate discount; when short-sales constraints on pure plays are more severe, conglomerates exhibit lower excess valuation.

The fourth hypothesis states that differences of opinion and short-sales constraints are complementary in explaining cross-sectional variation in the diversification discount. We find this in the data. For instance, once we account for interaction effects, the difference in the excess valuation due to a one IQR increase in imputed lendable supply is 12% higher for firms in the top quartile of imputed differences of opinion than for those in the bottom quartile of imputed differences of opinion. In other words, consistent with the predictions of the model, the effect of fewer short sales constraints for pure-play benchmarks is higher when they also exhibit higher disagreement. We find this to be true in both univariate and multivariate settings, controlling for a variety of confounding factors.

In establishing these empirical results, we recognize that there are a number of relevant methodological issues discussed in the conglomerate discount literature. One of the main criticisms of the methodology employed by Lang and Stulz (1994) and Berger and Ofek (1995) is that matching conglomerate firms to imputed values taken from pure plays uses benchmark firms that are very different from conglomerates. For instance, Hund et al. (2016) mention that, "the Berger and Ofek [1995] procedure matches diversified firms to focused firms that are

[8]The interquartile range (IQR) variation is the difference between the 75th and 25th percentile values.

15 times smaller on average." Thus, the existence of the conglomerate discount might be due to sample selection bias (e.g., Villalonga (2004b), Custódio (2014), and Hund et al. (2016)). To rule out this possibility, all of our analyses are performed on a matched sample using propensity-score matching as in Villalonga (2004b) and Custódio (2014). In our matched sample, we find that the diversification discount is still positive. Importantly, regardless of whether the diversification discount is positive *on average*, the combination of short-sales constraints and differences of opinion should generate variation in the discount in the cross section. To further generate an apples-to-apples comparison, we also conduct an event study around diversification events when a pure-play firm reports becoming a conglomerate for the first time, and we find that the change in the discount is related to the change in disagreement and short sales constraints.

The ideas in this paper mainly relate to two branches of the financial economics literature: short selling and the diversification discount. In the area of short selling, theoretical arguments by Miller (1977), Hong and Stein (2003), Ofek and Richardson (2003), and Hong et al. (2006) suggest that stocks will be overvalued if frictions impede short sellers. Empirically, a number of papers such as Boehmer et al. (2010), Asquith et al. (2005), Diether et al. (2002), and Chen et al. (2002) explore this relationship, and overall, these papers generally confirm the idea that short selling frictions are associated with overvaluation. A large literature examines the diversification discount (e.g., Lang and Stulz (1994), Jensen (1986), Rajan et al. (2000), Scharfstein and Stein (2000), Maksimovic and Phillips (2002), Amihud and Lev (1981), Lamont and Polk (2002) and Mitton and Vorkink (2007, 2011)). Maksimovic and Phillips (2013) provide an excellent survey. Measurement issues have also been used to explain (or deny) the existence of the discount (e.g., Campa and Kedia (2002), Villalonga (2004a), Villalonga (2004b), Custódio (2014) and Hund et al. (2016)).

Although developed somewhat differently, two contemporaneous papers share elements of our key insights relating divergence of opinions and short sale constraints to the diversification discount. Hwang et al. (2016) empirically explores how disagreement generates different pricing for portfolios of financial assets relative to when they trade individually. They test their approach on a variety of settings, including exchange traded funds (ETFs), closed-end funds, and M&As, and the valuation of conglomerates. In the context of spin-offs, Bhandari (2016) develops and tests a Jarrow (1980)-type model.

Our key variables have explanatory power beyond standard explanations for the conglomerate discount discussed in the literature, such as differences in risk and expected returns (Lamont and Polk (2002)), idiosyncratic risk (Amihud and Lev (1981)), and return skewness (Mitton and Vorkink (2007, 2011)). We also employ alternative classifications of firm diversification, such as the number of segments in the conglomerate and the Hirschman-Herfindahl index of within-firm sales. In all cases, our key variables partially explain the relative valuation of conglomerates and pure-play firms.

2 Model

Let there be two types of investor $i \in \{1, 2\}$ and two stocks $j \in \{A, B\}$. Without loss of generality, investor of type 1 prefers stock A, and investor of type 2 prefers stock B. We call investor 1 (2) "optimistic" about stock A (B), and "pessimistic" about stock B (A). Each investor is infinitesimal, and each type is found in unit mass. Demand of investor type 1 is

$$\begin{aligned} D_1^A &= 1 + \alpha - p^A \\ D_1^B &= 1 - \alpha - p^B, \end{aligned}$$

while demand of investor type 2 is the reverse:

$$\begin{aligned} D_2^A &= 1 - \alpha - p^A \\ D_2^B &= 1 + \alpha - p^B. \end{aligned}$$

The downward-sloping demand curves are based on the framework in Blocher et al. (2013). While demand can be highly elastic, it should still depend on the price of the asset, which is determined in equilibrium by the interaction between supply and demand. Because each type is found in unit mass, the aggregate demand for each type is precisely as written above. Note that each type of investor has the same overall demands, except that the preference between shares, denoted α is reversed.[9] Note also that (i) both investors demand fewer shares of either stock when its price is higher, (ii) both can demand negative shares if the price is sufficiently high, and (iii) higher values of α imply greater disagreement/divergence of preferences.[10]

Assume that shares of each stock are in unit net supply: $N^A = N^B = 1$. Also, assume that there may be a short-sales constraint, such that an investor wishing to sell one share of stock short can successfully short sell only $\lambda \in [0, 1]$ shares. We partially endogenize the decision to lend shares in Section 2.2, by incorporating an equity lending market and a fee for borrowing shares. We look for the price of each stock as a stand-alone entity and the price that would prevail if the companies merged, assuming no synergies.

The stocks' prices depend on the level of disagreement. We define "low disagreement" as the case where $\alpha \leq 1/2$ and "high disagreement" as the case where $\alpha > 1/2$.

Proposition 1. *The prices of both stocks are $p^A = p^B = 1/2$ if disagreement is low, and $p^A = p^B = \frac{\lambda+\alpha(1-\lambda)}{1+\lambda} > 1/2$ if disagreement is high.*

Proof. The equilibrium condition defining the price for each stock differs, depending on whether the pessimists for that stock wish to be long or short. Without loss of generality, we can focus on stock A, whose pessimistic investors are of type 2.

1. If investors of type 2 wish to be long, then the price is given by $D_1^A + D_2^A = N^A$, which implies $(1 + \alpha - p^A) + (1 - \alpha - p^A) = 1$, which implies $p^A = 1/2$. At this price, demand by investors of type 2 is $D_2^A = 1 - \alpha - p^A = 1/2 - \alpha$, so this price holds if and only if $\alpha \leq 1/2$.

2. If investors of type 2 wish to be short, then they can short only λ times their demands. Then the price is given by $D_1^A + \lambda D_2^A = N^A$, which implies $(1+\alpha-p^A)+\lambda(1-\alpha-p^A) = 1$, which implies $p^A = \frac{\lambda+\alpha(1-\lambda)}{1+\lambda}$. At this price, demand by investors of type 2 is $D_2^A = 1 - \alpha - p^A = \frac{1-2\alpha}{1+\lambda}$, which is negative if and only if $\alpha > 1/2$.

$\square$

[9] We relax this assumption in Online Appendix B.2 and find qualitatively similar results.

[10] Reduced-form models are useful in that they can nest many "micro-founded" models, but they are unappealing if it is difficult to find micro-founded examples that fit the reduced form. It is important to establish examples of micro-founded models that are consistent with any proposed reduced form. One simple example that is consistent with our assumptions is presented in Online Appendix B.1.

So long as investors have similar opinions about a stock, its price is fixed at $1/2$. However, as disagreement increases to the point where one type of investor would prefer to be short at that price, limits to short sales cause the price to rise above $1/2$. Importantly, as α increases, disagreement increases, but aggregate demand is unchanged.

These formulae for prices also allow us to evaluate comparative statics regarding the model's parameters.

Corollary 1. *If disagreement is high, then prices are increasing in the level of disagreement α, and decreasing in the availability of shares λ. The effect of disagreement on prices is larger if fewer shares are available to borrow.*

Proof. Focusing without loss of generality on stock A, if $\alpha > 1/2$, then $p^A = \frac{\lambda+\alpha(1-\lambda)}{1+\lambda}$. Then $\frac{dp^A}{d\alpha} = \frac{1-\lambda}{1+\lambda} > 0$, $\frac{dp^A}{d\lambda} = \frac{1-2\alpha}{(1+\lambda)^2} < 0$, and $\frac{d^2p^A}{d\alpha d\lambda} = -\frac{2}{(1+\lambda)^2} < 0$. □

What does it mean, in practice, for disagreement to be "high"? In the model, disagreement is high whenever some investors are short. In practice, this is the case for nearly all firms, so one could take all propositions and corollaries that condition upon disagreement being high as applying generally. However, the model also assumes that there is always some constraint on short demand. Propositions and corollaries that condition upon disagreement being high are therefore conditional upon some limit to the ability of investors to sell short. Therefore, high disagreement should be read to mean that there is sufficient short demand to induce some limitation in the ability of some investors to sell short.

We are interested in how the prices of these two stand-alone firms compare to the price that would arise if they were to merge. To calculate the price of the merged firm, we must make some assumptions about how investors will demand shares, as a function of its price and their demands for the stand alone entities. Any reasonable assumption will yield a value of the merged firm that is identical to the aggregate value of the unmerged firms in the absence of any frictions or synergies. This will require investors to have the same dollar holdings in the merged firm if its market value is the same. The simplest assumption satisfying this requirement is that demand for shares in the merged entity equals the combined demands for shares in the separate entities, so we make this assumption.

We note that we assume neither positive nor negative synergies, nor any other operational differences in the assets that the firms hold, nor changes in the capital structure. Our interest in this model is purely the asset-pricing implications of merging. We defer a discussion of synergies to Online Appendix B.3.

Demand for the merged firm is therefore given by:

$$\begin{aligned} D_1^M &= D_1^A + D_1^B = \left(1+\alpha-p^M\right) + \left(1-\alpha-p^M\right) = 2-2p^M \\ D_2^M &= D_2^A + D_2^B = \left(1+\alpha-p^M\right) + \left(1-\alpha-p^M\right) = 2-2p^M. \end{aligned}$$

Aggregate demand equals aggregate supply, which is $N^M = N^A + N^B = 2$.

Let the *diversification discount* be the percentage amount that the merged entity is valued below the combined values of the pure plays.[11] That is, the diversification discount is

$$\delta = 1 - \frac{p^M}{\left(p^A + p^B\right)/2}.$$

We now find the price of the merged firm, and the diversification discount, as a function of our parameters.

Proposition 2. *The price of the merged firm is* $p^M = 1/2$*. If disagreement is low, then there is no diversification discount, whereas if disagreement is high, then the diversification discount is* $\delta = \frac{\alpha-1/2}{\alpha+\left(\frac{\lambda}{1-\lambda}\right)} > 0$.

Proof. The price of the merged firm can be found by setting aggregate demand equal to aggregate supply: $4-4p^M = 2$, so $p^M = 1/2$. If $\alpha \leq 1/2$, then $p^A = p^B = 1/2$, so the diversification discount is $\delta = 1 - \frac{p^M}{(p^A+p^B)/2} = 1 - \frac{1/2}{(1/2+1/2)/2} = 0$. If $\alpha > 1/2$, then the diversification discount is $\delta = 1 - \frac{1/2}{\left(\frac{\lambda+\alpha(1-\lambda)}{1+\lambda}+\frac{\lambda+\alpha(1-\lambda)}{1+\lambda}\right)/2} = \frac{\alpha-1/2}{\alpha+\left(\frac{\lambda}{1-\lambda}\right)} > 0$. □

Effectively, if there is sufficient disagreement to generate a demand for shorting a stock, then limits to short sales cause the pure-play firms to be priced above what would obtain in the absence of such limits. However, there are no investors who want to sell short shares in the merged firm, so the merged firm's price is independent of the level of disagreement.

[11] We focus on a discount because it has been observed that conglomerates typically trade for a lower price than the weighted average imputed from pure plays.

This induces a diversification discount when disagreement is high. As before, we can evaluate comparative statics regarding the diversification discount.

Corollary 2. *If disagreement is high, then the diversification discount is increasing in the level of disagreement α and decreasing in the availability of shares λ. So long as disagreement is not too high (specifically, so long as $\alpha < 1 + \frac{\lambda}{1-\lambda}$), the effect of disagreement on the diversification discount is larger when fewer shares are available to borrow. Short interest is higher for the pure plays than for the merged firm.*

Proof. If $\alpha > 1/2$, then $\delta = \frac{\alpha - 1/2}{\alpha + \left(\frac{\lambda}{1-\lambda}\right)}$. Then $\frac{d\delta}{d\alpha} = \frac{\frac{\lambda}{1-\lambda} + 1/2}{\left(\alpha + \frac{\lambda}{1-\lambda}\right)^2} > 0$, and $\frac{d\delta}{d\lambda} = -\frac{\alpha - 1/2}{\left(\alpha + \left(\frac{\lambda}{1-\lambda}\right)\right)^2 (1-\lambda)^2} < 0$. $\frac{d^2\delta}{d\lambda d\alpha} = -\frac{1 - \alpha + \left(\frac{\lambda}{1-\lambda}\right)}{\left(\alpha + \left(\frac{\lambda}{1-\lambda}\right)\right)^3 (1-\lambda)^2}$. This is negative if $\alpha < 1 + \frac{\lambda}{1-\lambda}$. □

These results are shown graphically in Figure 1. The diversification discount as a function of the level of disagreement α is shown in the upper panel, for three levels of λ. When shares are freely available to be borrowed (i.e., $\lambda = 1$), there is never a diversification discount. So long as $\lambda < 1$, the diversification discount appears whenever disagreement is sufficient to generate short sales, $\alpha > 1/2$. In this region, higher disagreement induces a greater diversification discount, more so when shares are less available to borrow. The diversification discount as a function of the availability of shares is shown in the lower panel. If there is insufficient disagreement to generate short sales, $\alpha < 1/2$, then the availability of shares to short is irrelevant. However, as long as there is sufficient disagreement, the diversification discount decreases as more shares are made available to borrow, more so if the disagreement is greater.

We now allow for two extensions of the model, each of which will extend the insights beyond our baseline model, but will also confirm the qualitative intuition that we have established thus far.[12]

First, we allow the existence of different levels of disagreement across the two types of investor. One type will want to hold similar numbers of shares of the two stocks, and the other will have significantly different holdings of each type of share. We show that the diversification discount arises from the combined level of dispersion in holdings in a simple, linear way. We

[12] In Online Appendices B.2 and B.3, we allow disagreement not only concerning which stock to each investor favors, but also over the level of aggregate holdings and over the value of synergies in a merged firm. We do not test predictions from these sections, so they are relegated to the Online Appendix.

also show that changes in demand from either type of investor have equal effects on prices if nobody is short. However, if somebody is short, then increased demand from long investors has a larger impact on prices than does increased demand from short sellers.

Second, we partially endogenize the decision to lend shares and incorporate an equity lending market with a price to borrow. This will allow results and figures closely mirroring those in Blocher et al. (2013), who also incorporate an equity lending market in a format similar to that which we use here. We show that the higher the prices to borrow shares of pure plays, the greater the diversification discount.

2.1 Differing Levels of Disagreement

In this section, we allow the different types of investor to have differing variation in opinion across stocks. For example, investors of type 1 might think the two stocks are fairly similar, and have a low α, while investors of type 2 see them as fundamentally different, and have a high α. Demand of investor type 1 is

$$\begin{aligned} D_1^A &= 1 + \alpha_1 - p^A \\ D_1^B &= 1 - \alpha_1 - p^B, \end{aligned}$$

while demand of investor type 2 is

$$\begin{aligned} D_2^A &= 1 - \alpha_2 - p^A \\ D_2^B &= 1 + \alpha_2 - p^B. \end{aligned}$$

Consider stock A in the case in which type 2 investors are short. The price is given by $D_1^A + \lambda D_2^A = N^A$, which implies that $\left(1 + \alpha_1 - p^A\right) + \lambda(1 - \alpha_2 - p^A) = 1$, which implies that

$$p^A = \frac{\alpha_1 + \lambda(1 - \alpha_2)}{1 + \lambda}.$$

What is the condition under which the stock would indeed be shorted by investor 2? $1 - \alpha_2 - p^A < 0$, which implies $p^A > 1 - \alpha_2$, which implies $\frac{\alpha_1 + \lambda(1-\alpha_2)}{1+\lambda} > 1 - \alpha_2$. This can be rearranged to become

$$\alpha_2 + \alpha_1 > 1$$

For stock A to be special, the two investors combined must have sufficient variation of opinion to push the price above $1 - \alpha_2$. Interestingly, the same constraint applies to stock B.

Define the *combined disagreement* about the two stocks as the sum $\alpha_1 + \alpha_2$. Define *high combined disagreement* as the case where $\alpha_1 + \alpha_2 > 1$ and *low combined disagreement* as the case where $\alpha_1 + \alpha_2 \leq 1$.

Proposition 3. *The prices are given by* $p^A = \frac{1+(\alpha_1-\alpha_2)}{2}$ *and* $p^B = \frac{1+(\alpha_2-\alpha_1)}{2}$ *if combined disagreement is low, and given by* $p^A = \frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda}$ *and* $p^B = \frac{\alpha_2+\lambda(1-\alpha_1)}{1+\lambda}$ *if combined disagreement is high.*

Proof. Consider stock A.

1. If neither investor sells it short, then its price is given by $D_1^A + D_2^A = N^A$, which implies $(1 + \alpha_1 - p^A) + (1 - \alpha_2 - p^A) = 1$, which implies $p^A = \frac{1+(\alpha_1-\alpha_2)}{2}$. Investors of type 2 are more pessimistic, and are long if and only if $D_2^A = 1 - \alpha_2 - \frac{1+(\alpha_1-\alpha_2)}{2} = \frac{1-\alpha_2-\alpha_1}{2} > 0$, which is equivalent to $\alpha_1 + \alpha_2 < 1$. Clearly, the condition and price for stock B are identical, except with α_1 and α_2 being swapped.

2. If investors of type 2 sell stock A short, then its price is given by $D_1^A + \lambda D_2^A = N^A$, which implies that $(1+\alpha_1-p^A)+\lambda(1-\alpha_2-p^A) = 1$, which implies $p^A = \frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda}$. Investors of type 2 are more pessimistic, and are short if and only if $D_2^A = 1 - \alpha_2 - \frac{1+(\alpha_1-\alpha_2)}{2} = \frac{1-\alpha_2-\alpha_1}{2} < 0$, which is equivalent to $\alpha_1 + \alpha_2 > 1$. Clearly, the condition and price for stock B are identical, except with α_1 and α_2 being swapped. An equivalent argument yields the results for stock B.

$\square$

To see why aggregate disagreement is critical, consider the case of stock A, and assume that $\alpha_1 + \alpha_2 = 1$. The price of stock A is 1/2 and total demand is $D_1^A = 1 + \alpha_1 - 1/2$ from type 1 investors and $D_2^A = 1 - \alpha_2 - 1/2$ from type 2 investors. It should be obvious that if α_2 increases, the stock price will fall: lower demand means a lower stock price. However, it will not fall enough for type 2 investors to avoid going short. Indeed, $D_2^A = 1 - \alpha_2 - \frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda} = \frac{1-\alpha_1-\alpha_2}{1+\lambda} < 0$.

Therefore, the stock will be overpriced relative to the setting in which naked shorting is allowed, in which case the price is given by $D_1^A + D_2^A = 2 + \alpha_1 - \alpha_2 - 2p^A = 1$, which means that $p^A = \frac{1+(\alpha_1-\alpha_2)}{2}$. The difference in price in the case where shorting is limited vs. not is $\frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda} - \frac{1+\alpha_1-\alpha_2}{2} = \frac{\alpha_1+\alpha_2-1}{2} > 0$.

It is immediately obvious that the two stocks have different prices. Demand for each stock differs, so prices will differ. The precise difference is surprisingly simply written.

Corollary 3. *The price of the stock whose optimistic investors hold a narrower range of opinions is higher than the price of the stock whose optimistic investors hold a greater range of opinions. The price difference is $\alpha_1 - \alpha_2$.*

Proof. Without loss of generality, let $\alpha_1 > \alpha_2$. Suppose that $\alpha_1 + \alpha_2 < 1$. Then $p^A - p^B = \frac{1+(\alpha_1-\alpha_2)}{2} - \frac{1+(\alpha_2-\alpha_1)}{2} = \alpha_1 - \alpha_2 > 0$. Now suppose that $\alpha_1 + \alpha_2 > 1$. Then $p^A - p^B = \frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda} - \frac{\alpha_2+\lambda(1-\alpha_1)}{1+\lambda} = \alpha_1 - \alpha_2 > 0$. In each case, stock A is more expensive, and its optimistic investor has a more varied opinion. □

This result should be intuitive: both greater optimism and lower pessimism imply higher demand and a higher price.

We close this section with comparative statics analyses of the size of the diversification discount as we vary the levels of disagreement α_1 and α_2, and the difficulty to short shares, λ.

Proposition 4. *If combined disagreement is low, then there is no diversification discount, whereas if combined disagreement is high, then the diversification discount is $\delta = \frac{(\alpha_1+\alpha_2-1)(1-\lambda)}{(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)} > 0$.*

Proof. The price of the merged firm can be found by setting aggregate demand equal to aggregate supply: $D_1^A + D_2^A + D_1^B + D_2^B = 2$, which implies $\left(1+\alpha_1-p^M\right) + \left(1-\alpha_1-p^M\right) + \left(1-\alpha_2-p^M\right) + \left(1+\alpha_2-p^M\right) = 4 - 4p^M = 2$, which implies $p^M = 1/2$. If $\alpha_1 + \alpha_2 > 1$, then $p^A = \frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda}$ and $p^B = \frac{\alpha_2+\lambda(1-\alpha_1)}{1+\lambda}$, so the diversification discount is $\delta = 1 - \frac{1/2}{\left(\frac{\alpha_1+\lambda(1-\alpha_2)}{1+\lambda}+\frac{\alpha_2+\lambda(1-\alpha_1)}{1+\lambda}\right)/2} = \frac{(\alpha_1+\alpha_2-1)(1-\lambda)}{(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)} > 0$. If $\alpha_1 + \alpha_2 \le 1$, then the diversification discount is $\delta = 1 - \frac{1/2}{\left(\frac{1+(\alpha_1-\alpha_2)}{2}+\frac{1+(\alpha_2-\alpha_1)}{2}\right)/2} = 0$. □

Similar to the base model, if there is sufficient combined disagreement, then limits to short sales cause the pure-play firms to be priced above what would obtain in the absence of such limits. There are no investors who want to sell short shares in the merged firm, however, so its price is independent of the levels of disagreement. This induces a diversification discount when disagreement is high. As before, we can evaluate comparative statics regarding the diversification discount.

Corollary 4. *If combined disagreement is high, then the diversification discount is increasing in the level of disagreement α, and decreasing in the availability of shares λ. So long as combined disagreement is not too high (specifically, so long as $\alpha_1 + \alpha_2 < \frac{2}{1-\lambda}$), the effect of disagreement on the diversification discount is larger when fewer shares are available to borrow. Short interest is higher for the pure plays than for the merged firm.*

Proof. If $\alpha_1 + \alpha_2 > 1$, then $\delta = \frac{(\alpha_1+\alpha_2-1)(1-\lambda)}{(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)}$. Then $\frac{d\delta}{d\alpha_1} = \frac{d\delta}{d\alpha_2} = \frac{(1-\lambda)(1+\lambda)}{[(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)]^2} > 0$ and $\frac{d\delta}{d\lambda} = \frac{-2(\alpha_1+\alpha_2-1)}{[(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)]^2} < 0$. $\frac{d^2\delta}{d\lambda d\alpha_1} = 2\frac{(\alpha_1+\alpha_2-1)(1-\lambda)-(1+\lambda)}{[(\alpha_1+\alpha_2-1)(1-\lambda)+(1+\lambda)]^3}$, which is negative if and only if $\alpha_1 + \alpha_2 < \frac{2}{1-\lambda}$. $\square$

We see these results in Figure 1. The diversification discount as a function of the level of combined disagreement $\alpha_1 + \alpha_2$ is shown in the upper-right panel, for three levels of λ. When shares are freely available to be borrowed, $\lambda = 1$, and there is never a diversification discount. So long as $\lambda < 1$, the diversification discount appears whenever disagreement is sufficient to generate short sales, $\alpha_1 + \alpha_2 > 1$. In this region, higher disagreement induces a greater diversification discount, more so when shares are less available to borrow. The diversification discount as a function of the availability of shares is shown in the lower-right panel. If there is insufficient disagreement to generate short sales, $\alpha_1 + \alpha_2 \leq 1$, then the availability of shares to short is irrelevant. However, as long as there is sufficient disagreement, the diversification discount decreases as more shares are made available to borrow, more so if the disagreement is greater.

The additional complexity in this section provides comfort that the intuition captured by the baseline model is robust: the core qualitative insights of the paper, that the diversification discount is positive if and only if (stock-level) disagreement is high enough, and zero otherwise, continue to hold. However, there are novel insights as well. Perhaps most interestingly, it is the combined disagreement across both types of investor that determines both the existence and the size of the diversification discount. Whether the more optimistic or pessimistic investor is associated with one or the other stock does not affect the level of the discount.

2.2 The Equity Lending Market

In our final extension of the baseline model, we allow for a somewhat more endogenous choice of whether to lend shares. We have assumed thus far that only a fraction λ of short demand can be satisfied. In this section, we allow all of it to be satisfied, but only at a price. To the extent possible, we follow Blocher et al. (2013) in notation and graphical style. This model is adapted from their more general model, with linear simplifications that allow their model to apply to multiple stocks.

We allow investors to have both market-level and stock-level disagreement, so that it is possible that some investors will choose to sell short the merged firm.[13] Let p_s^A be the price to borrow shares of stock A and p_s^B be the price to borrow shares of stock B. Let demand of investor type 1 be

$$\begin{aligned} D_1^A &= 2 - \kappa + \alpha - p^A + \gamma p_s^A \\ D_1^B &= 2 - \kappa - \alpha - p^B + \gamma p_s^B, \end{aligned}$$

while the demand of investor type 2 is

$$\begin{aligned} D_2^A &= \kappa - \alpha - p^A + \gamma p_s^A \\ D_2^B &= \kappa + \alpha - p^B + \gamma p_s^B. \end{aligned}$$

κ measures how much type 1 and type 2 investors disagree regarding their aggregate holdings. If $\kappa = 1$, then both types of investor have identical demands as in the base model. As κ rises above (falls below) one, type 1 investors hold more (less) stock overall than type 2 investors. Short sellers want to short less when the price to borrow shares is higher, and long

[13] In Online Appendix B.2, we solve an extension of the model with market-level disagreement but with exogenous equity lending. Further discussion of how we formulate market-level disagreement, see that Appendix.

investors want to own more when they can lend shares at a higher fee. Because the price to borrow shares is a flow cost and the price to buy is a one-time cost, we allow them to enter the utility function differently. One could interpret the coefficient γ as the inverse of the cost of capital, though this interpretation is not necessary for our results.

We assume that a fraction of long investors is willing to lend their shares of stock j to shorts. For simplicity, let that fraction be λp_s^j: the higher a price at which they can lend shares, the more they are willing to lend.

Consider the case of stock A. Equilibrium in the equity market requires $D_1^A + D_2^A = N^A$, which implies $2 - 2p^A + 2\gamma p_s^A = 1$, which implies

$$p^A = 1/2 + \gamma p_s^A.$$

There are three ranges of parameters that imply different conditions for equilibrium in the equity lending market.

1. If $\kappa < 1/2+\alpha$, then investors of type 2 are short the stock. Then, equilibrium in the equity lending market requires $\lambda p_s^A D_1^A = -D_2^A$, which implies $\lambda p_s^A \left(2 - \kappa + \alpha - p^A + \gamma p_s^A\right) = -\left(\kappa - \alpha - p^A + \gamma p_s^A\right)$, which can be written as

$$p^A = \frac{\lambda\gamma\left(p_s^A\right)^2 + (2\lambda - \kappa\lambda + \alpha\lambda + \gamma)p_s^A + (\kappa - \alpha)}{1 + \lambda p_s^A}.$$

   Combining this equation with the stock market equilibrium equation yields equations defining each price implicitly:

$$\begin{aligned} p^A &= \frac{\lambda\gamma\left(\frac{p^A - 1/2}{\gamma}\right)^2 + (2\lambda - \kappa\lambda + \alpha\lambda + \gamma)\frac{p^A - 1/2}{\gamma} + (\kappa - \alpha)}{1 + \lambda\frac{p^A - 1/2}{\gamma}} \\ p_s^A &= \frac{\lambda\gamma\left(p_s^A\right)^2 + (3\lambda/2 - \kappa\lambda + \alpha\lambda + \gamma)p_s^A + (\kappa - \alpha - 1/2)}{\left(1 + \lambda p_s^A\right)\gamma}. \end{aligned}$$

2. If $1/2 + \alpha < \kappa < 3/2 + \alpha$, then no investors want to sell short and prices are given by $p^A = 1/2$, $p_s^A = 0$.

3. If $\kappa > 3/2 + \alpha$, then investors of type 1 want to sell short. Then equilibrium in the

equity lending market requires $\lambda p_s^A D_2^A = -D_1^A$, which implies $\lambda p_s^A \left(\kappa - \alpha - p^A + \gamma p_s^A\right) = -\left(2 - \kappa + \alpha - p^A + \gamma p_s^A\right)$, which can be written

$$p^A = \frac{\lambda\gamma \left(p_s^A\right)^2 + \left(\kappa\lambda - \alpha\lambda + \gamma\right) p_s^A + \left(2 - \kappa + \alpha\right)}{1 + \lambda p_s^A}.$$

Combining this equation with the stock market equilibrium equation yields

$$\begin{aligned} p^A &= \frac{\lambda\gamma \left(\frac{p^A - 1/2}{\gamma}\right)^2 + \left(\kappa\lambda - \alpha\lambda + \gamma\right) \frac{p^A - 1/2}{\gamma} + \left(2 - \kappa + \alpha\right)}{1 + \lambda \frac{p^A - 1/2}{\gamma}} \\ p_s^A &= \frac{\lambda\gamma \left(p_s^A\right)^2 + \left(\kappa\lambda - \alpha\lambda + \gamma - \lambda/2\right) p_s^A + \left(3/2 - \kappa + \alpha\right)}{\left(1 + \lambda p_s^A\right)\gamma}. \end{aligned}$$

Similarly, there are three inequalities relating κ and α that determine equilibrium conditions for the prices of stock B, and three more for the merged stock M, which yield closed-form solutions similar to those above. These nine cases are described in Section B.2 of the Online Appendix.

For any given κ and α, there is a unique pair of prices such that both the stock market and the equity lending market are in equilibrium. In cases in which prices are not $p^i = 1/2, p_s^i = 0$ for $i \in \{A, B, M\}$, each price is the solution to a quadratic equation, and in no case are the equations neatly reduced. We therefore present three results that do not require clean statements of prices.

We first note that the diversification discount can be written very simply in terms of the prices to borrow shares. The diversification discount is defined as $\delta = 1 - \frac{p^M}{(p^A + p^B)/2}$. Plugging in prices from the stock market equilibrium conditions yields

$$\begin{aligned} \delta &= 1 - \frac{1/2 + \gamma p_s^M}{\left(1/2 + \gamma p_s^A + 1/2 + \gamma p_s^B\right)/2} \\ &= \frac{p_s^A + p_s^B - 2p_s^M}{1/\gamma + p_s^A + p_s^B}. \end{aligned}$$

Thus, $\frac{\partial\delta}{\partial p_s^A} = \frac{\partial\delta}{\partial p_s^B} = \frac{1/\gamma + 2p_s^M}{(1/\gamma + p_s^A + p_s^B)^2} > 0$ and $\frac{\partial\delta}{\partial p_s^M} = \frac{-2/\gamma - 4p_s^M}{(1/\gamma + p_s^A + p_s^B)^2} < 0$. This allows us to state the following empirical prediction.

Claim 1. *If the diversification discount is positive, then it is larger when the price to borrow shares of the pure-plays is larger, and smaller when the price to borrow shares of the conglomerate is larger.*

We emphasize that these are not comparative statics. We are not changing prices and observing what happens to the diversification discount. Prices to buy and prices to borrow move together as underlying parameters vary, and prices to buy determine the diversification discount. It is true *by definition* that as the prices of pure plays increase and the price of the merged firm falls, the diversification discount increases. It is true *in equilibrium* that, as underlying parameters vary, the prices to borrow each share and the prices to own each share move in the same direction, and higher prices to own are associated with higher prices to borrow. It is therefore also true *in equilibrium* that higher prices to borrow pure plays and a lower price to borrow the conglomerate are associated with a higher diversification discount.

Note that the diversification discount is linear with respect to the difference in the average price to borrow the pure plays, $\left(p_s^A + p_s^B\right)/2$, and the price to borrow the conglomerate, p_s^M. The denominator merely scales the prices so that they are in percentage terms rather than dollar terms. The intuition for this relationship is straightforward: a higher price to borrow shares means a higher unmet demand to short, which implies greater overpricing.

We can now state our second result as a direct implication of our first. If $\delta > 0$, then $\frac{p_s^A+p_s^B-2p_s^M}{1/\gamma+p_s^A+p_s^B} > 0$, so $\left(p_s^A + p_s^B\right)/2 - p_s^M > 0$. Therefore, we can see that any set of parameters will cause the borrowing fees to be lower for the conglomerate.

Claim 2. *If the diversification discount is positive, then the conglomerate will have lower borrowing fees and lower short interest.*

If there is a diversification discount, then it must result from the conglomerate being easier to sell short than the pure plays. Regardless of whether shorting is easier because there are more shares available to borrow ($\lambda^M > \lambda^{A,B}$) or simply because there is less disagreement about the conglomerate, the result is a higher fee difference and a larger diversification discount.

Finally, we present numerical solutions for prices in Figure 2. This graphic replicates Figure 3 in Blocher et al. (2013) by plotting curves representing equilibrium pairs of prices in both the stock market and the equity lending market. For simplicity, $\kappa = \gamma = \lambda = 1$. Other choices of

γ and λ affect the levels of prices, but they affect neither the qualitative shapes of these curves nor the comparative statics. Alternative choices of κ cause a divergence in prices between the two stocks, but offer qualitatively similar figures otherwise.

The solid curve represents all pairs of points satisfying equilibrium in the stock market, namely $p^A = 1/2 + p_s^A$. The three dashed curves represent pairs of equilibrium prices in the equity lending market, namely $p^A = \frac{\left(p_s^A\right)^2 + (2+\alpha)p_s^A + (1-\alpha)}{1+p_s^A}$, each for a given choice of α.

When there is low disagreement, $\alpha = 0.4$, the equity lending equilibrium curve lies fully above the stock market equilibrium curve, and the price to borrow shares is fixed at the zero-lower bound. Then the equilibrium prices are $p^A = 1/2$, and $p_s^A = 0$, shown as point 1 in the figure. As disagreement increases and $\alpha = 0.6$, the set of points allowing equilibrium in the equity lending market shifts down. Equilibrium shifts to point 2, at which prices are $p_s^A = p_s^B = 0.064$ and $p^A = p^B = 0.53$. As disagreement continues to rise, to $\alpha = 0.8$, equilibrium shifts to point 3, at which $p_s^A = p_s^B = 0.175$ and $p^A = p^B = 0.59$. Clearly, increasing disagreement implies both rising prices and rising prices to borrow. Because the price of the combined entity is fixed at 1/2, the diversification discount will increase right along with prices.

Generally speaking, any change in parameters that causes an increase in the share price also increases the price to borrow shares. Similarly, any shock that increases the price to borrow shares also increases the share price. It should therefore be unsurprising that higher lending fees for pure plays are associated with a higher conglomerate discount.

This relationship between prices and disagreement is plotted in Figure 3. It should be clear that the qualitative results from our baseline model continue to hold when we partially endogenize the choice to lend shares. We also find a novel implication, linking the price to borrow shares with the diversification discount. This is critical for our empirical work, as the price to borrow is a key measure of short-sales constraints.

2.3 Testable Hypotheses

We conclude this section by providing the testable implications of the model. For clarity, we list the empirical predictions in the order in which they will be tested, not the order in which they arose in the theory.[14] All hypotheses are supported by theory developed above, but additional theory found in Online Appendix also provides support for these hypotheses. When appropriate, we point readers to these additional results.

The first hypothesis is consistent with the intuition of Miller (1977), Bhandari (2016), and Hwang et al. (2016). Testing it serves largely to confirm the validity of the assumptions underlying the model. The second through fourth hypotheses are generated by the model and have not been explored in prior work.[15]

Hypothesis 1. Differences of opinion are smaller for a conglomerate than for a pure-play firm.

This hypothesis follows immediately from Proposition 2: the demand for the merged firm is identical for the two investors, but differs by 2α for each pure-play firm, with α being the difference in beliefs between investor types. Sometimes an analyst might be bullish about one firm and bearish about another, while another analyst may be bearish about the first and bullish about the second. If the firms were combined, these idiosyncrasies would be partly mitigated. The lower variation in forecasted earnings for conglomerates has precisely the same theoretical and statistical basis as the lower variation in demand for conglomerates.

Hypothesis 2. Short-sales constraints are higher for pure-play firms than for conglomerates. If there is a diversification discount in our model, then it must result from the conglomerate being easier to sell short than the pure-play firms. Regardless of whether shorting is easier because there are more shares available to borrow ($\lambda^M > \lambda^{A,B}$) or simply because there is less disagreement about the conglomerate, the result is a higher fee difference and a larger diversification discount, as shown in Claim 2. Pure plays also feature higher short interest, according to Corollaries 2, 4, and Claim 2.

[14] We offer a note on interpreting the model. The model is about relative prices of identical assets. For it to be interpretable in practice, these prices should be adjusted relative to some benchmark. In the model, the prices are for otherwise identical assets, so the comparison must be between assets that are comparable in some way. The most natural way to compare is to use multiples of prices to other variables – earnings, assets, sales, etc. "Price" in the model should be interpreted as a multiple.

[15] In addition to the testable hypotheses presented below, in the Online Appendix we provide examples of our main empirical approaches using a sample of simulated data based on the model. The qualitative results are quite similar between the simulated data and the real-world data.

Hypothesis 3. The diversification discount is higher when the conglomerate has a higher supply of shares available, and a lower fee for borrowing shares, relative to the pure-play firm. If short-sales constraints exist, then a higher supply of shares available to borrow means a lower price. This is true for pure plays in all model specifications – Corollaries 1 and 4. For conglomerates, this is true when the conglomerate may be sold short in equilibrium, which can occur when investors disagree about either optimal aggregate holdings or the value of synergies created in a merger. Both of these possibilities are explored in Online Appendix B.2 and B.3. The fact that there typically exists a diversification discount, combined with Claim 1, implies that the discount increases in relative fees.

Hypothesis 4. The diversification discount increases along with the level of disagreement among owners of shares in pure-play firms, and the effect of disagreement is larger when short sales are more constrained. This follows immediately from Corollaries 1, 2, and 4. The reason is that disagreement and short-sales constraints are complementary in increasing share prices. Without constraints, disagreement does not increase prices. Without disagreement, constraints cannot increase prices. Or, more precisely, without disagreement, constraints cannot exist as the demand for shorting would not exist. Note that this is not a statement about the level of disagreement among investors in different firms – rather, it concerns disagreement among potential investors of one firm's shares (for example, disagreement among investors in General Electric stock, some of whom have high valuations while others have low valuations). In our model, the most pessimistic investors are willing to sell shares short to the most optimistic ones, but may be prevented from doing so due to endogenously determined short-sales constraints stemming from the equity lending market.

3 Data Construction

We combine several data sets with information about U.S. firms from January 2006 through December 2015. Accounting data come from Compustat, analyst forecast data from IBES, pricing data from CRSP, and institutional ownership data from Thomson-Reuters 13f files.

Our proxies for short-sales constraints are based on equity lending market data provided by Markit (see Saffi and Sigurdsson (2011) and Porras Prado et al. (2016)). A detailed definition of our measures is provided in Appendix A.

Our main focus is on the impact of short-sales constraints and differences of opinion on the conglomerate discount (Lang and Stulz (1994), Berger and Ofek (1995)). A conglomerate is defined as a firm that has more than one operating segment (based on 2-digit SIC codes) reported in Compustat's Segments file. The excess valuation of a conglomerate is based on comparing its valuation multiples to those imputed from a "pseudo" benchmark of pure-play firms. In this pseudo-conglomerate, we compute the weighted valuation ratio of pure-play firms operating in the same segments as the conglomerate, using the conglomerate's segment sales as weights.[16] Our main valuation multiple is the enterprise-value-to-sales ratio (*EV/Sales*). As in Berger and Ofek (1995), we measure the conglomerate discount as the log of the ratio between the conglomerate's *EV/Sales* and the imputed *EV/Sales* multiples. Larger values of this ratio imply a lower discount. We also compute the discount based on the market-to-book (*MB*) ratio used by Lang and Stulz (1994) and Hwang et al. (2016) and defined as the difference between the conglomerate's *MB* and the imputed *MB* ratios, divided by the value of imputed *MB* ratio. Finally, we also use firms' assets and compute the discount using the *EV/Assets* multiple similar to that used for *EV/Sales*.

Our main measure of differences of opinion is *Analysts' Dispersion*, the standard deviation of unadjusted analyst forecasts from IBES scaled by the absolute value of the mean earnings forecast, similar to Diether et al. (2002). However, forecast dispersion can also reflect fundamental uncertainty about the stock (Abarbanell et al. (1995) and Anderson et al. (2005)), so it is crucial to control for risk; a higher volatility of returns may also reflect higher uncertainty about the underlying firm (e.g., Zhang (2006)). We use *Stock Volatility*, measured by the standard deviation of monthly stock returns during the previous 12 months from the annual report date, as a control variable that is a proxy for risk when explaining differences in valuation between conglomerates and diversified firms in all of our regression analyses.

Our measures of short-sales constraints are based on equity lending market data from

[16]Our results are similar if we use the median rather than the mean to compute imputed values.

Markit and available from January 2006 through December 2015.[17] For each firm, we have daily information on the lendable supply of shares (*Supply*), the loan fee (*Fee*), and a *Fee Score* computed by Markit. This variable captures the loan-weighted fee charged by lenders based on Markit's proprietary benchmark rate, where 0 indicates the cheapest and 5 the most expensive stocks to borrow. Finally, we use *Fee Risk* as a measure of short-sales constraints, defined as the standard deviation of the daily *Fee* in the 12 months prior to the announcement date. This variable is used in Engelberg et al. (2016) and is shown to capture the risk that stock loans become expensive, which can deter short-sales activity.

Finally, as additional control variables, we employ several characteristics used in prior literature as the base set of variables. We use the log of the firm's assets (*Ln(Assets)*), the fraction of the firm held by institutions (*Total IO*), Amihud's (2002) *ILLIQ*, the log of 1 + analyst coverage (*Ln(1+Analyst)*), firm leverage (*Leverage*) using the book value of debt scaled by total assets, capital expenditures as a fraction of assets (*CAPEX*), and firm profitability (*EBIT/Sales*).

4 Results

4.1 Descriptive Statistics

In Table 1 we show basic descriptive statistics for our sample. Panel A presents results for conglomerate firms – those reporting more than one operating segment in Compustat – and differences relative to the benchmark pure-play firms, while Panel B focuses exclusively on valuation measures using the imputed method.

In Panel A, we see that conglomerates on average report segment data for 2.58 divisions. The mean lendable supply (*Supply*) is equal to 21.97% of market capitalization, 2.91 percentage points bigger than that of pure plays. Conglomerates are generally cheap to borrow, with the mean (median) annualized *Fee* being equal to 89 (10) bps, and have an interquartile range (IQR) of just 11.5 bps. These figures are in line with those reported by D'Avolio (2002) and Porras Prado et al. (2016). The standard deviation of loan fees, *Fee Risk*, is equal to 396.5

[17] More details about this data set can found in Saffi and Sigurdsson (2011), Aggarwal et al. (2015), and Porras Prado et al. (2016).

bps and is lower on average than that of pure-play firms. Institutions hold around 67.7% of shares of conglomerates, with the average conglomerate being held by 163 institutions. The average conglomerate is followed by 7.2 analysts, and the mean dispersion of annual earnings forecasts is 7.48% of the mean absolute earnings forecast, smaller than the value found for pure plays.[18] The results provide initial support for our hypotheses. Conglomerates have lower short interest, lending fees, fee volatility, analyst dispersion, and stock return volatility than pure plays, as well as higher supply.

TABLE 1 ABOUT HERE

In Panel B we present these statistics for conglomerates' valuation multiples relative to imputed values. The imputed value of X is defined as the sales-weighted average of X for pure plays operating in the same SIC industry codes as the conglomerate. We find that conglomerates also exhibit lower excess valuation multiples than pure plays, regardless of whether valuation is measured using *EV/Sales* (Berger and Ofek (1995)) or *EV/Assets*. We find that *MB* ratios are slightly higher for conglomerates than for focused firms (Lang and Stulz (1994), Custódio (2014), and Hwang et al. (2016)). However, these basic comparisons do not control for differences in other firm-related characteristics, like size and liquidity, which we account for using propensity score-matched samples in a regression framework in the upcoming sections.

4.2 Propensity Score Matching

One of the main criticisms of the methodology employed by Lang and Stulz (1994) and Berger and Ofek (1995) is that matching conglomerates to imputed values from pure plays compares "apples and oranges" by using benchmarks that are very different from their conglomerate counterparts. For instance, Hund et al. (2016) mention that "the Berger and Ofek [1995] procedure matches diversified firms to focused firms that are 15 times smaller on average." Conglomerates also tend to be older than pure plays. In the unmatched sample, conglomerates are ten years older on average than focused firms (the mean age of conglomerates in Compustat is 25.6 years). Thus, the existence of the conglomerate discount might

[18] Only 68% of conglomerates satisfy the requirement of being covered by at least two analysts.

be due to sample selection bias (e.g., Villalonga (2004b), Custódio (2014), and Hund et al. (2016)). Matching a conglomerate to the imputed pseudo-conglomerate based on SIC industry code-matching does not take into account differences in characteristics that can dramatically affect statistical inference, such as profitability and sales. It is possible that the observed differences in valuation multiples between conglomerates and pure plays are simply due to intrinsic differences between the two types of firms not captured in our prior linear specifications. If this is true, then inference requires finding a properly balanced sample of firms.

Several papers address this issue by using propensity score matching (PSM) to control for observable differences between conglomerates and focused firms. We follow Campa and Kedia (2002) and Villalonga (2004b) and use PSM to randomize the likelihood of being diversified relative to being a pure-play firm. This step ensures that the two groups are comparable along characteristics that explain the likelihood of being a diversified company in the first place. We employ a 1:1 nearest-neighbor method without replacement using a 0.01 caliper. In the first stage, we use a logit regression to predict whether a firm is diversified, using observed firm characteristics as controls and with heteroskedasticity-consistent analytical standard errors proposed by Abadie and Imbens (2006). The first set of covariates we employ, which we denote *Base*, includes the log of the firm's assets (*Ln(Assets)*), the fraction of the firm held by institutions (*Total IO*), Amihud's (2002) *ILLIQ*, the log of 1 + analyst coverage (*Ln(1+Analyst)*), firm leverage (*Leverage*) using the book value of debt scaled by total assets, capital expenditures as a fraction of assets (*CAPEX*), stock price volatility (*Stock Volatility*), and firm profitability (*EBIT/Sales*). All variables apart from *Leverage* are predictors of diversification at the 1% significance level.

In the full sample, the treatment and control groups have very different probabilities of being diversified. The propensity score is 0.285 for pure plays and 0.439 for conglomerates, with the difference significant at the 1% level. Of the 8,096 conglomerate-year observations, we find matches for 6,883, with the propensity-matched sample comprising 13,766 (=2*6,883) observations. The matching algorithm using the *Base* set of covariates results in a propensity score of 0.400 for the pure plays and 0.398 for the conglomerates, with the p-value of the difference equal to 0.361. This suggests that the match is correctly identifying pure plays that have a similar propensity to diversify as actual conglomerates. Campa and Kedia (2002) and

Villalonga (2004b) find that the discount is reduced or disappears after constructing samples that attempt to eliminate the imbalance between conglomerates and pure-play firms. From here on, we use the propensity-matched sample in our tests.

In Table 2 we report statistics for means' difference tests between conglomerates and pure-play firms for the main variables of the paper across different samples. In Panel A, we display results for the measures of short-sales constraints: *Supply*, *Fee Score*, and *Fee Risk*. The first row, (*Unmatched*), has values for the unmatched sample, showing that short-sales constraints measures and analysts' forecast dispersion are lower for conglomerates than for diversified firms, with all differences being statistically significant at the 1% level. The second row uses the propensity-matched sample with the *Base* set of control variables to match firms. The matching algorithm still cannot successfully account for differences in short selling constraints and differences of opinion. Conglomerates have statistically significantly higher supply, lower fees, and lower fee volatility compared to diversified firms. This is consistent with the predictions made in Hypotheses 1 and 2 about the size of differences of opinions and of short-sales constraints for conglomerates compared with pure-play firms. The final row, *Base+SS+Beliefs*, adds *Supply*, *Fee Score*, *Fee Risk*, and *Analyst Dispersion* as additional covariates in the matching equation. By design, the matching procedure generates a sample of firms with no statistical differences related to short-sales constraints and analyst dispersion between conglomerate firms and pure plays.

In Panel B, we display statistics for the valuation multiples. While conglomerates are still priced lower than pure plays, the discount is smaller after matching, consistent with the findings of Campa and Kedia (2002) and Villalonga (2004b). Using *EV/Sales*, the difference between conglomerates and matched pure-play firms is equal to -4.69 in the unmatched sample and -1.20 in the matched sample, a reduction of almost 75%. For the other valuation multiples, *MB* and *Ln(EV/Assets)*, the decrease in the discount is similar, showing the importance of constructing a matched sample of firms. In the final row, we see that adding short-sales constraints and analyst dispersion as covariates further reduces the conglomerate discount by around 10%, highlighting the assertion that our proposed variables contribute to explaining the conglomerate discount.

Table 2 About Here

In summary, these results support our main hypothesis on the conglomerate discount: proxies of differences of opinion and short-sales constraints affect its magnitude in a statistically and economically meaningful way, although this effect cannot be fully explained.[19]

4.3 Differences of Opinion and Diversification

Hypothesis 1 states that conglomerates should have lower differences of opinion than pure plays. As long as opinions about all of the divisions of a conglomerate are not perfectly correlated, opinions about the group will be less varied than opinions about each component part. In Table 3 we test Hypothesis 1 by estimating OLS regressions including both conglomerates and pure-play firms, with firm- and year-fixed effects and with standard errors clustered at the firm level.

Columns (1) and (2) display estimates using the standard deviation of analysts' annual earnings forecasts scaled by the absolute mean forecast (as demonstrated by Diether et al. (2002)) as the dependent variable. We use two alternative measures of firm diversification as explanatory variables: in column (1) *#Segments* is the number of different operating segments reported in Compustat, while in column (2) *D(Conglomerate)* is an indicator variable equal to one if the firm has more than one reported segment in Compustat, zero otherwise. In both cases, we find that when a firm is diversified, the differences of opinion about its earnings are smaller.[20] For example, using analyst forecast dispersion in column (2), we have a statistically significant estimate of -1.029 for the *D(Conglomerate)* variable, indicating that conglomerate firms are associated with a 5.5% (=-1.029/21.68) standard deviation decrease in analyst forecast dispersion (using the matched sample's standard deviation). Our results are robust to the inclusion of variables such as firm size, institutional ownership, liquidity, analyst coverage, leverage, CAPEX, stock volatility, and profitability. Overall, our estimates support Hypothesis 1: conglomerates have smaller differences of opinion than pure-play firms.

[19]Our conclusions are qualitatively the same if we replace *Fee Score* with *Fee* as a measure of short selling constraints, and if we use options' open interest to measure differences of opinion.

[20]These results are also valid unconditionally in regressions without any controls.

Table 3 About Here

4.4 Short-Sales Constraints and Diversification

Hypothesis 2 states that short-sales constraints should be higher for pure plays than for conglomerates. In columns (3)-(8), we test this hypothesis using three proxies for short-sales constraints: lendable supply (*Supply*), loan fees (*Fee Score*), and loan fee volatility (*Fee Risk*). In columns (3) and (4), we find that conglomerates have greater lendable supply than pure plays for both measures of firm diversification. For example, the 1.376 coefficient estimated for *Supply* in column (2) implies that conglomerates have greater lendable supply than pure plays, equivalent to 12.5% (=1.376/10.95) of the conglomerates' lendable supply standard deviation.

While lendable supply is directly related to the ease of shorting stocks, Kolasinski et al. (2013) and Porras Prado et al. (2016) highlight how most stocks have a large slack supply in the equity lending market. An alternative measure of short-sales constraints is the lending fee paid to borrow shares, which captures the costs associated with shorting. In columns (5) and (6), we use the loan fee score measure computed by Markit and find that diversified firms have smaller lending fees than focused ones. Finally, columns (7) and (8) report results using the *Fee Risk* measure proposed by Engelberg et al. (2016). The -0.292 coefficient estimated for *D(Conglomerate)* in column (8) implies that the loan fee volatility is 9.1% (=-0.292/3.189) of a standard deviation lower, on average, for conglomerates than for pure plays. Overall, our results are economically significant and consistent with Hypothesis 2: pure-play firms face higher short-sales constraints than conglomerates do.

4.5 Conglomerate Discount, Disagreement, and Short-Sales Constraints

Our previous results support the hypotheses that conglomerates have smaller differences of opinion and fewer short-sales constraints relative to pure plays. In this section, we test Hypothesis 3 by answering a simple question: are conglomerates relatively cheaper when benchmark pure plays have larger differences of opinion and face relatively tighter short-sales constraints?

We begin the analysis by comparing the valuation multiples of conglomerates, using groups sorted according to the relative level of short-sales constraints and analysts' dispersion. To avoid the potential selection biases with the imputed approach used by Lang and Stulz (1994) and Berger and Ofek (1995), we use the nearest pure-play neighbor in the propensity-matched sample (Villalonga (2004b) and Custódio (2014)).

For every year, we compute the relative difference in short-sales constraints (using, respectively, *Supply*, *Fee Score*, and *Fee Risk*) between a conglomerate and its nearest pure-play neighbor in the propensity-matched sample and sort these firms into terciles. Then, within each tercile, we further sort conglomerates according to the difference in analysts' forecast dispersion (*Analysts' Dispersion*).

In Table 4, we display the excess *EV/Sales* valuation multiple of conglomerates in the highest and lowest terciles for each combination of sorting variables. For example, using *Supply*, we find that the mean *EV/Sales* for firms in the top tercile of *Analysts' Dispersion* and lowest tercile of *Supply* is equal to -0.236, while for those in the lowest tercile of *Analysts' Dispersion* and highest tercile of *Supply* is equal to -0.661. We also display the difference between conglomerates with high dispersion / high short-sales constraints and those with low dispersion / low short-sales constraints. These are the portfolios that our model predicts should have the largest difference in prices. The 0.425 difference is positive and statistically significant at the 1% level. We find similar results for all other measures of short-sales constraints.[21]

<u>TABLE 4 ABOUT HERE</u>

The results above provide support for our hypotheses in a simple univariate setting. However, there are a number of confounding variables that may affect the results as shown in previous literature (e.g., Berger and Ofek (1995)). We address this issue by examining the conglomerate premium/discount in a multivariate setting.

We analyze the conglomerate discount using a similar methodology to Custódio (2014), comparing conglomerates and pure-play firms in a propensity-matched sample that minimizes the sample selection bias. We contribute to the literature by including measures of differences

[21]Note that while the lowest terciles of *Supply* face the tightest short-sales constraints, for *Fee Score* and *Fee Risk* we examine the highest tercile.

of opinion, short-sales constraints, and their interaction. Our baseline regression is written as follows:

$$\begin{aligned} \mathit{Excess(Ln(EV/Sales))}_{i,t} &= \alpha_1 + \delta D(Conglomerate)_{i,t} + \beta_1 Imp(Dispersion)_{i,t} + \beta_2 Imp(SS)_{i,t} \\ &\quad + \beta_3 Imp(Dispersion)_{i,t} * Imp(SS)_{i,t} + \ \phi' \mathbf{X}_{i,t} + \kappa_i + \mu_t + \epsilon_{i,t}, \quad (1) \end{aligned}$$

Our dependent variable, *Excess(Ln(EV/Sales))*, is the difference between the logarithm of a firm's enterprise-to-sales multiple and an industry benchmark, defined as the average of all pure-play firms operating in the same SIC industry 2-digit code as the firm. If the firm is a conglomerate, we compute an imputed value as the benchmark, similar to the approach by Berger and Ofek (1995). This imputed value is computed using the sales-weighted average of the pure-play firms operating in each of the conglomerate's segments. Furthermore, we also compute a similar benchmark for each measure of differences of opinion and short-sales constraints (i.e. *Imp(X)* for variable "*X*"). *D(Conglomerate)* is an indicator variable equal to one if the firm is a conglomerate, zero otherwise. The variable *Imp(Dispersion)* is based on analysts' forecast dispersion, while *Imp(SS)* uses one of three measures of short-sales constraints: *Supply*, *Fee Score*, and *Fee Risk*. The matrix **X** includes time-varying firm characteristics as control variables. All models include firm-fixed and year-fixed effects, with standard errors being clustered at the firm level. One can think of our tests as describing within-firm variation in excess valuation measures due to variation in the level of differences of opinion and short-sales constraints in the underlying pure-play benchmark firms.

Table 5 About Here

Table 5 displays our results. Column (1) shows the standard result that conglomerates have lower valuation: the *D(Conglomerate)* coefficient is negative and statistically significant, even when controlling for several firm characteristics and using a matched sample to minimize selection bias. In column (2), we include measures of lending supply (*Supply*), analysts' forecast dispersion (*Analysts' Dispersion*), and the cross-product between them, *Imp(Dispersion)*Imp(SS)*. If we perform a F-test comparing the *D(Conglomerate)* coefficient estimated for each regression, we find a small but statistically significant decrease in the coefficient, from -0.241 to -0.228, equivalent to a 5% reduction in the conglomerate discount. Furthermore, when it becomes easier to borrow shares in the benchmark firms (i.e., higher *Imp(Supply)*), the excess valuation of the conglomerate also increases: the coefficient on *Imp(SS)* is statistically significant and equal to 3.233. Critically, larger differences of opinion about the imputed firm increase the impact of short-sales constraints on excess valuation, consistent with Hypothesis 4. In column (2), the interaction term *Imp(Dispersion)*Imp(SS)* is equal to 9.266 and is statistically significant at the 1% level. For example, in column (2), for firms in the 25th percentile of *Imp(Dispersion)*, the impact of a one standard deviation increase in *Imp(SS)* results in a 0.076 standard deviation increase in *Excess(Ln(EV/Sales))*, while for firms in the 75th percentile of *Imp(Dispersion)* that impact is equal to 0.092, a 21% difference.

One potential concern with using *Supply* to measure short-sales constraints is that the equity lending market often has a large slack supply of shares (Kolasinski et al. (2013)). Thus, an increase in supply may not necessarily be associated with a relaxation of short-sales constraints. One way to address this issue is to use price-based measures, such as the *Fee Score* and *Fee Risk*, which capture costs associated with shorting a stock. In all cases we obtain similar results.[22]

Overall, consistent with Hypotheses 3 and 4 of our model, an increase in short-sales constraints of benchmark firms is associated with a higher relative valuation of firms and this effect increases with differences of opinion within the benchmark pure-play firms. The conglomerate discount is also lower following the inclusion of differences of opinion and short-sales constraints measures, although it is still positive and statistically significant.

The predicted coefficient estimates for *Imp(Dispersion)*, *Imp(SS)*, and *Imp(Dispersion)*Imp(SS)* are all clear from the comparative statics in the model. However, while differences of opinion and short-sales constraints affect pricing, it is not clear whether the coefficient on *D(Conglomerate)* should increase, shrink, or even disappear altogether as controls are added in columns (2)-(4). Therefore, in Online Appendix A we present similar regressions using simulated data and the pricing equations in Proposition 1 and Proposition 2. The results are qualitatively similar to

[22]Note that signs for *Imp(SS)* are negative when using *Fee* and *Fee Risk* as a proxy for short-sales constraints because, opposite to *Supply*, an increase in their values implies higher short-sales constraints.

the results in Table 5: the coefficient on *D(Conglomerate)* is constant as controls are added. This provides some reassurance that the model captures the data well.

4.6 Diversification Events and Price Dynamics

We explore the price dynamics related to differences in short sales constraints and differences of opinion by conducting an event study based on pure-play firms diversifying events. These events occur due to either internally-funded expansions or through M&As. In the 2008-2015 period, we identify 330 diversification events and compare the excess EV/Sales valuation multiple of a pure-play firm relative to the industry-average at the end of year *t-1* to its value on December-end of the fiscal year at time t, i.e., when the company reports being diversified for the first time.[23] We also compute the change in imputed measures of dispersion of opinion and short sales constraints and use those measures as the main variables of interest.

Table 6 shows the results. The change in excess valuation after a diversification event is negative. The -0.167 coefficient in column (1) means that diversifying on average reduces excess valuation ratios. This is consistent with the literature showing that there is a conglomerate discount. Once we control for firm characteristics in column (2) the effect is no longer significant. However, in columns (3)–(5), we add changes in dispersion and changes in short sales constraints. Consistent with our main hypotheses, following a diversification event, an increase in the imputed pure-plays short-sales constraints is associated with a larger reduction in valuation multiples. The effect of constraints on valuation is also lower whenever the imputed pure-plays also exhibit higher dispersion. Overall, this result shows, in a dynamic setting, that our main hypotheses are evident in the data. In columns (6)–(8) we include the interaction between dispersion and short sales constraints. While the coefficients have the correct sign, they are not statistically significant. Although somewhat mixed, these dynamic results are broadly supportive of our theoretical idea.

<u>TABLE 6 ABOUT HERE</u>

[23] This timing is chosen to ensure that we avoid including the year in which the the firm was changing from a pure-play to a diversified one.

5 Extensions and Robustness Tests

5.1 Alternative Classifications of Firm Diversification

In Table 7, we test whether alternative classifications of firm diversification (*Diversification Proxy*) still support the presence of a conglomerate discount and the significance of differences in opinion and differences in short-sales constraints. We re-estimate the regressions in columns (2)-(4) of Table 5, but replace the conglomerate indicator variable with three alternative measures of diversification employed by Custódio (2014). In columns (1)-(4) we use the number of unrelated segments based on the 2-digit SIC codes reported in Compustat's Segment files, while columns (5)-(8) use the Hirschman-Herfindahl index (*HHI(Sales)*) computed for the sales of all segments of a firm reported in Compustat. This variable measures how concentrated sales are among the reported segments of a firm, being equal to one for a pure-play. Similarly, columns (9)-(12) use the *HHI* based on segments' assets. In all cases, the estimated coefficients for *Imp(Dispersion)*, *Imp(SS)*, and their cross-product have the same signs as those found in Table 5. Furthermore, an increase in short-sales constraints of benchmark pure plays decreases the excess valuation of companies, with the effect being even larger when benchmark firms exhibit larger differences of opinion.

Table 7 About Here

5.2 Alternative Explanations for the Conglomerate Discount

Many alternatives have been advanced in the literature to explain the conglomerate discount. In Table 8 we include several additional variables to rule out the possibility that the explanatory power of differences of opinion and short-sales constraints is due to correlation with omitted variables.[24]

Lamont and Polk (2002) show that the conglomerate discount reflects differences in risk and expected returns between conglomerates and pure plays. For each firm in our sample, we include the cumulative stock returns over the past 12 months (*Past 12-month return*) as a

[24] We constrain the sample such that only firms with data available for all additional measures are included.

measure of overvaluation. Overvalued firms exhibit higher disagreement and are more heavily targeted by short sellers, which may lead to spurious correlation with short-sales constraints measures and *Analysts' Dispersion*. As expected, firms with relatively higher past valuations than the matched comparable tend to have higher *EV/Sales*, but our main variables remain significant.

TABLE 8 ABOUT HERE

Another possibility for why firms diversify is an attempt by managers to reduce their exposure to firm-specific risk (e.g., Amihud and Lev (1981)). Thus, we include *Idiosyncratic Risk*, defined as the standard deviation of the residuals based on the Carhart (1997) four-factor model of returns. This variable measures the volatility of the portion of returns that cannot be hedged by standard risk factors. Managers may have high exposure to firm-specific risk (e.g., human capital tied up in the company, employee stock options, etc.) and may be unable to diversify their risk. Thus, they can lower their total risk by diversifying the firm, which might make the firm pass up profitable opportunities and became relatively undervalued. As expected, we find that firms with relatively larger idiosyncratic risk tend to have lower valuations.

Mitton and Vorkink (2007, 2011) propose that the discount is related to compensation for conglomerates' lower upside potential (i.e., lower skewness). We control for this possibility by including the skewness of abnormal returns (computed from residuals of Carhart's (1997) four-factor model).[25] Investors pay a premium for focused firms due to their higher upside potential (i.e., positive returns' skewness). Consistent with Mitton and Vorkink (2011), we find that firms with relatively higher abnormal skewness are associated with higher valuation multiples, but the *D(Conglomerate)* is lower but still significant. Overall, while all of these variables suggested by previous literature have some degree of explanatory power, *Imp(SS)* and *Imp(Dispersion)* still remain significant in all cases, consistent with our hypotheses.

[25] Our results are similar if we use the skewness of raw returns rather than abnormal ones.

6 Conclusion

In this paper we take the ideas in Miller (1977) to establish a new driving force for the conglomerate discount. We provide evidence, from both theoretical and empirical standpoints, that disagreement and short-sales constraints matter in the valuation of conglomerates. We develop a model showing that when two assets are combined (e.g., a merger between firms), the price of the combined assets will be lower than if the individual components were traded separately. We establish the following pricing implications: (1) firms have higher prices when it is costlier to short them; (2) firms have higher prices when differences of opinion are higher; and (3) these two effects are complementary.

Empirically, we find strong support for the model's key implications. Conglomerates have smaller differences of opinion and fewer short-sales constraints than pure-play firms. While the model is agnostic about whether conglomerates on average are traded at a premium or at a discount relative to benchmark pure-play firms, we find that variation in differences of opinion and short-sales constraints are significant predictors of valuation differences. Greater differences of opinion and short-sales constraints faced by benchmark pure-play firms are associated with an increase in valuations relative to the benchmark firms. This effect is stronger when the benchmark firms exhibit both characteristics at the same time. These results hold using alternative sample construction methods, and for several measures of short-sales constraints; using other firm controls such as size, institutional ownership, and liquidity; and for alternative explanations for the conglomerate discount.

Taken together, we find that the hypotheses derived from the model are broadly supported. While we are unable to fully explain the conglomerate discount, using proxies of differences of opinion and short-sales constraints consistently contribute to reduce the difference in value between conglomerates and pure-play firms. Unlike existing work, our approach assumes neither the existence of synergies nor any other operational differences in the assets that the conglomerates hold. In fact, previous explanations are all based on corporate financial and statistical methodology differences, while our explanation arises purely from asset-pricing considerations. We establish that differences of opinion combined with short-sales constraints, as a limit to arbitrage, explain a significant fraction of the conglomerate discount.

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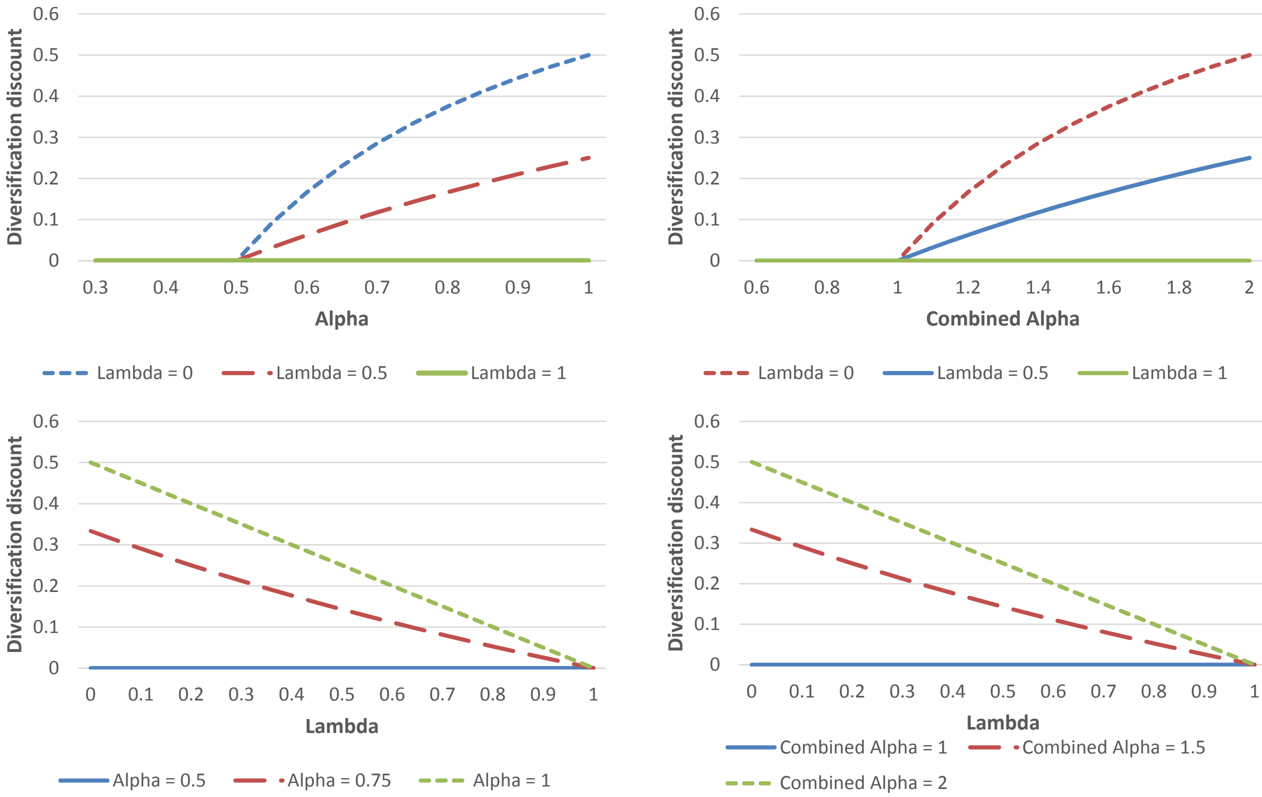
Appendix A: Variables Definitions

Variable	Definition
#Segments	Number of segments in which a firm operates as reported in Compustat's Segment files.
D(Conglomerate)	Indicator variable equal to one if the firm has more than one operating segment in the Compustat segment file.
Imputed(X)	Sales-weighted average of variable "X" for pure plays operating in the same SIC industry codes as the conglomerate.
Relative(X)	$X -$ *Imputed(X)*.
Enterprise Value (EV)	Mkt. Capitalization + Long term Debt (Compustat's DLC+DLTT).
Sales	Annual net sales reported in Compustat (*SALE*).
Assets	Firm assets in US$ billions.
MB	Market-to-Book ratio defined as the market value of common shares ÷ Book Equity.
Prem.(Ln(EV/Sales))	Ln(Conglomerate's *(EV/Sales)/Imputed(EV/Sales))* as in Berger and Ofek (1995).
Prem.(MB)	Ln(Conglomerate's *MB/Imputed(MB)*).
Prem.(Ln(EV/Assets))	Ln(Conglomerate's *(EV/Assets)/Imputed(EV/Assets))* as in Berger and Ofek (1995).
Supply	End-of-quarter fraction of market capitalization available to lend.
Fee	Value-weighted loan fee at the end of the quarter (in annualized %).
Fee Score	Fee score computed by Markit that ranges from 0 (cheapest to borrow) to 5 (most expensive).
Fee Risk	Standard deviation of daily *Fee* in the 12 months before the yearly announcement date.
Analyst Coverage	Number of analyst estimates in IBES reporting annual earnings forecasts.
Analysts' Dispersion	Standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES.
Total IO	Fraction of the firm held by institutional investors computed from the 13f files.
ILLIQ	Daily absolute return divided by dollar volume (Amihud (2002)) average during the previous 12 months.
Leverage	(Debt in Current Liabilities (Compustat's *DLC*) + Long-Term Debt (*DLTT*)) ÷ Book Assets.
CAPEX	(Capital Expenditures) ÷ Lagged Book Assets.
Stock Volatiliy	Standard deviation of monthly returns during the previous 12 months.
EBIT/Sales	Earnings Before Interest and Taxes ÷ *Sales.*

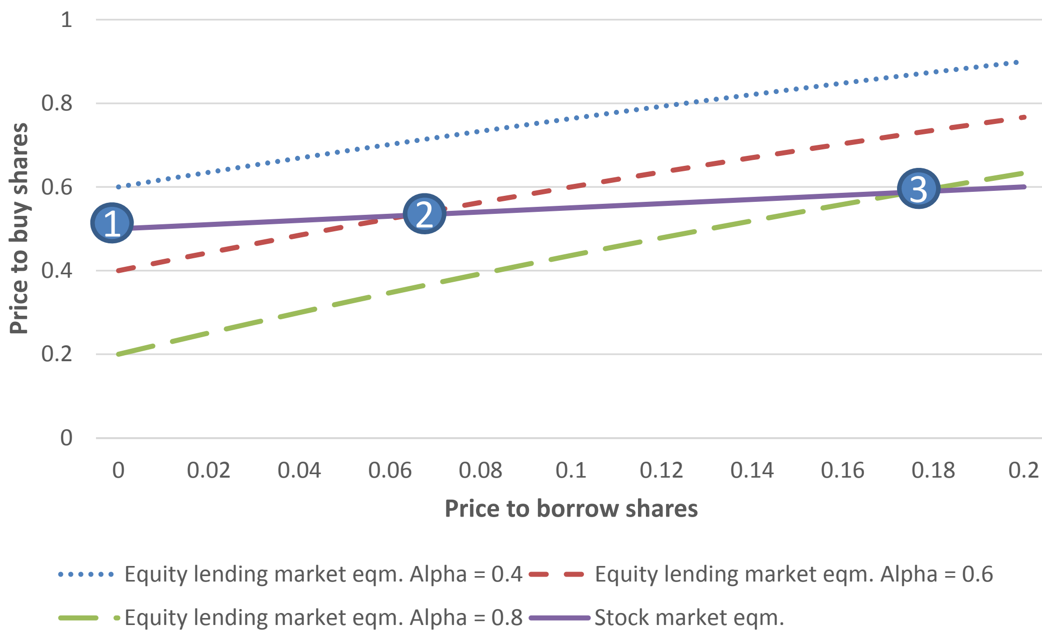
Figures and Tables

Figure 1. Diversification Discount and Differences of Opinion



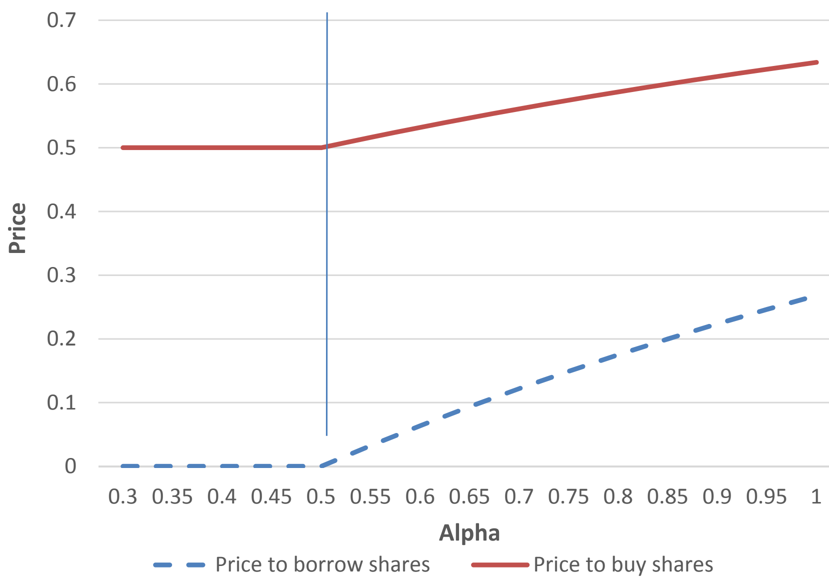
The left-hand panels plot the diversification discount in the baseline model, with symmetric optimism and pessimism among investors. In the upper-left panel, when the level of disagreement α is less than 0.5, no investors ever hold short positions so the discount is zero. For $\alpha > 1/2$, increasing disagreement yields higher discounts. The problem is exacerbated because there are fewer shares to borrow, represented as a decrease in λ. In the lower-left panel, as the number of shares available to borrow, λ, increases, the diversification discount decreases. The greater the level of disagreement α, the more the discount falls with λ. The right-hand panels replicate the results of the left-hand panels in the setting in which different investors have differing variation in opinion. Numbers are identical as in the left-hand panels, with the substitution $\alpha_1 + \alpha_2 = 2\alpha$.

Figure 2. Equilibrium: Stock Market and Equity Lending Market



This figure replicates Blocher et al.'s (2013) Figure 3, in the setting of this paper. Equilibrium requires equilibrium in the stock market, represented by the solid line, and equilibrium in the equity lending market, represented by dashed lines. Each of the three dashed lines is associated with a particular level of disagreement, α, and the importance of the equity lending price on short demand, γ, is set to unity. When disagreement is low, represented by $\alpha = 0.4$, the price to borrow shares is bounded below by zero, and the equilibrium price is given by the intersection of the stock market equilibrium curve with the vertical axis, point 1, at which $p = 1/2$. As the level of disagreement α rises to 0.6, the curve representing equilibrium in the equity lending market falls, and equilibrium shifts to point 2. Here, the price to borrow shares has risen to 0.064 and the price of each stock has risen to 0.53. As disagreement continues to rise, to $\alpha = 0.8$, equilibrium shifts to point 3, at which the price to borrow shares is 0.175 and the price to buy has risen to 0.59.

Figure 3. Equilibrium: Stock Market and Equity Lending Market



This figure plots the prices to borrow and buy shares, represented by the equilibrium points in Figure 3, as a function of the level of disagreement, α. For $\alpha < 1/2$, nobody takes a short position, and increases in disagreement do not affect prices. Once $\alpha > 1/2$, one type of investor takes a short position and further increases in disagreement lift both prices. Because the price of the combined entity does not increase as disagreement increases, the diversification discount increases in α for $\alpha > 1/2$.

Table 1: Descriptive Statistics

The table shows descriptive statistics of the main variables used in the analysis using data from January 2006 through December 2015. Equity lending data are provided by Markit, price data come from CRSP, ownership data from SEC's 13f holdings, accounting data from Compustat, earnings forecasts from IBES, and options data from Option Metrics. Panel A shows characteristics for the 10,923 conglomerate-years of observations; i.e., yearly data from firms with more than one segment reported in the Compustat Segment files. The next-to-last column, *Diff. to PP* shows the difference of means relative to pure-play firms. Panel B shows statistics for the imputed value of the valuation multiple X, defined as the sales-weighted average of X for pure plays operating in the same 2-digit SIC industry codes as the conglomerate. We report values for three alternative valuation measures: *EV/Sales* is the ratio between the conglomerate's enterprise value over sales ratio divided by the imputed ratio from the pure plays. *MB* is the ratio between the conglomerate's market-to-book ratio and the imputed market-to-book ratio. *EV/Assets* is the ratio between the conglomerate's enterprise value over assets ratio divided by the imputed ratio from the pure plays. Detailed variable definitions are given in Appendix A.

Panel A: Conglomerates

Variable	Mean	Median	St. Dev.	25th Pct.	75th Pct.	Diff. to PP	Obs.
#Segments	2.58	2.00	0.92	2.00	3.00	-	10,923
HHI(Sales)	0.63	0.60	0.20	0.50	0.79	-	10,923
HHI(Assets)	0.67	0.59	4.24	0.50	0.78	-	9,208
Supply (% Mktcap)	21.97%	23.55%	10.76%	14.95%	29.63%	2.91%***	10,923
Short Interest (% Mktcap)	4.47%	2.72%	5.13%	1.20%	5.72%	-0.65%***	8,293
Fee (x100)	89.15	10.08	480.84	6.90	18.39	-87.78***	10,923
Fee Score	0.47	0.00	1.21	0.00	0.00	-0.40***	10,923
Fee Risk (x100)	396.49	352.76	306.29	151.22	568.48	-89.45***	10,888
Analysts' Dispersion	7.48%	2.03%	19.96%	0.95%	5.19%	-2.99%***	7,937
Assets	16,251	1,740	83,622	484	6,765	13019***	10,923
Total IO	67.73%	74.59%	25.77%	52.43%	87.63%	6.53%***	9,361
ILLIQ	1.80	0.04	12.39	0.01	0.26	-1.42***	10,867
Analyst Coverage	7.18	5.00	7.45	1.00	11.00	1.43***	10,923
Leverage	25.52%	23.43%	20.39%	8.46%	37.56%	2.85%***	10,902
CAPEX	4.71%	3.16%	5.22%	1.49%	6.06%	0.08%	10,909
Stock volatility	37.77%	31.44%	24.50%	21.74%	46.31%	-8.22%***	10,828
EBIT/Sales	16.21%	17.58%	64.13%	10.30%	27.81%	58.06%***	10,824
Cash Holdings	12.39%	7.61%	13.78%	2.84%	16.93%	-12.02***	10,921
Idiosyncratic Risk	2.10%	1.72%	1.47%	1.17%	2.55%	-0.59%***	10,845
Imputed Skewness	0.23	0.19	1.27	-0.30	0.75	-0.03*	10,855
EV/Sales	2.32	1.39	5.57	0.81	2.37	-5.95***	10,902
MB	2.49	1.69	3.07	1.09	2.78	2.49***	10,603
EV/Assets	1.26	1.01	0.94	0.74	1.50	-0.63***	10,902
12m Returns	0.03	0.04	0.22	-0.08	0.14	0.01***	9,936
12m DGTW Abn. Ret.	0.00	0.00	0.18	-0.09	0.09	0.01***	9,936

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Panel B: Conglomerate Discount Measures using Imputed Method

Variable	Mean	Median	St. Dev.	25th Pct.	75th Pct.	Diff. to PP
Excess(Ln(EV/Sales))	-1.62	-1.30	1.55	-2.44	-0.49	-0.33***
Excess(Ln(MB))	-0.65	-0.62	0.83	-1.12	-0.15	0.01***
Excess(Ln(EV/Assets))	-0.42	-0.40	0.58	-0.76	-0.07	-0.08***

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 2: Conglomerate Premium/Discount and Propensity-Matched Sample Means' Tests

This table displays difference in valuation multiples and equity lending variables using data from January 2006 through December 2015. Alternative samples are constructed using propensity score matching. We split the sample between conglomerates (*C*) and Pure Plays (*PP*). *Diff* is the difference between the two groups, with each row representing an alternative set type of matched sample. Panel A shows statistics for measures of short-sales constraints and differences of opinion: *Supply* is lendable supply as a fraction of market capitalization, *Fee Score* is a measure of daily borrowing costs computed by Markit going from 0 (cheapest) to 5 (most expensive), *Fee Risk* is the standard deviation of daily *Fee* in the 12 months before the annual announcement date, and *Analysts' Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES. Panel B shows statistics for valuation measures: *EV/Sales* is the enterprise value over sales ratio, *MB* is the market-to-book ratio, and *EV/Assets* is the ratio of enterprise value to firm's assets. We use values on the reporting date of the yearly earnings announcement. The first column, *Matched Sample*, describes the sample used to compute averages: *Unmatched* reports statistics for the unmatched sample; *Base* uses as covariates total assets (*Ln(Assets)*), *CAPEX*, *EBIT/Sales*, (*Ln(Sales)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, and *Stock Volatility*; *Base+SS+Beliefs* adds *Supply*, *Fee Score*, *Fee Risk*, and *Analysts' Dispersion* as additional covariates in the matching equation. Detailed definitions are given in Appendix A.

Panel A: Short-Sales Constraints and Differences of Opinion

	Supply			Fee Score			Fee Risk			Analysts' Dispersion		
Matched Sample	C	PP	Diff	C	PP	Diff	C	PP	Diff	C	PP	Diff
Unmatched	25.58	24.33	1.258***	0.24	0.54	-0.295***	3.32	3.80	-0.479***	6.72	9.67	2.952***
Base	26.09	25.34	0.750***	0.27	0.32	-0.054***	3.20	3.39	-0.186***	7.23	8.45	-1.224***
Base+SS+Beliefs	24.97	24.90	0.299	0.30	0.27	-0.025	3.38	3.32	0.062	7.99	8.20	-0.207

Panel B: Valuation Multiples

	EV/Sales			MB			EV/Assets		
Matching Vars:	C	PP	Diff	C	PP	Diff	C	PP	Diff
None	2.066	6.757	-4.691***	0.699	0.971	-0.272***	1.374	2.082	-0.708***
Base	2.044	3.242	-1.197***	0.707	0.839	-0.131***	1.421	1.699	-0.279***
Base+SS+Beliefs	2.002	3.061	-1.059***	0.690	0.814	-0.124***	1.406	1.648	-0.243***

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 3: Differences of Opinion, Short-Sales Constraints, and Firm Diversification

This table displays regressions of proxies for differences of opinion and short-sales constraints as a function of firm diversification, using U.S. stock data from January 2006 through December 2015 in a propensity-score matched sample. *Analysts' Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean analysts' forecasts in IBES. *Supply* is lendable supply as a fraction of market capitalization, *Fee Score* is a variable computed by Markit that ranges from 0 (cheapest to borrow or General Collateral) to 5 (hardest to borrow), and *Fee Risk* is the standard deviation of loan fees in the previous 12 months. We use values on the date of the annual earnings announcement. *#Segments* is the number of segments in which a firm operates as reported in Compustat's Segment files. *D(Conglomerate)* is an indicator variable equal to one if the firm has only one operating segment in the Compustat segment file, zero otherwise. The covariates used on the first stage to create the matched sample are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, and *Stock Volatility*. All regressions have firm- and year-fixed effects. Standard errors clustered at the firm level are reported in brackets.

	Analysts' Dispersion		Supply (x100)		Fee Score		Fee Risk	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
#(Segments)	-1.874**		1.376***		-0.123***		-0.518***	
	[0.790]		[0.325]		[0.040]		[0.113]	
D(Conglomerate)		-1.029*		0.889***		-0.058**		-0.292***
		[0.530]		[0.194]		[0.027]		[0.067]
Ln(Assets)	-0.547**	-0.585**	0.103	0.134	-0.076***	-0.079***	0.053*	0.042
	[0.256]	[0.253]	[0.086]	[0.085]	[0.012]	[0.012]	[0.028]	[0.028]
Total IO	-4.893***	-4.800***	30.186***	30.137***	-1.403***	-1.398***	-4.976***	-4.957***
	[1.418]	[1.420]	[0.465]	[0.463]	[0.084]	[0.084]	[0.166]	[0.166]
ILLIQ	0.346	0.345	-0.003***	-0.003***	-0.003**	-0.003**	0.000	0.000
	[0.304]	[0.303]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Ln(1+Analyst)	-0.924**	-0.909**	1.057***	1.041***	-0.012	-0.011	-0.196***	-0.190***
	[0.363]	[0.362]	[0.155]	[0.155]	[0.019]	[0.019]	[0.045]	[0.045]
Leverage	7.204***	7.239***	-4.966***	-4.996***	0.593***	0.596***	1.083***	1.094***
	[1.572]	[1.572]	[0.520]	[0.520]	[0.080]	[0.080]	[0.176]	[0.177]
CAPEX	11.063**	11.140**	-4.286***	-4.323***	0.602**	0.605**	1.045*	1.059*
	[4.684]	[4.686]	[1.528]	[1.525]	[0.247]	[0.247]	[0.556]	[0.555]
Stock Volatility	20.387***	20.423***	-1.369***	-1.389***	1.148***	1.151***	2.498***	2.507***
	[1.769]	[1.773]	[0.369]	[0.369]	[0.079]	[0.079]	[0.152]	[0.152]
EBIT/Sales	0.112	0.121	0.101	0.098	-0.176***	-0.176***	-0.219***	-0.217***
	[0.392]	[0.391]	[0.074]	[0.074]	[0.021]	[0.021]	[0.033]	[0.033]
Obs.	9,592	9,592	13,766	13,766	12,889	12,889	13,751	13,751
Firms	2,354	2,354	3,209	3,209	3,062	3,062	3,205	3,205
Adj. R^2	0.06	0.06	0.69	0.69	0.26	0.26	0.39	0.39

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 4: Multivariate Sorts: Valuation Differences, Short-Sales Constraints, and Differences of Opinion

This table displays tests of differences of the excess *EV/Sales* multiple of conglomerate firms relative to matched pure-play firms, sorted on measures of short-sales constraints and analysts' forecast dispersion using data from January 2006 through December 2015. Using a propensity-score matched sample, each year we sort conglomerates into terciles based on the difference of a given measure of short-sales constraints to its nearest pure-play matched neighbor. Then, within each tercile, we further sort firms using the difference of analysts' forecast dispersion. We compute the difference between the *EV/Sales* of conglomerate and its nearest pure-play matched neighbor, reporting means for the top and bottom terciles. *Joint(High – Low)* computes the difference between two distinct groups of firms: (i) *Joint High* are firms in the top tercile of short-sales constraints and then, within this tercile, those in the top tercile of analyst dispersion; (ii) *Joint Low* are firms in the lowest tercile of short-sales constraints and bottom tercile of analyst dispersion. Significance levels are based on robust standard errors. The covariates used in the first stage to create the propensity matched sample are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, and *Stock Volatility*.

	Dispersion			Dispersion			Dispersion	
Supply	Low	High	Fee	Low	High	Fee Risk	Low	High
Low	-0.329	-0.236	Low	-0.529	-0.454	Low	-0.585	-0.468
High	-0.661	-0.486	High	-0.365	-0.307	High	-0.397	-0.294
Joint(High – Low)	0.425***			0.222***			0.291***	

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 5: Conglomerate Premium/Discount, Equity Lending, and Differences of Opinion
This table displays regressions of a measure of excess firm value as a function of differences of opinion and short-sales constraints using a propensity-score matched sample with data from January 2006 through December 2015. The dependent variable is the logarithm of the ratio between a firm's *EV/Sales* divided by the *EV/Sales* benchmark computed from the average of pure plays operating in the same 2-digit SIC code. For conglomerates, we use the sales-weighted average of the pure-play firms operating in each of the conglomerate's reported segments as in Berger and Ofek (1995), where *Imp(X)* is the imputed mean value of X. *D(Conglomerate)* is an indicator variable equal to one if the firm reports data for more than one segment on Compustat, and zero otherwise. *Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES, while *SS* is one of the following measures of short-sales constraints: *Supply* is lendable supply as a fraction of market capitalization, *Fee Score* is a measure of daily borrowing costs computed by Markit going from 0 (cheapest) to 5 (most expensive), and *Fee Risk* is the standard deviation of loan fees in the previous 12 months. We use values on the reporting date of the earnings announcement. The covariates used on the first stage to create the matched sample are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, and *Stock Volatility*. All regressions include firm- and year-fixed effects. Standard errors clustered at the firm level are reported in brackets.

SS Variable:	None	Supply	Fee Score	Fee Risk
Variables	(1)	(2)	(3)	(4)
D(Conglomerate)	-0.241***	-0.228***	-0.238***	-0.233***
	[0.050]	[0.048]	[0.049]	[0.049]
Imp(Dispersion)		-1.297***	0.521***	1.454***
		[0.250]	[0.098]	[0.263]
Imp(SS)		3.233***	-0.160***	0.024
		[0.879]	[0.041]	[0.018]
*Imp(Dispersion)*Imp(SS)*		9.266***	-0.253***	-0.206***
		[1.503]	[0.083]	[0.040]
Ln(Assets)	0.073**	0.084**	0.085**	0.074**
	[0.037]	[0.037]	[0.037]	[0.037]
Total IO	0.655***	0.619***	0.667***	0.647***
	[0.103]	[0.103]	[0.103]	[0.103]
ILLIQ	-0.001*	-0.001*	-0.001*	-0.001*
	[0.000]	[0.000]	[0.000]	[0.000]
Ln(1+Analyst)	0.033*	0.035*	0.030	0.033*
	[0.020]	[0.020]	[0.020]	[0.020]
Leverage	0.213*	0.198*	0.209*	0.212*
	[0.121]	[0.119]	[0.120]	[0.121]
CAPEX	0.444	0.412	0.403	0.476*
	[0.287]	[0.279]	[0.286]	[0.285]
Stock Volatility	0.016	0.017	0.025	0.017
	[0.050]	[0.050]	[0.050]	[0.050]
EBIT/Sales	-0.157***	-0.159***	-0.161***	-0.158***
	[0.026]	[0.026]	[0.027]	[0.026]
Obs.	13,765	13,752	13,752	13,752
Firms	3,209	3,208	3,208	3,208
Adj. R^2	0.06	0.07	0.06	0.06

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 6: Diversification Events, Equity Lending, and Differences of Opinion

This table displays regressions of changes in excess valuation diversification events from January 2008 through December 2015. The dependent variable is the excess *EV/Sales* valuation multiple on December-end of the fiscal year when the firm reports being diversified for the first time minus the excess *EV/Sales* multiple at the end of year *t-1*. For conglomerates, we use the sales-weighted average of the pure-play firms operating in each of the conglomerate's reported segments as in Berger and Ofek (1995), where $\Delta Imp(X)$ is the imputed mean value of X. *Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES, while *SS* is one of the following measures of short-sales constraints: *Supply* is lendable supply as a fraction of market capitalization, *Fee Score* is a measure of daily borrowing costs computed by Markit going from 0 (cheapest) to 5 (most expensive), and *Fee Risk* is the standard deviation of loan fees in the previous 12 months. The control variables are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, *Stock Volatility*, *Cash Holdings*. All regressions include year-fixed effects. Standard errors clustered at the firm level are reported in brackets.

SS Variable:	None	None	Supply	Fee Score	Fee Risk	Supply	Fee Score	Fee Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-0.167	-0.881	-0.952	-1.067	-0.342	-0.424	-0.229	-0.381
	[0.020]**	[0.116]	[0.077]*	[0.059]*	[0.488]	[0.394]	[0.644]	[0.439]
Δ*(Imp(Dispersion))*			-0.826	-0.848	-0.815	-0.907	-0.919	-0.708
			[0.049]**	[0.054]*	[0.059]*	[0.029]**	[0.048]**	[0.123]
Δ*(Imp(SS))*			-9.090	-0.433	-0.222	-9.468	-0.456	-0.222
			[0.011]**	[0.086]*	[0.034]**	[0.009]***	[0.068]*	[0.034]**
Δ*(Imp(Dispersion))**Δ*(Imp(SS))*						-27.818	-0.942	-0.410
						[0.132]	[0.258]	[0.335]
Ln(Assets)		0.053	0.047	0.055	0.058	0.041	0.050	0.056
		[0.457]	[0.506]	[0.439]	[0.412]	[0.558]	[0.484]	[0.425]
Total IO		-0.178	-0.065	-0.157	-0.158	-0.069	-0.138	-0.157
		[0.587]	[0.845]	[0.632]	[0.630]	[0.835]	[0.676]	[0.633]
ILLIQ		-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
		[0.030]**	[0.013]**	[0.072]*	[0.039]**	[0.006]***	[0.067]*	[0.030]**
Ln(1+Analyst)		-0.158	-0.141	-0.143	-0.149	-0.141	-0.142	-0.146
		[0.150]	[0.207]	[0.197]	[0.178]	[0.210]	[0.203]	[0.187]
Leverage		0.229	0.167	0.070	0.138	0.167	0.128	0.201
		[0.487]	[0.605]	[0.836]	[0.672]	[0.602]	[0.698]	[0.521]
CAPEX		1.989	2.121	1.962	2.123	2.023	1.918	1.966
		[0.098]*	[0.074]*	[0.092]*	[0.077]*	[0.089]*	[0.098]*	[0.103]
Stock Volatility		-0.534	-0.580	-0.542	-0.539	-0.617	-0.570	-0.564
		[0.108]	[0.072]*	[0.098]*	[0.090]*	[0.058]*	[0.084]*	[0.079]*
EBIT/Sales		0.001	0.011	0.009	0.011	0.004	0.006	0.007
		[0.975]	[0.722]	[0.797]	[0.732]	[0.903]	[0.857]	[0.833]
Cash Holdings		0.010	0.011	0.010	0.011	0.010	0.010	0.010
		[0.003]***	[0.002]***	[0.004]***	[0.002]***	[0.003]***	[0.004]***	[0.002]***
Obs.	414	330	330	330	355	307	307	307
Firms	397	316	316	316	344	297	297	297
Adj. R^2	0.01	0.12	0.15	0.14	0.15	0.16	0.15	0.15

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 7: Conglomerate Premium/Discount and Alternative Definitions of Firm Diversification

This table displays regressions of a measure of excess firm value as a function of equity lending market variables and alternative definitions of firm diversification in a propensity-score matched sample using data from January 2006 through December 2015. The dependent variable is the logarithm of the ratio between a firm's *EV/Sales* divided by the *EV/Sales* benchmark computed from the average of pure plays operating in the same 2-digit SIC code. For conglomerates, we use the sales-weighted average of the pure-play firms operating in each of the conglomerate's reported segments as in Berger and Ofek (1995), where *Imp(X)* is the imputed mean value of X. Columns (1)-(4) measure diversification with the number of unrelated segments based on 2-digit SIC codes (*No. of Unrelated Segments*), while columns (5)-(8) use the Hirschman-Herfindahl index (*HHI*) computed for the sales of all segments of a firm reported in Compustat. Columns (9)-(12) compute the *HHI* based on segments' asset size. *Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES, while *SS* is one of the following measures of short-sales constraints: *Supply* is lendable supply as a fraction of market capitalization, *Fee Score* is a measure of daily borrowing costs computed by Markit going from 0 (cheapest) to 5 (most expensive), and *Fee Risk* is the standard deviation of loan fees in the previous 12 months. We use values on the reporting date of the earnings announcement. The covariates used in the first stage to create the matched sample are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, and *Stock Volatility*. All regressions include firm- and year-fixed effects. Standard errors clustered at the firm level are reported in brackets.

Diversification Proxy:	#(Segments)				HHI(Sales)				HHI(Assets)			
SS Variable:	None	Supply	Fee Score	Fee Risk	None	Supply	Fee Score	Fee Risk	None	Supply	Fee Score	Fee Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Diversification Proxy	-0.518***	-0.550***	-0.551***	-0.568***	0.817***	0.860***	0.824***	0.860***	0.858***	0.871***	0.827***	0.856***
	[0.096]	[0.087]	[0.086]	[0.085]	[0.129]	[0.115]	[0.111]	[0.110]	[0.163]	[0.157]	[0.147]	[0.152]
Imp(Dispersion)		-4.726***	0.264	4.686***		-4.724***	0.294	4.680***		-4.455***	0.212	4.550***
		[0.776]	[0.277]	[0.428]		[0.771]	[0.275]	[0.427]		[0.811]	[0.286]	[0.427]
Imp(SS)		15.034***	-1.330***	-0.566***		15.054***	-1.318***	-0.564***		15.077***	-1.316***	-0.560***
		[1.222]	[0.077]	[0.032]		[1.219]	[0.076]	[0.032]		[1.281]	[0.081]	[0.033]
*Imp(Dispersion)*Imp(SS)*		24.759***	-0.635**	-0.842***		24.744***	-0.669**	-0.841***		23.084***	-0.617**	-0.821***
		[4.324]	[0.267]	[0.069]		[4.293]	[0.265]	[0.069]		[4.522]	[0.278]	[0.069]
Ln(Assets)	-0.030	0.010	-0.011	0.001	-0.032	0.008	-0.014	-0.002	-0.023	0.018	-0.010	0.001
	[0.024]	[0.021]	[0.020]	[0.020]	[0.023]	[0.021]	[0.020]	[0.020]	[0.025]	[0.022]	[0.022]	[0.021]
Total IO	0.376***	0.001	0.297***	0.166	0.389***	0.014	0.312***	0.181*	0.382***	0.005	0.324***	0.191*
	[0.126]	[0.112]	[0.107]	[0.105]	[0.125]	[0.111]	[0.106]	[0.104]	[0.135]	[0.120]	[0.115]	[0.113]
ILLIQ	-0.001	-0.001**	-0.001*	-0.001**	-0.001	-0.001**	-0.001*	-0.001**	-0.001	-0.001**	-0.001*	-0.001**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Ln(1+Analyst)	0.078**	0.071**	0.073**	0.083***	0.079**	0.073**	0.075**	0.084***	0.065*	0.057*	0.066*	0.076**
	[0.034]	[0.032]	[0.031]	[0.031]	[0.034]	[0.032]	[0.031]	[0.031]	[0.036]	[0.034]	[0.034]	[0.034]
Leverage	1.048***	1.136***	0.995***	0.987***	1.050***	1.138***	0.997***	0.989***	1.065***	1.140***	0.977***	0.986***
	[0.131]	[0.121]	[0.115]	[0.114]	[0.131]	[0.120]	[0.115]	[0.114]	[0.138]	[0.128]	[0.122]	[0.121]
CAPEX	2.294***	3.356***	2.587***	2.909***	2.226***	3.286***	2.520***	2.837***	2.080***	3.225***	2.485***	2.811***
	[0.316]	[0.309]	[0.300]	[0.302]	[0.316]	[0.309]	[0.300]	[0.302]	[0.325]	[0.324]	[0.315]	[0.317]
Stock Volatility	-0.296***	-0.359***	-0.081	-0.089	-0.300***	-0.363***	-0.084	-0.093	-0.293***	-0.351***	-0.066	-0.079
	[0.099]	[0.091]	[0.090]	[0.089]	[0.098]	[0.090]	[0.090]	[0.089]	[0.106]	[0.097]	[0.096]	[0.095]
EBIT/Sales	-0.140***	-0.163***	-0.188***	-0.181***	-0.139***	-0.162***	-0.188***	-0.181***	-0.141***	-0.166***	-0.190***	-0.183***
	[0.025]	[0.021]	[0.018]	[0.019]	[0.025]	[0.022]	[0.019]	[0.020]	[0.023]	[0.020]	[0.018]	[0.018]
Obs.	13,765	13,752	13,752	13,752	13,765	13,752	13,752	13,752	12,064	12,051	12,051	12,051
Firms	3,209	3,208	3,208	3,208	3,209	3,208	3,208	3,208	2,945	2,943	2,943	2,943
Adj. R^2	0.06	0.20	0.20	0.21	0.06	0.20	0.21	0.22	0.07	0.21	0.21	0.22

*** p-value<0.01, ** p-value<0.05, * p-value<0.10

Table 8: Conglomerate Premium/Discount and Alternative Explanatory Variables

This table displays regressions of a measure of excess firm value as a function of short-sales constraints and differences of opinion using a propensity-score matched sample with data from January 2006 through December 2015. The dependent variable is the logarithm of the ratio between a firm's *EV/Sales* divided by the *EV/Sales* benchmark computed from the average of pure plays operating in the same 2-digit SIC code. For conglomerates, we use the sales-weighted average of the pure-play firms operating in each of the conglomerate's reported segments as in Berger and Ofek (1995), where *Imp(X)* is the imputed mean value of X. *D(Conglomerate)* is an indicator variable equal to one if the firm reports data for more than one segment on Compustat, and zero otherwise. *Dispersion* is the standard deviation of analysts' annual earnings forecasts divided by the absolute value of the mean forecast in IBES, *Supply* is lendable supply as a fraction of market capitalization, and *Past six-month return* is the cumulative stock return in the six months prior to the annual earnings announcement date. *Idiosyncratic Risk* and *Excess Skewness* are, respectively, the mean squared error and skewness of residuals from Carhart's (1997) 4-factor model. We use values on the reporting date of the earnings announcement. The covariates used on the first stage to create the matched sample are: total assets (*Ln(Assets)*), institutional ownership (*Total IO*), Amihud's (2002) *ILLIQ*, log of 1 + analyst coverage, *Leverage*, *CAPEX*, *EBIT/Sales*, and *Stock Volatility*. All regressions include firm- and year-fixed effects. Standard errors clustered at the firm level are reported in brackets.

SS Variable:	None	Supply		Fee Score		Fee Risk	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
D(Conglomerate)	-0.316***	-0.308***	-0.312***	-0.329***	-0.330***	-0.329***	-0.332***
	[0.056]	[0.050]	[0.050]	[0.050]	[0.050]	[0.049]	[0.049]
Imp(Dispersion)		-0.493***	-3.732***	-0.339**	-0.026	-0.195	4.365***
		[0.135]	[0.732]	[0.132]	[0.285]	[0.129]	[0.462]
Imp(SS)		21.116***	17.903***	-1.491***	-1.443***	-0.720***	-0.619***
		[1.019]	[1.016]	[0.076]	[0.080]	[0.035]	[0.033]
*Imp(Dispersion)*Imp(SS)*			19.423***		-0.298		-0.769***
			[4.090]		[0.268]		[0.074]
Past 12-month Returns		0.263***	0.268***	0.222***	0.221***	0.243***	0.252***
		[0.030]	[0.030]	[0.030]	[0.030]	[0.030]	[0.030]
Idiosyncratic Risk		-6.506***	-6.396***	-4.994***	-4.981***	-4.845***	-4.517***
		[1.674]	[1.671]	[1.659]	[1.658]	[1.657]	[1.633]
Excess Skewness		0.019*	0.019*	0.014	0.014	0.018*	0.015
		[0.011]	[0.010]	[0.010]	[0.010]	[0.011]	[0.010]
Obs.	13,765	12,402	12,402	12,402	12,402	12,402	12,402
Firms	3,209	2,897	2,897	2,897	2,897	2,897	2,897
Adj. R^2	0.06	0.22	0.23	0.22	0.22	0.22	0.23

*** p-value<0.01, ** p-value<0.05, * p-value<0.10