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Financing Through Asset Sales

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Abstract. Most research on firm financing studies debt versus equity issuance. We model an alternative source, non-core asset sales, and identify three new factors that contrast it with equity. First, unlike asset purchasers, equity investors own a claim to the firm's balance sheet (the "balance sheet effect"). This includes the cash raised, mitigating information asymmetry. Contrary to the intuition of Myers and Majluf [Myers SC, Majluf NS (1984) Corporate financing and investment decisions when firms have information that investors do not have. *J. Financial Econom.* 13(2):187–221], even if non-core assets exhibit less information asymmetry, the firm issues equity if the financing need is high. Second, firms can disguise the sale of low-quality assets—but not equity—as motivated by dissynergies (the "camouflage effect"). Third, selling equity implies a "lemons" discount for not only the equity issued but also the rest of the firm, since both are perfectly correlated (the "correlation effect"). A discount on assets need not reduce the stock price, since non-core assets are not a carbon copy of the firm.

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1. Introduction

One of a firm's most important decisions is how to raise capital. Most research focuses on the choice between debt and equity. For example, the pecking-order theory of Myers and Majluf (1984, hereafter referred to as MM) posits that managers issue securities with least information asymmetry, while the market timing theory of Baker and Wurgler (2002) suggests that managers sell securities that are most overvalued. However, another major source of financing is relatively unexplored: selling non-core assets, such as divisions or physical capital. Asset sales are substantial in practice: Securities Data Corporation (SDC) records $131 billion of asset sales by nonfinancial firms in the United States in 2012, versus $81 billion in seasoned equity issuance. Eckbo and Kisser (2018, p. 11) find that "the lifecycle funding contribution of asset sales . . . is substantial."

While some asset sales may be motivated by operational reasons, financing is a key driver of many others. Asset sales are used to fund investment and research and development (shown by Hovakimian and Titman 2006 and Borisova and Brown 2013, respectively), to recapitalize in response to regulatory or investor concerns (as with many banks after the financial crisis), and to address one-time cash needs (BP sold $38 billion of assets in the two years following the 2010 Deepwater Horizon disaster). More generally, Borisova et al. (2013) find that over half of asset sellers state financing motives. Campello et al. (2010) report that 70% of financially constrained firms increased asset sales in the financial crisis, versus 37% of unconstrained firms. In all of these cases, the firm could have presumably met its financing needs by issuing securities but instead chose to sell assets. Indeed, Hite et al. (1987) examine the stated motives for asset sales and note that "in several cases . . . selling assets was viewed as an alternative to the sale of new securities" (p. 232).

This paper's goal is to analyze the factors that determine whether firms raise capital through selling assets rather than issuing securities. It may seem that asset sales can already be analyzed by extending the MM intuition from security issuance to asset sales, removing the need for a new theory. Such an extension would suggest that selling non-core assets is preferred if and only if they exhibit less information asymmetry than the firm's total assets, which underlie firm-level securities such as debt and equity. While information asymmetry about assets-in-place remains important, there are two critical differences between assets and securities, which mean that asset sales cannot be studied within the MM framework. First, a purchaser of non-core assets obtains a claim to the assets alone,

whereas a purchaser of securities owns a claim to the firm's entire balance sheet. Second, the sale of non-core assets—but not securities—may be motivated by dissynergies rather than private information. These two differences, in turn, lead to three new forces that drive the choice between asset sales and security issuance, which may outweigh information asymmetry concerns and are the core contribution of the paper. In turn, the strength of these forces depends on various factors, such as the amount of financing required, the use of proceeds, the range of potential synergies, the correlation structure of the firm's assets, and the manager's stock price concerns, thus giving rise to a rich set of empirical predictions.

We analyze a firm that comprises a core asset and a non-core asset, and has a financing need that it can meet by either selling part of the non-core asset or issuing a security against its balance sheet. For simplicity, this security is equity, but Online Appendix B shows that the same insights apply to debt. The firm's type is privately known to its manager and comprises two dimensions. The first is quality, which determines the assets' standalone (common) values. Firms with high-quality core assets may have either high- or low-quality non-core assets. We analyze both possibilities, labeling them the positive- and negative-correlation cases, respectively. The second dimension is synergy, which captures the additional (private) value lost when the non-core asset is separated from its current owner. Thus, our model allows firms to sell assets not only for financing reasons but also for operational reasons (dissynergies). The model is tractable even allowing for two dimensions of private information (quality and synergy), which typically makes a signaling model difficult to solve.

The first of our three new forces is the *balance sheet effect*, which represents an advantage to selling equity, and its strength depends on the amount of financing required and the use of proceeds. It stems solely from the first difference between assets and equity. New shareholders obtain a stake in the firm's entire balance sheet, which includes not only the core and non-core assets in place (whose values are unknown) but also the funds raised. Since the value of the funds raised is known, this mitigates the information asymmetry of assets in place. By contrast, asset purchasers obtain a claim to the asset alone, and not the entire balance sheet and thus the funds raised. As a result, even if the non-core asset exhibits less information asymmetry than the firm's total assets—and so the MM intuition would suggest that firms sell non-core assets—equity may exhibit less information asymmetry, and thus be preferred, if enough funds are raised that the balance sheet effect dominates.

Thus, the source of financing depends on the amount required: larger (smaller) amounts encourage the sale of equity (assets). This contrasts with standard financing models, in which the choice of financing depends only on the characteristics of each claim (such as its information asymmetry, as in MM, or misvaluation, as in Baker and Wurgler 2002) and not the amount required—unless one assumes exogenous limits such as debt capacity. The balance sheet effect does not appear in MM, since all claims (debt and equity) are on the balance sheet.

The initial analysis considers any use of funds whose expected value is uncorrelated with firm quality (e.g., replenishing capital, repaying debt, paying suppliers). We next allow the funds to finance an investment whose expected return is correlated with firm quality and thus exhibits information asymmetry. One might expect the balance sheet effect to weaken, since risky investment makes the balance sheet (and thus equity) riskier. However, there is a second effect: since investment is net present value (NPV) positive, the certain (i.e., quality-independent) component of the value of the injected funds rises. If the minimum investment return (earned by the low-quality firm) is large compared with the additional return earned by the high-quality firm, this second effect dominates, and the balance sheet effect strengthens. Thus, equity is more common when growth opportunities are good for firms of all quality (e.g., in booms): the source of financing depends on the use of proceeds. If the additional return earned by the high-quality firm is large, the first effect dominates, and the balance sheet effect weakens. However, it almost always remains positive: asset (equity) sales continue to be used for low (high) financing needs.

The second new force is the *correlation effect*, which represents an advantage to selling assets, and its strength depends on the correlation structure of the firm's balance sheet and the manager's stock price concerns (which are absent in MM). It also stems solely from the first difference between assets and securities—the purchaser of assets acquires a claim to assets alone, and not the firm, and so the value of this claim need not be positively correlated with the firm. An equity issuer suffers an Akerlof (1970) "lemons" discount on not only the equity issued but also the rest of the firm because the two are perfectly correlated—equity is a claim on the firm and is, in fact, a carbon copy of it. Thus, its stock price falls. An asset seller similarly receives a low price on the assets sold, but not necessarily the firm, since it is not a carbon copy. For example, companies often shed their original lines of business after they have become non-core.[1] Non-core business lines are not necessarily safer than the rest of the firm but may have low correlation—while their sale is a negative signal about the divested assets, it may be a positive signal about the retained ones. The magnitude of this advantage is increasing in the manager's

stock price concerns. Note that the correlation effect does not require the core and non-core asset to be negatively correlated; it can exist even if the correlation is strictly positive. The crux is that equity has a correlation of 1 with the firm, so a low price for equity issued automatically implies a low price for the rest of the firm. However, a non-core asset may have a correlation of less than 1, even if the correlation is still positive, since it is not a claim on the firm's balance sheet.

An implication of the correlation effect is that conglomerates issue equity less often, and sell assets more often, than firms with closely related divisions, since they are more likely to have lowly correlated assets. It also gives rise to a novel benefit of diversification: a non-core asset is a form of financial slack. While the literature on investment reversibility (e.g., Abel and Eberly 1996) models reversibility as a feature of the asset's technology, here an investment that is not a carbon copy of the firm is "reversible" in that it can be sold without negative inferences on the stock price.

The third new force is the *camouflage effect*, which also represents an advantage to selling assets, and its strength depends on the firm's actual level of synergy and the range of potential synergies in the economy. It stems solely from the second difference between assets and securities—that the sale of the former may be motivated by dissynergies. Conglomerates often shed non-core assets stating a desire to refocus on the core business, but outsiders do not know if the true motivation is that the non-core assets were of low quality. (The balance sheet and correlation effects do not require synergies, but they are robust to the inclusion of synergies.) The effect arises if firms have the option not to raise financing and instead to forgo a growth opportunity. If the growth opportunity is weak, it is outweighed by the losses that high-quality firms would suffer from issuing equity, and so they will not issue equity. However, high-quality firms will sell assets if they are sufficiently dissynergistic, not so much to finance growth but to get rid of dissynergies. Asset sales by high-quality firms allow low-quality firms to pool: they can camouflage an asset sale driven by overvaluation (the asset is low-quality and has a low common value) as instead being driven by operational reasons (it is dissynergistic and only has a low private value).

Note that *any* noninformational motive allows a seller to "camouflage" an overvalued claim. For example, in MM, firms can issue overvalued equity and claim that it is to finance investment. However, this motive can be used to disguise both asset sales and equity issuance, and so it does not affect the choice between them. We use the term "camouflage effect" to refer not to general noninformational motives (which arise in other models and apply to both assets and equity) but specifically to the camouflage provided by dissynergy motives, which applies only to asset sales and is unique to this paper. When growth opportunities are strong, high-quality firms sell both assets and equity to finance growth; since both financing channels offer camouflage, low-quality firms have no clear preference for either. When growth opportunities are weak, the only noninformational motive to issue claims is dissynergies. This motive exists only for assets and not equity, and so only assets provide camouflage. Thus, low-quality firms strictly prefer asset sales: indeed, they will sell assets even if they are synergistic.

While our model explicitly studies selling equity versus assets, it can be interpreted more broadly as studying at what *level* to issue claims: the firm level (equity issuance) or the asset level (asset sales). Our effects also apply to other *types* of claim that the firm can issue at each level.[2] All three effects apply to parent-company risky debt (or general securities issued against the firm's balance sheet, as analyzed by DeMarzo and Duffie 1999) in the same way as parent-company equity: since parent-company debt is also a claim to the entire firm, it benefits from the balance sheet effect but not the correlation effect (debt is positively correlated with firm value) nor the camouflage effect (issuing debt cannot be camouflaged by the desire to remove dissynergies). We analyze debt explicitly in Online Appendix B. Since our focus is on the level of claim rather than the type of claim, we study the firm's choice between standard claims (assets, equity, and, in an extension, debt) rather than taking a general security design approach. This allows us first to focus on the core contribution of the paper and second to simplify the model, in turn enabling us to solve a two-dimensional adverse selection problem in a tractable manner.

Existing theories of asset sales generally consider asset sales as the only source of financing and do not compare them to equity; see, for example, Shleifer and Vishny (1992), Eisfeldt (2004), DeMarzo (2005), He (2009), and Kurlat (2013). In Milbradt (2012) and Bond and Leitner (2015), the firm only owns one type of asset, and so there is no distinction between selling assets and equity. A partial asset sale affects the mark-to-market price of the seller's remaining portfolio, similar to our correlation effect. Here, the firm has other (core) assets in addition to the ones under consideration for sale. Thus, we show that the correlation effect is stronger for equity: while a partial asset sale implies a negative valuation of the remaining unsold non-core assets, it need not imply a negative valuation of the core assets and thus the firm. Nanda and Narayanan (1999) also consider both asset sales and equity issuance under information asymmetry, but they do not feature the balance sheet, correlation, or camouflage effects. In their model, information asymmetry only exists under negative correlation, and there is no correlation effect because the manager has

no stock price concerns. Arnold et al. (2018) study the choice between asset sales and equity issuance to overcome debt overhang, rather than information asymmetry and the pecking order. Edmans et al. (2018a) focus on how diversification by the seller affects the price impact of asset sales and do not generate our three effects.[3]

While we show that the MM pecking order intuition cannot be naturally extended to the choice between asset sales and equity, Nachman and Noe (1994) show that the original pecking order (between debt and equity) only holds under special conditions. Fulghieri et al. (2016) demonstrate that these conditions are particularly likely to be violated for younger firms with larger investment needs and riskier growth opportunities, where equity is indeed preferred to debt empirically.

In addition to the applied implications for asset sales, our paper makes a theoretical contribution by solving a multidimensional information asymmetry problem in a tractable manner. We avoid the considerable technical difficulties that typically arise in models of multidimensional information asymmetry, as discussed in Kreps and Sobel (1994), Armstrong and Rochet (1999), and Rochet and Stole (2003), because the expected value of the asset to the uninformed party depends only on quality and not synergy, even though both dimensions affect the value of the asset sale to the informed party. Guerrieri and Shimer (2018), Williams (2016), and Chang (2018) similarly study multidimensional signaling models in which one dimension of private information only affects the seller's private value. This dimension is the seller's impatience, which always leads him to wish to sell the asset, whereas synergy in our model can be positive or negative. The applications of the models are quite different: the above papers consider a single asset and a search framework, where trade happens probabilistically and the probability of trading is a key dimension on which different types can separate. Our model studies multiple assets, and the choice is on the type of claim rather than probability of sale. To our knowledge, ours is the first model to solve a signaling problem with multidimensional information asymmetry where trade happens with certainty. Such a framework is applicable to settings in which the seller must satisfy a liquidity need, although it can also apply to the case of voluntary capital raising.

2. Baseline Model

The model consists of two types of risk-neutral agent: firms, which raise financing, and investors, who provide financing and set prices. The firm is run by a manager, who has private information about the firm's quality $q \in \{H, L\}$, which measures the stand-alone (common) value of its assets. The prior probability that $q = H$ is $\pi \in (0, 1)$. In Section 3 we will introduce a second dimension to firm type, synergy, which measures the (positive or negative) additional private value of the asset.

The firm comprises two assets or lines of business. The core business has value C_q, where $C_H > C_L$, and the non-core business has value A_q. Where there is no ambiguity, we use the term "assets" to refer to the non-core business. We consider two specifications of the model. If $A_H > (<) A_L$, the two assets are positively (negatively) correlated. (If $A_H = A_L$, the non-core asset exhibits no information asymmetry, and so it is automatic that firms will raise financing by selling it.) In both cases, we assume

$$C_H + A_H > C_L + A_L, \tag{1}$$

so H has a higher total value even if $A_H < A_L$. The distinction between $A_H > A_L$ and $A_H < A_L$ reflects that it is not only the information asymmetry of the non-core asset that matters ($|A_H - A_L|$), as in MM, but also its correlation with the core asset ($\text{sgn}(A_H - A_L)$).[4]

We consider an individual firm that raises financing of F. In Section 2, the firm is forced to raise financing (e.g., to meet an exogenous liquidity need), and the funds raised increase expected firm value by F. This treatment incorporates many capital raising motives, such as retaining cash to replenish capital or for precautionary reasons, repaying debt holders or suppliers, or meeting one-time cash needs such as litigation expenses.[5] Section 3 gives firms the choice of whether to raise financing, and it also allows the cash to be used to finance an investment whose return is correlated with q and thus exhibits information asymmetry.

The firm can raise F by selling either non-core assets or equity; partial asset sales are possible. Formally, it issues a claim $X \in \{E, A\}$, where E represents equity and A assets. Investors are perfectly competitive and price both the claim being sold and the firm's stock at their expected values conditional upon X. The firm cannot sell the core asset as it is essential to the firm; Online Appendix D relaxes this assumption.

Online Appendix B allows the firm to issue risky debt and shows that the same balance sheet, correlation, and camouflage effects apply to risky debt as well as equity. Since the analysis of risky debt requires us to complicate the model by introducing risk, we do not include it in the core model (as in MM). Instead, when the core model delivers each of the three effects for equity, we discuss the intuition for why they also apply to debt.

Firms cannot raise financing in excess of F; this assumption can be justified by forces outside the model such as agency costs of free cash flow. Firms use a single source of financing; Online Appendix E shows that the equilibria continue to hold when firms are

allowed to use a combination of both sources. We specify $F \leq \min(A_L, A_H)$, so that asset sales are feasible for any F; this ensures that there is no mechanical link between the amount of financing required and the source of financing. We abstract from differences between asset sales and equity issuance due to frictions such as taxes, transactions costs, liquidity, and bargaining power, because they will have obvious effects: the firm will lean toward the financing source that exhibits the weakest frictions.

The financing choice affects the firm's fundamental value, because it will enjoy a capital gain (loss) if the claim is overvalued (undervalued). It will also affect the firm's stock price as the market will infer firm quality from the choice of claim issued. The manager places weight ω on the firm's stock price and $1-\omega$ on its fundamental value.[6] These concerns are common in the signaling literature and can stem from a number of sources. Examples include takeover threat (Stein 1988), reputational concerns (Narayanan 1985, Scharfstein and Stein 1990), the manager maximizing value on behalf of shareholders who may sell before fundamental value is realized (Miller and Rock 1985), or the manager expecting to sell his own shares before fundamental value is realized (Stein 1989).[7]

We solve for pure strategy equilibria.[8] We use the perfect Bayesian equilibrium solution concept, where (i) investors have a belief about which firm types issue which claim X; (ii) the price of the claim being issued equals its expected value, conditional on investors' beliefs in (i); (iii) each manager issues the claim X that maximizes his objective function, given investors' beliefs; (iv) investors' beliefs satisfy Bayes' rule; and (v) beliefs on off-equilibrium actions are consistent with the D1 refinement of Banks and Sobel (1987) and Cho and Kreps (1987). For an off-equilibrium action, D1 precludes putting any weight on a type for which the set of beliefs that would induce deviation to that action are a strict subset of that for a different type. Specifically, if the set of prices for claim X that would induce L to deviate to X is a strict subset of that which would induce H to deviate—loosely speaking, if L is "less willing" to deviate than H—then the off-equilibrium belief that a deviator to claim X is of type L is ruled out. We use the D1 refinement as it is typically used in other security issuance models, such as Boot and Thakor (1993), Nachman and Noe (1994), and DeMarzo and Duffie (1999), and thus maximizes comparability with prior literature. An earlier version of this paper used the weaker intuitive criterion equilibrium refinement; all results were similar, although the expressions were somewhat more complex.[9]

We first analyze the positive correlation version of the model ($A_H > A_L$) and then move to negative correlation ($A_L > A_H$).

2.1. Positive Correlation

This section demonstrates the *balance sheet effect*, an advantage of issuing equity. It stems from the first difference between assets and securities—assets are not a claim to the firm's entire balance sheet and thus do not share in the new funds raised whose value is certain.

For ease of exposition, we set $\omega = 0$ in the positive correlation model, so that the manager maximizes fundamental value. There is a nontrivial role for $\omega > 0$ only under negative correlation, in which case there is a trade-off in being inferred as L: market valuation falls, but the firm receives a high price if it sells assets. With positive correlation, there is no such trade-off: being inferred as L worsens both market and fundamental values. Allowing for $\omega > 0$ adds additional terms to the equilibrium conditions, without affecting the set of sustainable equilibria or their properties.

The equilibria are given in Proposition 1. We define $E_q \equiv C_q + A_q + F$ as the equity value of a firm of type q, and $F^* \equiv (C_H A_L - C_L A_H)/(A_H - A_L)$. (All proofs are in the appendix.)

Proposition 1 (Positive Correlation, Pooling Equilibria). (i) *An asset-pooling equilibrium is sustainable if and only if $F \leq F^*$. In this equilibrium, all firms sell assets for $\mathbb{E}[A] = \pi A_H + (1-\pi)A_L$. If equity is sold (off-equilibrium), it is inferred as type L and valued at E_L.*

(ii) *An equity-pooling equilibrium is sustainable if and only if $F \geq F^*$. In this equilibrium, all firms sell equity for $\mathbb{E}[E] = \pi E_H + (1-\pi)E_L$. If assets are sold (off-equilibrium), they are inferred as type L and valued at A_L.*

We first discuss the asset-pooling equilibrium. This equilibrium requires three conditions: L does not wish to deviate, H does not wish to deviate, and the off-equilibrium belief that a deviator is of type L satisfies D1.

We start by analyzing the first requirement. Note that L enjoys a capital gain of $F(\pi(A_H - A_L)/(\mathbb{E}[A]))$ by selling low-quality assets (worth A_L) at a pooled price (of $\mathbb{E}[A]$). If L deviates to equity, its capital gain is zero since low-quality equity (worth E_L) is sold for E_L. Thus, L automatically does not want to deviate.

The second and third requirements are satisfied by the condition $F \leq F^*$. This condition can be rewritten as

$$\frac{A_H}{A_L} \leq \frac{C_H + A_H + F}{C_L + A_L + F}. \tag{2}$$

The left-hand side (LHS) is the ratio of high- to low-quality asset values, and the right-hand side (RHS) is the ratio of high- to low-quality equity values. Thus, $F \leq F^*$ implies that the information asymmetry of assets is less than that of equity. Crucially, F appears only in the equity term on the RHS but not the assets term on the LHS. An equity investor has a claim to the firm's entire balance sheet, which contains the funds raised F. Since F is known, this balance sheet effect mitigates the information asymmetry of equity. By contrast, an asset purchaser owns a claim to the

asset alone and so bears the full information asymmetry associated with its value. As F rises, the RHS of (2) becomes dominated by the term F (which is the same in the numerator and the denominator as it is known) and less dominated by the unknown assets-in-place terms C_q and A_q (which differ between the numerator and denominator). Thus, the information asymmetry of equity on the RHS falls toward 1, and the inequality is harder to satisfy. Note that even if non-core assets exhibit less information asymmetry than total assets in place ($A_H/A_L < (C_H + A_H)/(C_L + A_L)$), they may still exhibit more information asymmetry than equity if F is large enough. Contrary to the MM intuition, equity is not always the riskiest claim.

In short, assets have less information than equity if and only if the balance sheet is weak (i.e., $F \leq F^*$). In turn, $F \leq F^*$ plays two roles. First, it ensures that H does not wish to deviate (the second requirement of the equilibrium). In equilibrium, H suffers a capital loss on asset sales and would suffer a capital loss by deviating to equity. If $F \leq F^*$, the information asymmetry of assets, and the thus the capital loss from asset sales, is lower. Second, $F \leq F^*$ ensures that the off-equilibrium belief, that a deviator to equity is of type L, satisfies D1 (the third requirement of the equilibrium). Loosely speaking, D1 requires L to be "more willing" to deviate to equity than H; H prefers claims with low information asymmetry as it suffers a smaller capital loss, and L prefers high information asymmetry. If $F \leq F^*$, the balance sheet effect is sufficiently small such that equity exhibits higher information asymmetry than assets, and so L is indeed more willing to sell it than H. Thus, the two nontrivial requirements normally needed for a pooling equilibrium reduce to only one.

The intuition for the equity-pooling equilibrium is the same. Condition $F \geq F^*$ implies that assets have more information asymmetry than equity. Thus, H will not deviate to assets, as the capital loss would be higher; it also means that the off-equilibrium belief, that a deviator to asset sales is of type L, satisfies D1.

Overall, Proposition 1 shows that a pooling equilibrium always exists and is unique. There can be no separating equilibrium since one claim would be associated with L, and so the firm selling it would have an incentive to pool with H. The claim sold in the pooling equilibrium depends on the amount of financing required. When it increases, the balance sheet effect strengthens, and firms switch from selling assets to equity. Thus, the type of claim issued depends not only on its inherent characteristics (information asymmetry) but also on the amount of financing required. In standard theories, the type of security issued only depends on its characteristics (e.g., information asymmetry or overvaluation), unless one assumes exogenous restrictions on financing such as limited debt capacity. Here, F can be fully raised from either source.

To put numbers on this result, if C_H = \$100, C_L = \$85 M, A_H = \$80 M, and A_L = \$70 M, then F^* = \$20 M: equity exhibits less information asymmetry than asset sales whenever the financing need is greater than \$20 M. Note that F refers to the amount of financing required relative to the size of the existing assets in place. If the values C_H, C_L, A_H, and A_L all doubled, then the threshold $F^* \equiv (C_H A_L - C_L A_H)/(A_H - A_L)$ would also double.

It may seem that, since financing is a motive for asset sales, greater financing needs should lead to more asset sales. This result is delivered by investment models where financial constraints induce disinvestment. Here, if F rises sufficiently, the firm may sell *fewer* assets, since it substitutes into an alternative source of financing: equity. The amount of capital required therefore affects firm boundaries. If we introduce synergies and allow for the average synergy to be positive, then asset sales reduce total surplus compared with equity issuance. Surprisingly, greater financial constraints may improve real efficiency as firms retain their synergistic assets and issue equity instead.

We close this section by discussing additional extensions and applications.

2.1.1. Risky Debt. As shown in Online Appendix B, the balance sheet effect applies equally to risky debt, since debt—similar to equity but unlike assets—is also a claim on the firm's balance sheet and thus shares in the new funds raised. Thus, risky debt will also exhibit less information asymmetry—and is preferred to assets—if and only if F is large. (Naturally, if F is so low that debt becomes risk-free, it is also preferred.)

2.1.2. Single-Segment Firm. A single-segment firm corresponds to $C_q = A_q$: core and non-core assets are one and the same. Then, $F^* = 0$, and so asset-pooling is never sustainable for any F. Intuitively, since the information asymmetry of the firm equals that of the non-core asset, the balance sheet effect reduces the information asymmetry of equity lower.

2.1.3. Selling the Core Asset. Online Appendix D shows that the balance sheet effect is robust to allowing firms also to sell the core asset. The intuition is as follows. One of the assets (core or non-core) will exhibit greater information asymmetry; since equity is a mix of both assets, its information asymmetry will lie in between, and so it is never the safest claim. Indeed, DeMarzo's (2005) "information destruction effect" might suggest that equity would never be issued: pooling assets together destroys the seller's option to sell one asset in particular. However, it may still be issued as a result of the balance sheet effect: equity pooling can be sustained.

2.2. Negative Correlation

We now turn to the case of negative correlation; that is, $A_L > A_H$. This section demonstrates the *correlation effect*,

an advantage of selling assets. This effect stems from the first difference between assets and securities—assets are not a claim to the firm's entire balance sheet and so are not a carbon copy. Thus, even if the market infers that an asset being sold is of low quality, this need not imply that the firm as a whole is of low quality.

Since $A_L > A_H$, we now use the term "high-quality (low-quality) non-core assets" to refer to the non-core assets of L (H). Note that negative correlation only means that high-quality firms are not universally of high quality, as they may have low-quality non-core assets. It does not require the values of the divisions to covary negatively with each other over time (e.g., that a market upswing helps one division and hurts the other). The market may know the correlation of the asset with the core business (even if it does not observe quality) by observing the type of asset traded. For example, the value of Interlake's steel business is likely negatively correlated with its aerospace business, as a high steel price is good (bad) news for the former (latter).[10] As we will see, the correlation effect does not require that the correlation between the core and non-core assets be perfectly negative, only that it is not perfectly positive.

We return to the case of general stock price concerns $\omega > 0$ because, with negative correlation, there is now a trade-off involved in selling assets: being inferred as L reduces the firm's stock price but increases proceeds and thus fundamental value. Without stock price concerns, firms would trivially sell their worst-quality claim (H sells its low-quality assets, and L sells a claim on its low-quality core assets by issuing equity), and so no pooling equilibrium is sustainable (see Online Appendix C.1). In MM, the firm only has a single class of assets, which are therefore perfectly positively correlated with each other. Thus, a low price for the claim issued automatically implies a low valuation for the rest of the firm, and so there is no loss of generality in setting $\omega = 0$ (just as in Section 2.1). This section generalizes MM by allowing for negative correlation, which can lead to the market's inference of the claim sold differing from that of the rest of the firm. This, in turn, has nontrivial implications if the manager is concerned with both stock price and fundamental value.

Proposition 2 states that an equity-pooling equilibrium is never sustainable under negative correlation, but an asset-pooling equilibrium is sustainable if stock price concerns ω are sufficiently high.

Proposition 2 (Negative Correlation, Pooling Equilibria). *An equity-pooling equilibrium is never sustainable. An asset-pooling equilibrium is sustainable if and only if*

$$\omega \geq \omega^{APE} \equiv \frac{F(A_L/(\mathbb{E}[A]) - 1)}{\pi((C_H - C_L) - (A_L - A_H)) + F(A_L/(\mathbb{E}[A]) - 1)}. \quad (3)$$

In this equilibrium, all firms sell assets for $\mathbb{E}[A] = \pi A_H + (1-\pi)A_L$. *If equity is sold (off-equilibrium), it is inferred as type* L *and valued at* E_L. *The stock prices of asset sellers and equity issuers are* $\mathbb{E}[C + A]$ *and* $C_L + A_L$, *respectively.*

We start by discussing the asset-pooling equilibrium. Unlike in the positive correlation section, it is now L (H) that makes a capital loss (gain). Since L also has lower-quality equity, L is more willing to deviate to equity than H, and so the only admissible off-equilibrium belief is that a deviator to equity is of type L. Under this belief, it is automatic that H will not deviate. We now consider L's incentive to deviate. Under asset pooling, L suffers a capital loss but enjoys a pooled stock price. If it deviates to equity, L breaks even, as its low-quality equity (worth E_L) is sold for a low price (of E_L). Importantly, the low price applies not only to the equity sold but also to the rest of the firm, as it is a carbon copy. The manager will thus not deviate if stock price concerns are sufficiently high ($\omega \geq \omega^{APE}$), even though deviation would avoid a capital loss.

We now turn to the equity-pooling equilibrium. As in the positive correlation section, H (L) makes a capital loss (gain). Since H also has lower-quality assets than L, H is more willing to deviate, and so the only admissible off-equilibrium belief is that a deviator to asset sales is of type H. We now consider H's incentive to deviate under this belief. If H deviates to assets, it would receive a (fair) low price of A_H and break even compared with its current capital loss. However, this low price applies only to the asset being sold and not the rest of the firm, as it is not a carbon copy. Instead, deviation leads to a high stock price, which, coupled with the avoidance of a capital loss, induces H to deviate, and so equity pooling is unsustainable for any ω. Under deviation, H's assets are correctly assessed as lemons and lowly priced. Thus, the market-timing motive for financing (e.g., Baker and Wurgler 2002) does not exist—yet deviation is still profitable, as it yields a high stock price.

In sum, a pooling equilibrium where all firms sell assets is sustainable, but one where all firms issue equity is not. This preference for asset sales stems from the *correlation effect*, which arises from two sources. First, equity is perfectly correlated with the rest of the firm, but the asset need not be. A low price is attached to any claim sold, but only if this claim is equity is the low price also attached to the rest of the firm. Second, the manager places sufficient weight on how financing decisions affect the market's inference over firm value, reflected in the stock price ($\omega \geq \omega^{APE}$). The correlation effect shows that it is not only an asset's information asymmetry that matters (as in MM) but also its correlation with the firm. Even if an asset exhibits high information asymmetry and thus suffers a high lemons discount, its sale could still be attractive, if it does not imply that the firm is of low quality.

The preference for asset sales points to a novel benefit of diversification. Stein (1997) notes that an advantage of holding assets that are not perfectly correlated is "winner-picking": a conglomerate can increase investment in the division with the best investment opportunities at the time. Our model suggests that another advantage is "loser-picking": a firm can raise capital by selling a low-quality asset, without implying a low value for the rest of the firm. Thus, diversification into unrelated sectors provides greater financial slack than expanding in one's core business. Relatedly, the analysis points to a new notion of investment reversibility. Standard theories (e.g., Abel and Eberly 1996) model reversibility as the real value that can be salvaged by undoing an investment, which in turn depends on the asset's technology. Here, reversibility depends on the market's inference of firm type if an investment is sold, and thus the correlation between the asset and the rest of the firm.

In addition to the asset-pooling equilibrium, a separating equilibrium may also be sustainable, where H sells its low-quality non-core assets and L sells its low-quality equity. Since this equilibrium yields the unsurprising result that each firms sells its low-quality claim, we defer it to Online Appendix C.1.

We close this section by discussing additional extensions and applications.

2.2.1. Risky Debt. Online Appendix B shows that the correlation effect also applies to risky debt since, similar to equity, it is positively correlated with firm value. The issuance of debt may imply that debt is of low quality, and so the firm is also of low quality.

2.2.2. Selling the Core Asset. Online Appendix D considers the case when the firm can sell the core asset. Since the core (non-core) asset is positively (negatively) correlated with firm value, this extension allows the firm to choose the correlation of the asset it sells, whereas the analysis thus far has considered either positive or negative correlation. A pooling equilibrium in which all firms sell the non-core asset can be sustained, but neither one in which all firms sell equity, nor one in which all firms sell the core asset, is feasible. This is because the non-core asset is negatively correlated with firm value, whereas equity and the core asset are both positively correlated. Thus, the correlation effect continues to apply when firms can choose the correlation of the assets they sell.

2.2.3. General Correlations. A two-type model, while tractable, implies that correlations are either perfectly positive (if $A_H > A_L$) or perfectly negative (if $A_H < A_L$). Online Appendix F studies a more general model that allows for any degree of correlation between the core and non-core assets (which nests Sections 2.1 and 2.2 as special cases). The correlation effect continues to hold as long as the correlation is sufficiently low (indeed, it can even be strictly positive): asset pooling is sustainable if ω is sufficiently high, but equity pooling cannot be sustained for any ω.

The intuition is the same as above. Regardless of the correlation between core and non-core assets, the correlation between the equity being sold and the rest of the firm will always be 1. Thus, deviation to equity issuance from asset pooling always leads to a low price for both the equity being issued and the rest of the firm. By contrast, even with a positive correlation, non-core assets are not a carbon copy of the rest of the firm, and so a negative signal on the former can be a positive signal on the latter.

3. General Model

This section gives firms the choice of whether to raise capital, allows the capital raised to finance a positive NPV investment, and introduces synergies. These extensions naturally go together since, if given the choice not to raise capital, H would never sell assets unless they are dissynergistic nor issue equity unless the capital raised could be used productively.

Now, in addition to quality q, each firm has a second type of dimension: synergy k, which is uncorrelated with q. The cumulative distribution function is given by $G(k)$, which is differentiable and bounded below and above by $\underline{k}$ and $\bar{k}$, where $-1 < \underline{k} \leq 0$, $\bar{k} > 0$. Synergy k measures the additional (private) value lost if the current owner sells the asset.[11] If a firm sells a non-core asset with a true value of \$1, its fundamental value falls by $\$1 + k$.[12] Thus, $k > (<)0$ represents synergies (dissynergies), where the asset is worth more (less) to the current owner than a potential purchaser, even absent information asymmetry. That $\underline{k} \leq 0$ allows for asset sales to be motivated by operational reasons (dissynergies) rather than only financing reasons.[13] In addition to synergies, $k > 0$ can also arise if investment in assets is costly to reverse (e.g., Abel and Eberly 1996). The expected value of the claim to investors depends only on how they infer quality q from X, and not synergy k, which allows us to incorporate two dimensions of private information while retaining tractability. We sometimes use the term "H" or "H firm" to refer to a high-quality firm regardless of its synergy parameter, and similarly "L" or "L firm."

The action space is now richer. All firms can either do nothing or instead raise capital of F to finance an investment with expected value $R_q = F(1 + r_q)$, where $r_H \geq 0$ and $r_L \geq 0$: since the firm can always hold cash, it will only undertake positive NPV investments. We thus now have $E_q = C_q + A_q + F(1 + r_q)$. We allow for both $r_H \geq r_L$ and $r_H < r_L$ (while continuing to assume $E_H > E_L$). Note that r_q captures the expected return on the investment; the model does not require investment to lead to a return of r_q with certainty. Thus, it accommodates general distributions for the investment

return; given risk neutrality, only the expected return matters.

In the following sections, we analyze the case of positive correlation and demonstrate two main results. First, Section 3.1 analyzes the conditions under which the pooling equilibria of Section 2.1 continue to be sustainable. It shows that the balance sheet effect continues to hold, and can even strengthen, when there is information asymmetry over the use of the cash raised. Second, Section 3.2 shows that new semi-separating equilibria may now be sustainable; this demonstrates the *camouflage effect*, an advantage of selling assets. This effect stems from the second difference between assets and securities—the sale of assets, but not equity, may be motivated by dissynergies. Thus, low-quality firms can disguise asset sales that are truly motivated by negative private information as being instead due to dissynergies. Online Appendix C.2 shows that, in the case of negative correlation, this general model continues to generate the correlation effect of Section 2.2. Since this analysis only demonstrates robustness but does not generate any new implications, we defer it to the appendix.

3.1. Pooling Equilibria

Proposition 3 gives conditions under which pooling equilibria are sustainable.

Proposition 3 (Positive Correlation, Pooling Equilibria, Voluntary Capital Raising). (i) *An asset-pooling equilibrium is sustainable if and only if* (ia) $E_H/E_L \geq A_H/A_L$, (ib) $1+\bar{k} \leq \mathbb{E}[A]/A_L$, *and* (ic) $1+r_H \geq A_H(1+\bar{k})/(\mathbb{E}[A])$ *hold. The prices of assets and equity are* $\pi A_H + (1-\pi)A_L$ *and* $C_L + A_L + F(1+r_L)$, *respectively.*

(ii) *An equity-pooling equilibrium is sustainable if and only if* (iia) $E_H/E_L \leq A_H/A_L$, (iib) $1+\underline{k} \geq E_L/(\mathbb{E}[E])$, *and* (iic) $1+r_H \geq E_H/(\mathbb{E}[E])$ *hold. The prices of assets and equity are* A_L *and* $\mathbb{E}[C+A]+F(\mathbb{E}[1+r])$, *respectively.*

As in Proposition 1, condition (ia) ensures that H firms do not deviate to equity issuance from an asset-pooling equilibrium, and (iia) ensures that H firms do not deviate to asset sales from an equity-pooling equilibrium. When investment opportunities are zero ($r_H = r_L = 0$), (ia) reduces to the condition $F \leq F^*$ from Proposition 1. With positive investment opportunities, it becomes

$$F[A_H(1+r_L) - A_L(1+r_H)] \leq C_H A_L - C_L A_H. \quad (4)$$

The sign of the RHS depends on whether $C_H/C_L \lessgtr A_H/A_L$. We first consider $C_H/C_L > A_H/A_L$, as this is the more realistic case for two main reasons. First, Online Appendix D shows that if firms have the option to sell both the core and non-core asset, in a pooling equilibrium, firms only sell the asset with lower information asymmetry, and so we can label this asset as the "non-core" one. Second, the core business bears the risk of the firm's future prospects, such as its ability to launch new products and retain employees, whereas a separable non-core asset (such as a factory or oilfield) does not.

If $C_H/C_L > A_H/A_L$, the RHS is positive. If the LHS is also positive ($A_H/A_L > (1+r_H)/(1+r_L)$), (4) yields

$$F \leq F^{*I} \equiv \frac{C_H A_L - C_L A_H}{A_H(1+r_L) - A_L(1+r_H)}. \quad (5)$$

In Section 2.1, the upper bound was $F^* \equiv (C_H A_L - C_L A_H)/(A_H - A_L)$. If $F^{*I} < F^*$, the balance sheet strengthens compared with Section 2.1. This is clearly true if $r_L > r_H$, as L's superior growth options reduce the information asymmetry of equity. More surprisingly, $F^{*I} < F^*$ holds even if $r_H \geq r_L$, as long as $r_H/r_L < A_H/A_L$. To see why, note that $R_H = F(1+r_L) + F(r_H - r_L)$. When $r_H > r_L$, the second term increases the information asymmetry of equity and indeed raises F^{*I} compared with F^*, but the first term, which is common to both R_H and R_L, has the opposite effect. Intuitively, $F(1+r_L)$ is a minimum expected investment return regardless of firm type: since the investment is positive NPV, the certain component of the firm's balance sheet is now higher ($F(1+r_L)$ rather than F). Only when $r_H/r_L > A_H/A_L$ do we have $F^{*I} > F^*$, weakening the balance sheet effect compared with Section 2.1.[14] Note that the only difference between F^* and F^{*I} are the r_L and r_H terms; the synergy terms do not enter into F^{*I} as they do not affect the value of assets to outside investors.

If the LHS of (4) is negative ($A_H/A_L \leq (1+r_H)/(1+r_L)$), then (4) is satisfied for any F: the upper bound on F is infinite. Intuitively, equity holders obtain a portfolio of assets in place ($C+A$) and the new investment (R); F determines the weighting of the new investment in this portfolio. Firm H cooperates with asset sales if his capital loss, A_H/A_L, is less than the weighted average loss on this overall equity portfolio. If both the assets in place and the new investment exhibit more information asymmetry than non-core assets—that is, $A_H/A_L \leq C_H/C_L$ and $A_H/A_L \leq (1+r_H)/(1+r_L)$—then the loss on the equity portfolio is greater regardless of the weights.

The alternative inequality, $C_H/C_L < A_H/A_L$, is an extreme case since it means that assets have such high information asymmetry that asset sales can never be sustained for any F in the core model: it yields $F^* < 0$. In the model with investment, we similarly have $F^{*I} < 0$ if the LHS of (4) is positive (i.e., $A_H/A_L > (1+r_H)/(1+r_L)$). Intuitively, when non-core assets exhibit more information asymmetry than both core assets and the new investment, then they exhibit more information asymmetry than equity for any weight F. On the other hand, if $C_H/C_L < A_H/A_L$ and also $A_H/A_L < (1+r_H)/(1+r_L)$, then the inequality in (5) becomes a *lower* bound on F (i.e., $F \geq F^{*I}$). Now, asset pooling is only sustainable for *high* F, as we need a high weight on investment for the

balance sheet to exhibit more information asymmetry than non-core assets.

In addition to demonstrating robustness, the extension to voluntary capital raising also generates a new prediction. As r_H falls and r_L rises (the information asymmetry of investment falls), the upper bound on the asset-pooling equilibrium tightens, and the lower bound on the equity-pooling equilibrium loosens. Thus, the source of financing also depends on the use of financing. If growth opportunities are good regardless of firm quality (r_L is high, for example, in good macroeconomic conditions or a growing industry), then they are more likely to be financed using equity. The use of financing also matters in models of moral hazard (uses subject to agency problems will be financed by debt rather than equity) or bankruptcy costs (purchases of tangible assets are more likely to be financed by debt rather than equity); here, it matters in a model of pure adverse selection. Moreover, our predictions differ from a moral hazard model. Under moral hazard, if cash is to remain on the balance sheet, equity is undesirable because of the agency costs of free cash flow (Jensen 1986). Here, equity is preferred as a result of the balance sheet effect.

We now turn to the new conditions for asset pooling not in Proposition 1; the new conditions for equity pooling are analogous. Condition (ib) ensures that L does not deviate to equity issuance. While L is making a capital gain from asset sales, it also loses (positive or negative) synergies, and so its incentive constraint is no longer trivial. The condition ensures that, even for the L firm with the greatest synergies (type $(L, \bar{k})$), the capital gain from asset sales exceeds the synergy loss, and so no L firm wishes to deviate to equity. Condition (ic) ensures that H does not deviate to inaction (just as (ia) rules out deviation to equity issuance). It states that H's investment return is sufficiently high that he is willing to bear the capital loss from raising financing.

3.2. Semi-Separating Equilibria

The pooling equilibria require (dis)synergies to be sufficiently weak that all firms are willing to sell the same claim. If they are strong, we have a semi-separating equilibrium where firms of the same quality sell either assets or equity depending on their level of synergy. This equilibrium is characterized in Proposition 4.

Proposition 4 (Positive Correlation, Semi-Separating Equilibria, Voluntary Capital Raising). (i) *If* $1+r_H \geq E_H/E_L$, *a semi-separating equilibrium in which type* (q,k) *sells assets* (*equity*) *if* $k \leq (>) k_q^*$ *is sustainable if neither pair of conditions* $(1+\bar{k} \leq \mathbb{E}[A]/A_L,\ E_H/E_L \geq A_H/A_L)$ *nor* $(1+\underline{k} \geq E_L/(\mathbb{E}[E]),\ E_H/E_L \leq A_H/A_L)$ *is satisfied.*

(ia) *If* $E_H/E_L > A_H/A_L$, *then* $k_H^* > k_L^*$. *Assets are sold at a premium to their unconditional expected value* $\mathbb{E}[A]$, *while equity is issued at a discount.*

(ib) *If* $E_H/E_L < A_H/A_L$, *then* $k_H^* < k_L^*$. *Equity is issued at a premium to its unconditional expected value* $\mathbb{E}[E]$, *while assets are sold at a discount.*

(ic) *If* $E_H/E_L = A_H/A_L$, *then* $k_L^* = k_H^* = 0$.

(ii) *If* $1 + r_H \leq E_H/E_L$, *a semi-separating equilibrium is sustainable in which H sells assets if* $k \leq k_H^*$ *and does nothing if* $k > k_H^*$ *and L sells assets if* $k \leq k_L^*$ *and issues equity if* $k > k_L^*$, *where* $k_L^* \geq 0$. *A rise in* r_H *increases both* k_H^* *and* k_L^*.

(iia) *If* $E_H/E_L \geq 1 + r_H > (A_H/A_L)(1+\underline{k})$, *then* $k_H^* > \underline{k}$ *and* $k_L^* > 0$. *The price of assets exceeds* A_L, *and the price of equity is* $C_L + A_L + F(1+r_L)$. *If* $1 + r_H > (<) A_H/A_L$, *then* $k_H^* > (<) k_L^*$, *and assets are sold at a premium* (*discount*) *to their expected value* $\mathbb{E}[A]$.

(iib) *If* $1 + r_H \leq \min(E_H/E_L, (A_H/A_L)(1+\underline{k}))$, *then* $k_H^* = \underline{k}$ (*all H firms do nothing*) *and* $k_L^* = 0$. *The price of assets is* A_L, *and the price of equity is* $C_L + A_L + F(1+r_L)$.

(iii) *If* $r_H = r_L = 0$, *then we have the same equilibria as in parts* (ia) *and* (iib), *except that L firms with* $k > k_L^* (= 0)$ *either issue equity or do nothing.*

There are three cases to consider.

3.2.1. High r_H. We start with part (i), where $1 + r_H \geq E_H/E_L$ ensures that the investment return is sufficiently high such that all firms raise financing. The choice of financing depends on both components of type. First, it depends on synergy k: there is an equilibrium threshold k_q^*, and any firm below (above) the threshold sells assets (equity). Second, it depends on quality q, because H and L use different thresholds k_q^*. The main result of part (i) is how F affects whether $k_H^* > (<) k_L^*$, and thus whether H is more (less) willing to sell assets than L.

The role of F again arises through the balance sheet effect. As demonstrated in condition (4), the value of F determines whether $E_H/E_L \lesseqgtr A_H/A_L$. If both sides of (4) are positive, it simplifies to $F \leq F^{*I}$, which generalizes the condition $F \leq F^*$ from Section 2.1. When $F < F^{*I}$, and thus $E_H/E_L > A_H/A_L$, equity exhibits higher information asymmetry than assets. As a result, H is more willing to sell assets than L and so uses a higher cutoff ($k_H^* > k_L^*$). The different cutoffs, in turn, affect the valuations. Since H is more willing to sell assets, the asset (equity) price is higher (lower) than its unconditional expectation. When $F > F^{*I}$, and thus $E_H/E_L < A_H/A_L$, the balance sheet effect is sufficiently strong such that equity is more attractive to H ($k_H^* < k_L^*$). The asset (equity) price is now lower (higher) than its unconditional expectation.[15] Finally, when $F = F^{*I}$, and thus $E_H/E_L = A_H/A_L$, the information asymmetry of assets and equity are the same, and so H and L use the same cutoff.

Unlike in the pooling equilibria, here the impact of a stronger balance sheet effect is nuanced—it does not make one claim universally more popular but instead

increases (reduces) the attractiveness of equity to high-quality (low-quality) firms. This differential effect contrasts with standard frictions, such as taxes, transactions costs, liquidity, and bargaining power, which have the same directional effect on all firms. Because of this differential effect, changes in F affect the price and quality of assets sold in the real asset market, as well as the price and quality of equity. Assets (equity) that are sold for financing reasons should fetch lower (higher) prices if the sale is large, as large sales are more likely to stem from low-quality (high-quality) firms.

3.2.2. Moderate r_H: Camouflage Effect. Part (iia) shows that if r_H is moderate, H firms with synergistic assets will not raise capital at all, since the return on investment is insufficient to outweigh the loss from capital raising. This echoes an intuition in MM: high-quality firms forgo investment as a result of the cost of financing. However, H firms with sufficiently dissynergistic assets still sell them, not so much to finance investment but to get rid of dissynergies: the gain from doing do, when added to the (minor) return on investment, outweighs the capital loss from asset sales. As before, L sells either equity or assets (depending on its synergy level), not so much to finance investment but to exploit overvaluation.

The key result is $k_L^* > 0$: L prefers asset sales and will sell assets even if they are synergistic. The reason is the camouflage effect. Since the growth opportunity is only moderate, it is too weak to induce H to issue equity. Thus, the only reason to issue equity is if it is of low quality, and so equity issuance reveals the firm as L. By contrast, asset sales may be undertaken because the asset is either of low quality (low common value, sold by L) or dissynergistic (low private value, sold by H), and so the asset price exceeds A_L. This high price induces L to sell assets ($k_L^* > 0$). Here, an increase in r_H augments k_H^*, as H is more willing to sell assets. Then assets provide even better camouflage, so k_L^* rises also.

Note that, for any semi-separating equilibrium, there may be said to be "camouflage" in that multiple types pool into the same action. MM and its extensions (e.g., Cooney and Kalay 1993, Wu and Wang 2005) also feature a noninformational motive—the desire to finance investment—which allows sellers to camouflage the disposal of an overvalued claim. However, those motives can be used to disguise both asset and equity sales, and so they do not affect a firm's choice between them.[16] We use the term "camouflage effect" to refer specifically to the ability to disguise a sale as motivated by dissynergies, rather than noninformational motives in general, which applies only to assets.[17]

Indeed, in the equilibrium of (iia), investment opportunities are too weak to motivate capital raising ($1 + r_H < E_H/E_L$)—the only non-overvaluation motive is dissynergies, which only apply to assets, and so they lead H to sell assets but not to issue equity. Thus, while assets are priced above A_L, equity is priced at the lowest possible value of E_L—assets offer camouflage and equity does not, and so L exhibits a strict preference for assets ($k_L^* > 0$). By contrast, when $1 + r_H > E_H/E_L$ (part (i)), we cannot sign k_L^*. When the investment return is good, H sells both assets and equity (to finance the investment), and so both offer camouflage; thus, L exhibits no clear preference between them.

Just like the balance sheet effect, the camouflage effect also applies to the choice between asset sales and risky debt, as shown in Online Appendix B. Absent a profitable growth opportunity, the issue of risky debt signals that the debt is overvalued, since it cannot be camouflaged as stemming from an operational reason, unlike an asset sale.

3.2.3. Low r_H. Part (iib) shows that if r_H is low and dissynergies are not severe ($1 + r_H \leq (A_H/A_L)(1 + \underline{k})$), even H firms with the most dissynergistic assets do nothing. Information asymmetry A_H/A_L is so strong that the capital loss from asset sales is high relative to both the growth opportunity r_H and the dissynergy motive $\underline{k}$. Since no H firms sell assets, asset sales do not offer camouflage. Thus, $k_L^* = 0$: L no longer prefers asset sales.

Part (iii) shows that if $r_H = r_L = 0$, even L has no reason to issue equity: it cannot exploit overvaluation since there is no camouflage, and it cannot invest the cash raised profitably. Thus, low-quality firms with synergistic assets ($k > k_L^*(= 0)$) are indifferent between selling equity and inaction. Indeed, there exists an equilibrium where all L firms with $k > 0$ do nothing, and so the equity market shuts down. Absent an investment opportunity, the only reason to sell equity is if it is of low quality, and so the "no-trade" theorem applies. By contrast, asset sales may be motivated by operational reasons, and so the market continues to function.

We now analyze comparative statics that affect the type of semi-separating equilibrium ((i), (iia), (iib), or (iii)) that is sustainable.

3.2.4. Effect of r_H. This parameter captures investment opportunities of high-quality firms, which, among other things, will be correlated with the business cycle. We start with the effect of r_H on asset sales. When $1 + r_H$ falls from moderate to low (i.e., drops below $(A_H/A_L)(1 + \underline{k})$), we switch from (iia) to (iib). Then, H no longer sells assets for dissynergy motives. In turn, the decline in asset sales by H is amplified by L (k_L^* falls to zero) since the camouflage effect disappears. Thus, the camouflage effect leads to multiplier effects—exogenous factors that deter H from selling assets also then deter L. Indeed, Eisfeldt and Rampini (2006) find empirically that asset sales are procyclical because, when growth opportunities are low, asset liquidity (the price of sold assets) falls. Here, when $1 + r_H$ drops below $(A_H/A_L)(1 + \underline{k})$, the asset price falls to A_L.

We now turn to the effect of r_H on equity issuance. When r_H is high, we are in case (i) in which both H

and L sell both assets and equity. Thus, while large rises in r_H that switch the equilibrium from (iib) to (i) increase the aggregate issuance of both claims, moderate rises that switch it to (iia) increase aggregate asset sales but *decrease* equity issuance: assets respond to rises in r_H before equity does. The fall in equity issuance arises because a shift to (iia) causes H firms to start to sell assets but not to issue equity, and such behavior encourages some L firms to switch from equity to asset sales as a result of the camouflage effect.

3.2.5. Effect of F. The equilibrium in part (i), where all firms sell either assets or equity, exhibits greater real efficiency than the one in part (iia) since all firms are undertaking profitable investment. It is easier to satisfy the condition for part (i) $(1 + r_H \geq E_H/E_L)$ if F is high. Thus, a greater *scale* of investment opportunities (high F) encourages H to invest, even if the per-unit productivity of investment (r_H) is unchanged. The balance sheet effect reduces the per-unit cost of financing, whereas scale effects typically considered in the literature (e.g., limited supply of capital) increase the per-unit cost of financing. Thus, a higher F has beneficial, real consequences by encouraging investment.

Finally, we consider the interesting special case where there is no information asymmetry about the non-core asset (i.e., $A_H = A_L$). Then, condition (ib) in Proposition 3 becomes $1 + k \leq 1$, which can never be satisfied, and so asset pooling is unsustainable. Since assets exhibit no information asymmetry, L makes no capital gains from selling them, and so any L with positive synergies deviates to equity. In addition, condition (iia) in Proposition 3 becomes $E_H/E_L \leq 1$, which can never be satisfied, and so equity pooling is unsustainable. When assets have zero information asymmetry, any H firm with weakly negative synergies will sell them—similar to the MM intuition that information-insensitive claims are sold first, absent operational reasons. As a result, the only possible equilibria are semi-separating—case (ia), (iia), or (iii) from Proposition 4, depending on whether r_H is high, medium, or low. Note that in cases (ia) and (iia), we now have a positive stock price reaction to asset sales regardless of the value of F—since assets have zero information asymmetry, they automatically have less information asymmetry than equity regardless of F, and so the balance sheet effect is no longer important. This special case shows that information asymmetry about A is necessary to make the balance sheet effect relevant but is not necessary for the camouflage effect: the equilibrium in case (iia) can still hold.

4. Empirical Implications

This section discusses the main implications of the model. While some implications are consistent with existing empirical findings, many implications are new and untested, yielding potential questions for future research.

4.1. Determinants of Financing Choice

The first set of empirical implications concerns the determinants of financing choice.

4.1.1. Amount of Financing Required. Proposition 1 shows that equity is preferred for high financing needs, because of the balance sheet effect, while asset sales are preferred for lower needs. For example, large oil and gas companies typically expand by adding individual fields, which require low F; indeed, this industry exhibits an active market for asset sales. A related implication is that equity issuances should represent a larger percentage of firm size than financing-motivated asset sales. This result may also shed light on previous empirical studies of external finance. An analysis excluding asset sales might infer from the infrequency of financing that it is subject to large, indirect costs. For example, Hennessy and Whited (2007) find that firms behave as if facing a cost of 8.3% on the first million dollars of equity raised, versus underwriting fees of only 5.1% reported in Altınkılıç and Hansen (2000). Our model suggests that if asset sales were also included in external financing, observed external financing would be both smaller and more frequent, implying lower indirect costs.

4.1.2. Use of Proceeds. Both the balance sheet and camouflage effects predict that the probability of equity issuance is increasing if growth opportunities improve across the board (r_L and r_H are high). Proposition 4 shows that the balance sheet effect is stronger when financing an investment opportunity that is attractive regardless of firm quality (r_L is high). Turning to the camouflage effect, if r_H is low, high-quality firms do not issue equity, and low-quality firms prefer asset sales as only they can provide camouflage. When r_H increases above a threshold, not only do high-quality firms start to issue equity to exploit the growth opportunity but also low-quality firms issue equity to a greater extent, as they can camouflage themselves with high-quality equity issuers.

Thus, firms where growth opportunities are known to be good should raise equity. For example, a technology shock that increases investment opportunities across an industry (such as the invention of fracking for the energy sector, or an increase in processing speed for the computer sector) should make equity issuance more likely. In a strong macroeconomic environment, even low-quality firms will have good investment projects, and so equity is again preferred, as found by Choe et al. (1993). Covas and Den Haan (2011) show that equity issuance is procyclical, except for the very largest firms. A separate prediction from the balance sheet effect is that equity is more likely to be used for purposes with less information asymmetry, such as paying debt or replenishing capital.

4.1.3. Firm Characteristics. A third determinant of financing choice is firm characteristics. Single-segment firms are more likely to issue equity; firms with negatively correlated assets prefer asset sales because of the correlation effect. Thus, conglomerates are more likely to sell assets than firms with closely related divisions and more likely to sell non-core assets than core assets (see Online Appendix D). Indeed, Maksimovic and Phillips (2001) find that conglomerates are more likely to sell peripheral divisions than main divisions. While consistent with the correlation effect, this result could also stem from operational reasons: peripheral divisions are more likely to be dissynergistic. Maksimovic and Phillips also find that less productive divisions are more likely to be sold. This result is consistent with the idea that conglomerates can sell poorly performing divisions without creating negative inferences on the rest of the firm, although they do not study the market reaction to such sales.

4.2. Market Reactions to Financing

A second set of empirical implications concerns the market reaction to financing. In the negative correlation case, and in the positive correlation case where $k_H^* > k_L^*$ (low F), asset (equity) sales lead to a positive (negative) stock price reaction. Indeed, Jain (1985), Klein (1986), Hite et al. (1987), Slovin et al. (1995), and Feldman (2014), among others, find evidence of the former; a long line of empirical research beginning with Asquith and Mullins (1986) documents the latter. Under positive correlation and high F, we have $k_L^* > k_H^*$, and so equity issuance leads to a positive reaction.[18] Holderness (2018) finds a positive reaction in some countries but does not relate it to the size of the equity issue or the correlation structure of the issuer. Separately, the model also predicts that equity issuance will typically lead to a more negative reaction for conglomerates (where negative correlation is likely) than for single-segment firms.

4.3. Synergy Motives

Our next implications concern synergy motives for asset sales. Testing these implications is harder for the econometrician, who is rarely able to measure synergies, but they are still relevant for managers, who are better able to estimate synergies.

4.3.1. Market Depth. Firms are more willing to sell assets in deep markets where others are selling for operational reasons, providing camouflage. One potential way to estimate (dis)synergies is to compare across industries. For example, in the oil and gas industry, asset sales frequently involve self-contained plants with little scope for synergies. In consumer-facing industries where multiple products are cross-sold to the same customer base, operational motives should be stronger. A more general implication of the model is that there will be multiplier effects. A rise in operational motives for asset sales also encourages overvaluation-motivated asset sales, as the seller can camouflage the disposal as resulting from dissynergies.

4.3.2. Interaction Between Synergies and Amount of Financing. The link between the source of financing and the amount required is stronger with fewer synergies. With weak synergies, only pooling equilibria are sustainable, and so when F is high (low), all firms sell equity (assets). With strong synergies, we have a semi-separating equilibrium, and so even when F is high (low), some firms are selling assets (equity). Put differently, with weak synergies, firms will issue the same type of claim for a given financing requirement; with strong synergies, we should observe greater heterogeneity in financing choices across firms.

4.3.3. Firm Quality. Equity issuers are likely to have synergistic assets, and asset sellers are likely to be parting with dissynergistic ones. Moreover, high-quality firms are more likely to sell synergistic assets if their financing needs are low, whereas low-quality firms are more likely to do so if their financing needs are high.

5. Conclusion

This paper has studied a firm's choice between financing through asset sales and the issuance of securities, such as equity, under asymmetric information. A direct extension of MM would imply that firms will issue the claim that exhibits the least information asymmetry. While information asymmetry is indeed relevant, there are two key differences between assets and equity, absent from the MM framework, which in turn lead to three new forces that govern the financing decision.

The first key difference is that a purchaser of non-core assets obtains a claim to the assets alone, whereas a purchaser of securities owns a claim to the firm's entire balance sheet. This leads to two new forces. The first is the balance sheet effect, which represents an advantage to selling equity. Since the firm's balance sheet includes the amount of funds raised, which is known, this reduces the information asymmetry of equity but not assets, particularly if the amount of funds raised is high. Thus, low (high) financing needs are met through asset (equity) sales: the amount of financing required affects the choice of financing and, consequently, firm boundaries. This result is robust to using the cash to finance an uncertain investment.

The second new force is the correlation effect, which represents an advantage to selling assets. Since equity is a carbon copy of the firm's balance sheet, issuing it leads to a lemons discount not only on the equity being sold but also on the rest of the firm as a whole, reducing its stock price. By contrast, an asset sold need

not be a carbon copy of the firm, because it is not a claim to the firm's balance sheet.

The second key difference is that the sale of assets—but not equity—can be motivated by operational reasons (synergies). This leads to the third new force, the camouflage effect, which also represents an advantage to selling assets. When firms have discretion over whether to raise financing, and growth opportunities are moderate, high-quality firms will not issue equity but may still sell assets if they are dissynergistic. This allows low-quality firms to pool with them, disguising their capital raising as being motivated by operational reasons rather than overvaluation. This camouflage effect leads low-quality firms to sell assets even if they are synergistic.

In sum, our model predicts that equity issuance is preferred when the amount of financing required is high, if growth opportunities are good, and for uses about which there is little information asymmetry (e.g., repaying debt or replenishing capital). Asset sales are preferred if the firm has non-core assets that exhibit little information asymmetry or are dissynergistic, if other firms are currently selling assets for operational reasons, and if the asset has a low correlation with the core business (e.g., in a conglomerate).

This paper suggests a number of avenues for future research. On the empirical side, it gives rise to a number of new predictions, particularly relating to the amount of financing required and the purpose for which funds are raised. On theoretical side, a number of extensions are possible. One would be to allow for other sources of asset-level capital raising, such as equity carve-outs.[19] Since issuing asset-level debt or equity does not involve a loss of (dis)synergies, a carve-out is equivalent to asset sales if synergies are zero. A carve-out also benefits from the correlation effect, as it need not imply low quality for the firm as a whole. However, it does not benefit from the balance sheet effect, as investors only own a claim to the asset, not the parent company's balance sheet where the new funds reside. If synergies are nonzero, asset sales but not carve-outs benefit from the camouflage effect, so it would be interesting to analyze the case in which synergies are nonzero and the firm has a choice between asset sales, carve-outs, and equity issuance. Another restriction of the model is that even when firms can choose whether to raise capital, they raise a fixed amount F (as in MM, Cooney and Kalay 1993, and Nachman and Noe 1994), since there is a single investment opportunity with a known scale of F. An additional extension would be to allow for multiple investment opportunities of different scales, to generate predictions for the amount of capital raised in equilibrium in addition to the source.

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Appendix. Proofs

Proof of Proposition 1

For either pooling equilibrium, let $X \in \{A, E\}$ represent the pooling claim and $\tilde{X}$ the off-equilibrium claim. Let $\tilde{\pi}$ represent the off-equilibrium path belief (OEPB), where $\tilde{\pi}$ is investors' posterior probability that $q = H$ for a deviating firm. We first show that D1 requires $\tilde{\pi} = 0$ under the conditions stated in the proposition and then show that firms cooperate given this OEPB.

Firms cooperate if their "unit cost of financing" is weakly lower for X than $\tilde{X}$,

$$\frac{X_q}{\mathbb{E}[X]} \leq \frac{\tilde{X}_q}{\tilde{X}_L + \tilde{\pi}(\tilde{X}_H - \tilde{X}_L)} \quad \forall\, q \in \{H, L\}, \tag{A.1}$$

which can be rewritten as

$$\frac{X_q}{\tilde{X}_q} \leq \frac{\mathbb{E}[X]}{\tilde{X}_L + \tilde{\pi}(\tilde{X}_H - \tilde{X}_L)}. \tag{A.2}$$

Note that the proposition's conditions ($F \leq F^*$ for an asset-pooling equilibrium (APE) and $F \geq F^*$ for an equity-pooling equilibrium (EPE)) both imply that the pooling claim features weakly less information asymmetry than the off-equilibrium claim:

$$\frac{X_H}{X_L} \leq \frac{\tilde{X}_H}{\tilde{X}_L}. \tag{A.3}$$

First, consider the OEPBs that are allowable under D1. If (A.3) holds, then the LHS of (A.2) is maximized for L, so L has the stronger incentive to deviate. Then the set of OEPBs under which H deviates is a subset of those under which L deviates. To show that this subset is strict, note that L cooperates if $\tilde{\pi} = 0$ but deviates if $\tilde{\pi} = 1$. Because the conditions are

continuous in $\tilde{\pi}$, there must be some value of $\tilde{\pi}$ at which L is indifferent. Then, because H has a strictly stronger incentive to cooperate, there must be some slightly higher value of $\tilde{\pi}$ at which L deviates but H cooperates. Thus, if (A.3) holds, then D1 requires $\tilde{\pi} = 0$. With this, (A.2) is satisfied for L and then also for H, who has the strictly stronger incentive to cooperate.

Conversely, if (A.3) is violated, then H has the stronger incentive to deviate, so the set of beliefs under which L deviates is a subset of those under which H deviates. Here, we can show that this subset is strict by noting that H cooperates at $\tilde{\pi} = 1$ but deviates at $\tilde{\pi} = 0$. Again, continuity implies that there is some $\tilde{\pi}$ at which H deviates while L does not. Then D1 requires $\tilde{\pi} = 1$, and given this belief, the equilibrium is not sustainable, as (A.2) is violated for H. Thus, (A.3) is both necessary and sufficient for the pooling equilibria to be sustainable and satisfy D1.

Proof of Proposition 2

We first show that an *EPE* is unsustainable by demonstrating that the only OEPB that satisfies D1 is that an asset seller is of type H, and that some H firms will automatically deviate under such an OEPB. Given an OEPB $\tilde{\pi}$, type q deviates to assets if and only if

$$\omega[(\tilde{\pi}-\pi)((C_H-C_L)-(A_L-A_H))] > (1-\omega)F\left(\frac{A_q}{A_L-\tilde{\pi}(A_L-A_H)}-\frac{E_q}{\mathbb{E}[E]}\right). \quad \text{(A.4)}$$

The LHS is independent of q. The RHS is lower for $q = H$ than for $q = L$, so the OEPBs under which L deviates to assets are a subset of those under which H deviates. We can show that they are a strict subset using an analogous argument to the proof of Proposition 1.

Under the OEPB that a deviator is H, the stock price $C_H + A_H$ upon selling assets and being inferred as H is higher than that upon pooling on equity $\mathbb{E}[C + A]$. An H firm deviating to assets receives this higher stock price and sells assets at a fair value compared with suffering a fundamental loss on equity issuance. Thus, any firm with $q = H$ will deviate to assets, and so *EPE* is unsustainable.

We now discuss the conditions under which an APE is sustainable. We first show that no firm wishes to deviate under condition (3) and the OEPB that a deviator is of type L, and then we show that this is the only OEPB that satisfies D1.

Under the equilibrium, L sells assets worth A_L at the pooled price of $\pi A_H + (1-\pi)A_L$, and its stock price is $\pi(C_H + A_H) + (1-\pi)(C_L + A_L)$. If L deviates to equity, it will be valued correctly at E_L, and its stock price will be $C_L + A_L$, so its objective function is simply $C_L + A_L$. Thus L will cooperate with asset sales if

$$\omega(\pi(C_H + A_H) + (1-\pi)(C_L + A_L)) + (1-\omega)\left(C_L + A_L + F - F\left(\frac{A_L}{\pi A_H + (1-\pi)A_L}\right)\right) \geq C_L + A_L,$$

which simplifies to (3). Note that both the numerator and denominator of (3) are positive.

We now show that, in APE, the only OEPB that satisfies D1 is that a deviator to equity is of type L. The proof is similar to the EPE analysis. Type q deviates if and only if

$$\omega[(\tilde{\pi}-\pi)((C_H-C_L)-(A_L-A_H))] > (1-\omega)F\left(\frac{E_q}{E_L+\tilde{\pi}(E_H-E_L)}-\frac{A_q}{\mathbb{E}[A]}\right). \quad \text{(A.5)}$$

Inequality (A.5) is easier to satisfy for $q = L$ than for $q = H$, since $E_L < E_H$ and $A_L > A_H$. Therefore, the beliefs under which H deviates are a subset of those under which L deviates. We can show that they are a strict subset using an analogous argument to the proof of Proposition 1. Thus, the only OEPB that satisfies D1 is that an equity issuer is type L.

Proof of Proposition 3

The conditions to ensure that neither H nor L deviate are given by

$$\frac{c(X,q,k)}{\mathbb{E}[X]} \leq \frac{c(\tilde{X},q,k)}{\tilde{X}_L+\tilde{\pi}(\tilde{X}_H-\tilde{X}_L)} \quad \forall (q,k)\in\{H,L\}\times[\underline{k},\bar{k}], \quad \text{(A.6)}$$

$$1+r_q \geq \frac{c(X,q,k)}{\mathbb{E}[X]} \quad \forall (q,k)\in\{H,L\}\times[\underline{k},\bar{k}]. \quad \text{(A.7)}$$

The first condition (A.6) is similar to (A.1) in the proof of Proposition 1, but with some changes. First, we define a function $c(X,q,k)$ that measures the fundamental loss to a firm of type (q,k) choosing claim X. Thus, $c(A,q,k) = A_q(1+k)$ and $c(E,q,k) = E_q$. Second, the definition of equity value E_q includes the investment return r_q, Third, the condition must hold for all k as well as both q values. Given $\tilde{\pi} = 0$ (see below), the condition holds for all k if and only if the proposition's conditions (ib) (for APE) and (iib) (for EPE) are satisfied.

We also have a new set of conditions (A.7) to prevent any firms from deviating to inaction. Intuitively, the investment return must exceed the unit cost of financing. This yields the conditions $1 + r_L \geq A_L(1+\bar{k})/(\mathbb{E}[A])$ and $1 + r_H \geq A_H(1+\bar{k})/(\mathbb{E}[A])$ for APE and $1 + r_L \geq E_L/(\mathbb{E}[E])$ and $1 + r_H \geq E_H/(\mathbb{E}[E])$ for EPE. The first APE condition is implied by (ib) since $r_L \geq 0$, and the first EPE condition is implied by $E_L < E_H$. This leaves us with conditions (ic) and (iic) stated in the proposition.

Next, we confirm that the off-equilibrium valuation of $\tilde{X}$ at X_L is consistent with D1. Analogous to Proposition 1, conditions (ia) and (iia) guarantee that the pooling claim in either equilibrium is subject to less information asymmetry than the off-equilibrium claim, and this in turn is enough to imply that for any value of k, (A.6) is more easily satisfied for type (H,k) than for type (L,k), and so the belief that a deviator is of quality L satisfies D1.[20]

Finally, we must check that when L would prefer $\tilde{X}$ to X, it would not prefer inaction even more. This is automatic, since inequality (A.7) already guarantees that the firm prefers X to inaction. Thus, if L prefers $\tilde{X}$ to X, it also prefers $\tilde{X}$ to inaction.

Proof of Proposition 4

Case (i). First, we note that $1 + r_H > E_H/E_L$ implies that all firms raise capital, as every firm prefers equity issuance to inaction, although some will prefer asset sales even more.

Thus, r_q does not further affect case (i) except by implicitly appearing in the value of E.[21]

Second, given that all firms raise financing, we analyze each firm's choice between equity and asset sales. Define k_q^* as the equilibrium cutoff value below (above) which q sells assets (equity). If the cutoff is interior $k_q^* \in (\underline{k}, \bar{k})$, it is defined by equating the unit cost of financing of these two sources, $1 + k_q^* = (E_q/A_q)(\mathbb{E}[A \mid X = A]/(\mathbb{E}[E \mid X = E]))$. If both cutoffs are interior, this definition implies $1 + k_H^* = \lambda(1 + k_L^*)$, where $\lambda \equiv (E_H/E_L)/(A_H/A_L)$, which is decreasing in F. Thus, any equilibrium is defined by its value of k_L^*, from which $k_H^* = \lambda(1 + k_L^*) - 1$ if this value is in the interval $(\underline{k}, \bar{k})$ and otherwise is equal to the nearer endpoint of this interval.

The proof will involve specifying candidate equilibria, which are summarized by a candidate cutoff k_L' (and implied value of k_H' by the reasoning above), then evaluating the incentives of firms at those cutoff values. The candidate cutoffs constitute an equilibrium if, for any interior cutoffs, firms at those cutoffs are exactly indifferent between asset sales and equity issuance, while for any boundary cutoffs, firms at those cutoffs weakly prefer the specified action.

Before proceeding, we make two observations. First, observe that the value of F determines the price reaction to the financing choice, by determining whether or not $E_H/E_L \lessgtr A_H/A_L$. The general relationship between F and this inequality is given in condition (4). If both sides of the condition are positive, this yields $E_H/E_L > A_H/A_L$ if and only if $F < F^{*I}$, which generalizes the condition $F < F^*$ from the model of Section 2.1. If $E_H/E_L > (<) A_H/A_L$, then $\lambda > (<) 1$, which implies $k_H^* > (<) k_L^*$ from the relationship $1 + k_H^* = \lambda(1 + k_L^*)$. This ordering of the cutoffs determines the price reaction: if $k_H^* > (<) k_L^*$, then $\mathbb{E}[A \mid X = A] > (<) \mathbb{E}[A]$ and $\mathbb{E}[E \mid X = E] < (>) \mathbb{E}[E]$.

Second, define the value $\hat{k} \equiv (E_L/A_L)(\mathbb{E}[A]/(\mathbb{E}[E]))$, and observe that this value is strictly between the values $E_L/(\mathbb{E}[E])$ and $\mathbb{E}[A]/A_L$ from cases (ib) and (iib), respectively, of Proposition 1. Thus, if synergies are stronger than allowed for in Proposition 1, then $\hat{k}$ is guaranteed to be strictly between $\underline{k}$ and $\bar{k}$.

Now consider the case $E_H/E_L > A_H/A_L$. Suppose we specify as a candidate equilibrium $k_L' = \bar{k}$, which implies $k_H' = \bar{k}$ as well. Given these cutoffs, and the assumption $1 + \bar{k} > \mathbb{E}[A]/A_L$, then $(L, \bar{k})$ strictly prefers equity issuance. On the other hand, suppose we specify as a candidate equilibrium $k_L' = \hat{k}$ and $1 + k_H' = \min(\lambda(1 + \hat{k}), 1 + \bar{k})$. Given these cutoffs, $(L, \hat{k})$ strictly prefers asset sales, as can be seen by examining the relevant inequality $A_L(1 + \hat{k})/(\mathbb{E}[A \mid X = A]) < E_L/(\mathbb{E}[E \mid X = E])$, which simplifies to $\mathbb{E}[A]/(\mathbb{E}[A \mid X = A]) < \mathbb{E}[E]/(\mathbb{E}[E \mid X = E])$, which in turn is satisfied by the price reactions given above for the case $E_H/E_L > A_H/A_L$. The continuity of the expressions implies that there is a value k_L^* between $\hat{k}$ and $\bar{k}$ at which (L, k_L^*) is indifferent between selling equity and assets. By construction, (H, k_H^*)'s incentives will also satisfy the equilibrium conditions when k_H^* is determined by $1 + k_H^* = \min(\lambda(1 + k_L^*), 1 + \bar{k})$. Thus, the value of k_L^* defines an equilibrium.

Now consider $E_H/E_L < A_H/A_L$. Suppose we specify as a candidate equilibrium $k_H' = k_L' = \underline{k}$. Given these cutoffs, and the assumption $1 + \underline{k} < E_L/(\mathbb{E}[E])$, then $(L, \underline{k})$ strictly prefers asset sales. On the other hand, suppose we specify as a candidate equilibrium $k_L' = \hat{k}$ and $1 + k_H' = \max(\lambda(1 + \hat{k}), 1 + \underline{k})$. Given these cutoffs, $(L, \hat{k})$ strictly prefers equity issuance, as can be seen by examining the relevant inequality $E_L/(\mathbb{E}[E \mid X = E]) < A_L(1 + \hat{k})/(\mathbb{E}[A \mid X = A])$, which simplifies to $\mathbb{E}[E]/(\mathbb{E}[E \mid X = E]) < \mathbb{E}[A]/(\mathbb{E}[A \mid X = A])$, which in turn is satisfied by the price reactions above for the case $E_H/E_L < A_H/A_L$. The continuity of the expressions involved then implies that there is a value k_L^* between $\hat{k}$ and $\underline{k}$ at which (L, k_L^*) is just indifferent between equity issuance and asset sales. By construction, (H, k_H^*)'s incentives will also satisfy the equilibrium conditions when k_H^* is determined by $1 + k_H^* = \max(\lambda(1 + k_L^*), 1 + \underline{k})$. Thus, the value of k_L^* defines an equilibrium.

Case (ii). The major difference is that some firms prefer inaction to either financing source. Since H is more likely to prefer inaction, it is r_H (rather than r_L) that moves us from case (i) to case (ii). Moreover, among H firms, the ones more likely to switch to inaction are those issuing equity in case (i)—that is, those with $k > k_H^*$—as their assets are sufficiently synergistic that they choose to retain them. The fundamental loss to equity issuance is the same for all H firms regardless of k, so as r decreases compared with case (i), there is a cutoff below which all H firms with $k > k_H^*$ shift from equity issuance to inaction.

To derive this cutoff value, observe that when all H firms strictly prefer inaction to equity issuance, any equity issued is valued at E_L, and the H firms with $k > k_H^*$ weakly prefer inaction if $1 + r_H \leq E_H/E_L$; that is, the capital loss from selling undervalued equity exceeds the investment return. This yields the condition $1 + r_H \lessgtr E_H/E_L$ that differentiates case (i) from case (ii).

The indifference condition defining k_H^*, if that cutoff is interior, is now $A_H(1 + k_H^*)/(\mathbb{E}[A \mid X = A]) = 1 + r_H$. On the other hand, L firms will not deviate to inaction, as they always enjoy a weakly positive fundamental gain plus the investment return, and thus they should at least be willing to issue equity. The indifference condition for L between asset sales and equity issuance yields $k_L^* = \min(\bar{k}, \mathbb{E}[A \mid X = A]/A_L - 1)$.

We have $k_L^* > 0$ if and only if $k_H^* > \underline{k}$—that is, if and only if some H firms sell assets. In turn, we have $k_H^* > \underline{k}$ if and only if $1 + r_H > (A_H/A_L)(1 + \underline{k})$, because otherwise, even $(H, \underline{k})$ would strictly prefer inaction to selling assets. This is the condition distinguishing case (iia) from case (iib). When this condition does not hold, we move to case (iib) with $k_H^* = \underline{k}$ and $k_L^* = 0$.

Case (iii). This case is almost identical to case (iib), except that L firms are now indifferent between equity issuance and inaction, as they do not make a capital gain nor a positive investment return. Thus an equilibrium is sustainable in which no firms raise financing, except for L firms with $k < 0$, who sell assets simply to get rid of dissynergies.

Endnotes

[1] Examples include the sales of Interlake's steel business in favor of its aerospace business, General Electric's appliance and finance businesses in favor of its industrials business, and Pearson's *Financial Times* and its stake in the *Economist* in favor of its education business. See Feldman (2014) for a systematic study.

[2] The securitization literature (e.g., DeMarzo and Duffie 1999, DeMarzo 2005) studies the *type* of claim that a firm should issue, in contrast to our focus on the *level* of claim. In DeMarzo and Duffie (1999), all claims are against the firm's balance sheet. In DeMarzo (2005), all claims are at the asset level. Even if a claim is securitized against multiple assets, it is backed only by those assets and not by the funds injected, so there is no balance sheet effect.

[3] Empirically, Jain (1985), Klein (1986), Hite et al. (1987), Slovin et al. (1995), and Feldman (2014) find positive market reactions to asset sales. Lang et al. (1995) show that this positive reaction stems from financing rather than operational reasons. Brown et al. (1994) and Bates (2006) examine the use of proceeds. Maksimovic and Phillips (2001) and Eisfeldt and Rampini (2006) analyze operational rather than financing motives.

[4] He (2009) considers a different multiple-asset setting where the value of each asset comprises a component known to the seller and an unknown component. The (known) correlation refers to the correlation between the unknown components; here, it refers to the correlation between the total values of the assets (which are known to the seller). His model considers asset sales but not equity issuance.

[5] Consistent with the first motive, Kim and Weisbach (2008) and McLean (2011) find that stockpiling cash for precautionary motives is the largest use of seasoned equity issues. Consistent with the second and third motives, DeAngelo et al. (2010) find that a near-term cash need is the primary motive for seasoned equity issues and that the majority of issuers would have run out of cash without the issue; the introduction cites several papers showing that cash needs motivate asset sales.

[6] The stock price is the firm's expected value based on public information, while fundamental value is based on the manager's private information. Both are calculated from the perspective of existing shareholders and are thus net of financing costs (e.g., claims given to new shareholders).

[7] Gopalan et al. (2014) and Edmans et al. (2017, 2018b) show that managers typically have significant equity vesting in the short term.

[8] Mixed strategy equilibria only exist for the type that is exactly indifferent between the two claims. Since synergies are continuous, this type is atomistic, and so it does not matter for posterior beliefs whether we specify this cutoff type as mixing or playing a pure strategy.

[9] For example, a pooling equilibrium requires three conditions: one to ensure that H does not deviate, one to ensure that L does not deviate, and one to ensure that the off-equilibrium belief is reasonable. The second is typically trivial. Under D1, the third condition is so strong that it automatically implies the first, and so the equilibrium only requires one condition. Under the intuitive criterion, the third condition neither implies nor is implied by the first, so we need to characterize the equilibria with two separate conditions. However, the results remain the same—intuitively, since D1 is a strong refinement, all equilibria will continue to hold under weaker refinements such as the intuitive criterion.

[10] Note that the correlation effect requires (the possibility of) negative correlation not between core and non-core assets' total cash flows but between the component of their cash flows that is private information. Using the earlier example of Interlake, if private information is on the outlook for the steel price (which increases cash flows for its steel business but reduces them for its aerospace business), the correlation effect applies. However, if private information is on the quality of Interlake's corporate culture, which is likely positively correlated with the value of both businesses, it does not.

[11] The results continue to hold when using a discrete synergy distribution (to match our discrete quality distribution). However, the analysis becomes significantly more cumbersome. While quality naturally has two outcomes (high and low), synergy would have to have at least three outcomes (negative, zero, and positive), with zero synergies necessary to nest the MM case and also match reality. Thus, we would have six firm types, making the equilibria much more complex to characterize.

[12] Synergies k thus do not appear under the current balance sheet but instead affect the fundamental value lost if assets are sold. We have also solved the model where synergies explicitly appear on the firm's balance sheet before financing is raised; that is, the firm's current equity value is $C_q + A_q(1+k)$. The economic forces remain robust but the exposition is more cumbersome because the privately known synergy k now appears in the equity claim and thus requires additional inference by investors.

[13] A firm may own dissynergistic assets because it initially acquired them when they were synergistic, but they became dissynergistic over time. The firm may not have yet disposed of the dissynergistic asset for two reasons. First, the firm may retain it because of the transactions costs of asset sales: only if it is forced to raise financing and so would have to bear the transactions costs of equity issuance otherwise would it consider selling assets. Second, the market for assets is not perfectly frictionless, and so not all assets are owned by the best owner at all times. Our model allows for $\underline{k} = 0$, in which case there are no dissynergies.

[14] Note that equity issuance does not become more likely simply because the firm is worth more because of its growth opportunities, which attracts investors. The growth opportunities are fully priced into the equity issue and are not a "freebie."

[15] We also have that $k_H^* < 0$: H retains assets even if they are mildly dissynergistic, because of their higher information asymmetry. Similarly, for $F < F^*$, we have $k_H^* > 0$: even H firms with positive synergies are willing to sell assets, because of their lower information asymmetry.

[16] In Eisfeldt (2004), higher investment opportunities encourage firms to issue more claims; since there is only one class of risky assets (excluding cash and realized payoffs from past projects), these claims can be interpreted as either assets or equity.

[17] By contrast, we do not label the semi-separating equilibrium of part (i) as exhibiting a camouflage effect: even though multiple firm types pool on the same action, this is similar to any semi-separating equilibrium and does not arise from H voluntarily selling assets because of dissynergies. All firms raise capital since the growth opportunity is sufficiently attractive, and so when H prefers to sell assets ($k_H^* > 0$), it is because assets exhibit less informational asymmetry than equity rather than assets being dissynergistic.

[18] Cooney and Kalay (1993) and Wu and Wang (2005) show that an extension of MM can also generate positive returns to equity issuance. The sign of the return depends on the uncertainty about the growth opportunity; here, it depends on the size of the equity issue and the correlation structure of the issuer.

[19] Nanda (1991) also notes that non-core assets may be uncorrelated with the core business and that this may motivate carve-outs. In his model, correlation is always zero and the information asymmetry of core and non-core assets is identical. Our model allows for general correlations and information asymmetries, as well as synergies, enabling us to generate balance sheet, camouflage, and correlation effects.

[20] We do not need to specify the OEPB about k, as they do not affect the purchaser.

[21] As stated, the inequality contains r_H on both sides. We can solve for r_H to restate the condition as $1 + r_H > (C_H + A_H)/(C_L + A_L + Fr_L)$.

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