

Asset tangibility and capital allocation[☆]

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Abstract

Firms comprise divisions that often differ with respect to the degree of asset tangibility. As the strength of borrowing constraints depends on the liquidation value of assets, these firms influence their debt capacity by allocating funds across divisions. We argue that a company whose capital allocation is not verifiable suffers from a dynamic inconsistency problem, as it tends to allocate resources in favor of divisions with fewer tangible assets, leading to a tight borrowing constraint. When capital allocation is verifiable, committing to invest only little eases this constraint, although it implies a deviation from a return maximizing allocation.

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1. Introduction

Asset tangibility has been found to be an important determinant of a company's ability to finance investments externally (Almeida and Campello, in press). The basic reasoning is that the tangibility of assets determines the external financiers' valuation of a firm's transferable assets in case of default. Since financiers rely, to some extent, on the option to liquidate a company's assets in order to cope with opportunistic behavior or asymmetric information issues, the degree of the overall asset tangibility finally establishes an upper bound on a firm's total debt capacity.

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Credit constraints and their interactions with asset tangibility are typically analyzed within frameworks that identify a firm with a single project. But what happens when a firm has several lines of business that differ with respect to the degree of asset tangibility? How does diversity in terms of asset tangibility affect a company's investment behavior and borrowing constraint? In this paper we address these questions. The starting point is that, when divisions differ with respect to asset tangibility, the financiers' valuation of a firm's assets depends on the intra-company allocation of resources and thus on the financiers' ability to control internal capital markets.

There are two cases conceivable. The first is when capital allocation is transparent to financiers such that they can make the use of resources verifiable. Headquarters of such a transparent company is unable to use funds (including the loan) in any way different from what is stated in a loan contract. It can therefore commit itself to any allocation and thus effectively pledges its highly tangible assets for investments associated with less tangible assets. The second case is when financiers are unable to control the allocation of resources because they cannot make it verifiable. A multidivisional firm is then referred to as being opaque, and financiers face the risk that, in the case of default, the proceeds from liquidation will fall short from the face value of debt because of funds having been invested into almost intangible assets. From headquarters' point of view, it is indeed rational to follow this strategy: When debt repayments are bounded to the liquidation value of assets, headquarters can make provisions to reduce these repayments by allocating resources strategically biased, i.e. by directing them mainly to those divisions that are of little value to financiers.

While diversity in terms of asset tangibility may apply to many multidivisional companies, an important source of it is global diversification. Multinational corporations (henceforth MNCs) operate in countries that differ with respect to jurisdiction, regulations and other institutional factors that affect asset tangibility.¹ For example, when assets are to be liquidated in a country with lacking property rights and unpredictable legal decisions, it may require additional costly safeguarding measures to enforce the claims specified in an asset sale contract. Other problems may arise when labor market regulations form an obstacle for a potential buyer to redeploy assets properly by adjusting employment. Furthermore, in a country with an inadequately developed financial system potential purchasers of assets may be credit constrained. To sum up, opportunities to collect much by means of liquidation may be limited for institutional reasons in some countries, while in other countries institutions allow for higher liquidation proceeds.

The main contribution of this paper is to show that for financially constrained MNCs an efficient allocation of resources across business lines can be an indication for severe inefficiencies in financial contracting with external financiers, while an inefficient use of funds indicates that such contractual inefficiencies indeed are less pronounced. The reason is that financiers of an opaque MNC are unwilling to provide funds as long as the firm has an incentive to allocate resources strategically biased. Only if the amount of funds raised externally is sufficiently small, this disincentive vanishes and it is then not optimal for the MNC to deviate from a return maximizing allocation. If, however, the MNC is transparent, its debt capacity is higher because of its contractual obligation to strictly prefer those projects where asset tangibility is higher. But then marginal returns will not be balanced across subsidiaries unless they exhibit similar degrees of asset tangibility. This result contrasts with the notion that when headquarters directs resources towards subsidiaries according to the principle of balancing marginal returns, internal capital markets work efficiently.

¹ It is widely recognized that country-specific institutions determine what external financiers get as a return on their investment (Shleifer and Vishny, 1997).

Besides, the analysis has other important implications. A general first implication refers to the issue of exogeneity of asset tangibility. At first sight, asset tangibility is an exogenous determinant for a firm's borrowing constraint. But once we account for a firm's strategic decision on committing to a specific internal resource allocation, financiers' overall valuation of assets may become endogenous. A further implication is that the credit multiplier, which relates a company's internal funds to its total debt capacity, is stronger for opaque firms than it is for transparent firms. The reason lies in the firms' differing incentive structures. For opaque companies, disincentives to invest strategically biased are mitigated when internal funds increase and financiers are thus strongly inclined to extend lending. For transparent companies, however, there is a tendency to use additional internal funds primarily for reducing allocative inefficiencies, which is generally not in the interest of external financiers who therefore are less willing to lend out more funds.

The remainder of the paper is organized as follows. In Section 2, we briefly discuss recent research that is related to our study. In Section 3, we introduce the basic model setup. Section 4 deals with a transparent MNC, while Section 5 focuses on an opaque MNC. In Section 6 we further compare opaque and transparent MNCs. The empirical implications are thereafter discussed in Section 7. The final section consists of some concluding remarks.

2. Related literature

Recent theoretical contributions to the understanding of the relationship between asset tangibility and borrowing constraints were not only able to show how asset tangibility puts an upper bound on firms' total indebtedness. They have also been proved to be very insightful with respect to many other related research questions. For example, [Hart and Moore \(1998\)](#) showed that debt is among the class of optimum contracts when financiers rely to some extent on the liquidation of assets. Moreover, [Hart and Moore \(1994\)](#) argued that the maturity structure of debt can be explained when changes in asset tangibility over time are taken into account. [Kiyotaki and Moore \(1997\)](#) exploited the dynamic interaction between credit constraints and asset prices in order to study persistence, amplification and spillover effects of macroeconomic shocks. In a more recent paper, [Diamond and Rajan \(2001\)](#) explain the existence of depository institutions as liquidity providers resting on the notion that valuations of assets differ across certain types of financiers. In addition, [Diamond and Rajan \(2000\)](#) show that a bank's capital structure can be further linked to risks associated with liquidation values of assets. As opposed to these studies, we highlight another dimension of variations in asset tangibility, namely across a multidivisional company's businesses.

With a focus on multidivisional decision-making, however, our paper also adds to the theoretical literature on intra-company allocation mechanisms.² According to [Gertner et al. \(1994\)](#), headquarters exerts control rights over the resources pooled in a multidivisional firm, and as long as it is not contrary to existing law or enforceable contractual agreements, these rights allow headquarters to pursue its own interests while deciding on the allocation of funds. [Stein \(1997\)](#) has argued that the main motive driving headquarters' decision is to channel resources to the most productive projects.³ Albeit this winner-picking strategy aims at improving the efficiency of capital allocation, it also generates additional adverse incentives, as a result of which

² Surveys on this literature are provided by [Stein \(2003\)](#) and [Martin and Sayrak \(2003\)](#).

³ Channeling resources should be understood broadly. It may concern cash flows (as in [Stein, 1997](#)) as well as real assets that are already in place (as in [Gertner et al., 1994](#)) or – as in this paper – even funds raised externally.

conglomerates often trade at a discount.⁴ On the divisional level, incentives to exert effort (Brusco and Panunzi, 2005) or to gather and process information (Stein, 2002) may be weakened. Moreover, Rajan et al. (2000) analyze how internal power struggles among division managers hamper efficient capital allocation. Concerning disincentives for headquarters, it may not be willing to provide necessary incentives for division managers by paying them incentive compatible wages but by assigning inefficient capital budgets (Scharfstein and Stein, 2000). Integrating projects may also allow headquarters to turn its back on external financiers once the pooling of internally generated cash flows suffices in order to ensure follow-up finances for at least some of its projects, thereby lowering headquarters' incentive to meet its obligations vis-à-vis financiers (Inderst and Müller, 2003).

The model presented below is most closely related to Inderst and Müller (2003) in that they also explicitly address the issue of contracting between headquarters and external financiers, internal allocation, and the implications of this for the strength of external borrowing constraints. However, neither their paper nor any other of the above papers studies the role of diversity in asset tangibility. Our paper is furthermore special in that winner-picking effects are not of first-order importance. On the contrary, the argument developed below gives reason for why headquarters of conglomerates does not always pursue a policy of picking winners, even when there are no additional conflicts of interest within the firm.

3. The basic structure of the model

The model is a simple contracting model with long-term investments where pledgeability of cash flows is limited. It is, therefore, related to papers such as those of Bolton and Scharfstein (1990), Hart and Moore (1998) and Campello (2006), but particularly to Hart and Moore (1994) from which we adopt the main assumption that an entrepreneur can quit at some date before the returns are due and withdraw his human capital from the project. This potential behavior puts an upper bound on total indebtedness if financiers cannot costlessly replace the entrepreneur.

At date $T=0$ the entrepreneur has two investment opportunities (projects) in different countries. Let I_n denote capital investment in country $n=1,2$ and suppose that each project yields a non-verifiable but safe return $R(I_n)$ at date $T=2$ if the initial entrepreneur contributes his specific knowledge at some intermediate date $T=1$. The production function R applies to both projects, it is strictly increasing and concave with $R(0)=0$ and $R'(0)=\infty$.

If the entrepreneur does not provide his human capital, physical assets can generate returns only by means of liquidation. The proceeds of liquidation depend on the respective tangibility of assets. From the perspective of multinational investments, assets exhibit a low degree of tangibility when they are located in a country where appropriate institutions are lacking and financiers thus face particular difficulties in finding a potent and reliable buyer for the assets. Hence, liquidation will yield $\beta_1 I_1$ or $\beta_2 I_2$, respectively, where tangibility of assets in country n is reflected by β_n with $\beta_1 \geq \beta_2$, i.e. assets located in country 1 have higher values to financiers. Moreover, liquidation proceeds are non-verifiable unless financiers have access to a specific monitoring technology that enables them to disclose these values. We further assume that $\beta_n < \gamma$ with $\gamma > 1$ being the marginal gross return on an alternative investment.

First-best investment I_n^{fb} is implicitly defined by $R'(I_n^{\text{fb}}) = \gamma$. When internal funds W of the entrepreneur do not suffice to finance these first-best investments, the entrepreneur may raise a

⁴ See, e.g., Lang and Stulz (1994) and Stowe and Xing (2006). Despite those inefficiencies, however, corporate spinoffs not necessarily improve efficiency (McNeil and Moore, 2005).

loan from external financiers. The financial contract may be unenforceable, however, as the entrepreneur cannot commit himself at $T=0$ to contribute his specific human capital at $T=1$. Hence, even though at $T=0$ funds are invested and repayments payable to the financiers at $T=2$ are agreed upon, the entrepreneur might initiate renegotiations at $T=1$ to beat down repayments by threatening to withdraw his specific skills.

The bargaining structure for debt renegotiations is borrowed from Diamond and Rajan (2001). The entrepreneur can make a take-it-or-leave-it offer regarding a new payment and can credibly commit to withdraw his skills in case the offer will be rejected. When financiers accept the new offer, it will replace the initial contractual payment obligation. When they reject, the entrepreneur will actually not contribute his human capital and financiers thus can only liquidate. Given this bargaining structure, the entrepreneur offers a repayment equal to the liquidation value of assets whenever this amount is smaller than the initially promised repayment H . Actual repayments P are therefore given by $P = \min \{H, \beta_1 I_1 + \beta_2 I_2\}$.⁵

Two further restrictions, commonly known as participation constraints, complete the setup. First, financiers will supply funds only if P compensates them for their alternative investment, i.e. if $P \geq \max \{\gamma(I_1 + I_2 - W), 0\}$. Assuming that financiers are competitively organized, this condition will hold with equality. Second, the entrepreneur will accept a contract when the projects' returns net of repayments to financiers cover at least the opportunity costs of internal funds, which could also be invested in the alternative investment. However, since there is no other cost than I for projects to be carried out, his participation constraint will not be binding in equilibrium and we can henceforth neglect it in our formal analysis.

4. Transparency and commitment

We proceed with an MNC that is always transparent irrespective of how diverse (in terms of asset tangibility) it is. This is the case, e.g., when the MNC maintains a close lending relationship with a bank that has means to effectively monitor and enforce additional loan covenants regarding capital allocation, be it directly or indirectly by making the liquidation proceeds in each country verifiable.

Then, the entrepreneur and the banker jointly maximize total surplus with respect to the investment profile (I_1, I_2) by taking into account the financiers' participation constraint and the restriction on renegotiation-proof payments. The optimization problem thus reads as

$$\begin{aligned} \max_{I_1, I_2} \quad & R(I_1) + R(I_2) - \gamma(I_1 + I_2) \\ \text{s.t.} \quad & \beta_1 I_1 + \beta_2 I_2 \geq \max \{\gamma(I_1 + I_2 - W), 0\}. \end{aligned} \quad (1)$$

In what follows the upper index C denotes commitment. We conclude

Proposition 1. Define a critical value of internal funds $W_{crit}^C := \left(2 - \frac{(\beta_1 + \beta_2)}{\gamma}\right) I^{fb}$. If $W \geq W_{crit}^C$ there will be first-best investments in both projects, i.e. $I_1^C = I_2^C = I^{fb}$. If $W < W_{crit}^C$ and $\beta_1 > \beta_2$, there is

⁵ Neither our assumption of the entrepreneur having full bargaining power nor the non-cooperative bargaining structure applied here is crucial for our qualitative results. They still hold true as long as the entrepreneur has some bargaining power vis-à-vis financiers. Moreover, one could also derive the outcome of debt renegotiations on grounds of cooperative Nash-bargaining implying that repayments are some linear combination of project returns and their liquidation proceeds. In either case, dependency of actual debt repayments on the value of assets to financiers remains.

underinvestment in both projects with underinvestment being more severe in country 2, i.e. $I_2^C < I_1^C < I^{fb}$.

As projects have hard-to-pledge returns, the MNC is subject to a borrowing constraint and needs to fill in the resulting financial gap with internal funds. If there are, however, plenty of them the borrowing constraint does not restrain the MNC from first-best investments. Moreover, since assets in country 2 are less valuable to a banker ($\beta_1 > \beta_2$), her willingness to grant a loan is even more restricted when the entrepreneur uses funds for investment in country 2. This results from the entrepreneur's need to trade off not only the marginal returns on investments but also to take into account the different effects these investments have on the strength of the borrowing constraint. Therefore, when the financial constraint is binding, an entrepreneur is willing to forgo investment returns in country 2 in favor of financial easing.⁶

5. Opacity and strategic allocation

The financial contract derived in the previous section requires that the entrepreneur can credibly commit himself to the investment profile (I_1^C, I_2^C) , i.e. once the contract is concluded the entrepreneur is not able to use funds (including the loan) in any way different from the contract. Financiers may, however, not be able to control the internal allocation of resources. This will be the case when the allocation is not observable and, additionally, the liquidation proceeds are non-verifiable, a situation that refers to what is meant by opacity.

This deficiency generates an additional problem at the entrepreneurial level since the entrepreneur can allocate funds strategically. By strategic allocation we mean that the investment strategy primarily aims at reducing the firm's debt service. A conceivable way to deal with this adverse incentive problem effectively could be to let the financier own the assets and lease them to subsidiaries in the same proportion as under transparency. Such a contractual arrangement may, however, not always work. For example, suppose that the technology comprises two stages. In the first stage, the production of an intermediate good takes place, which requires some initial finance. This intermediate good has no market value unless it is used to produce the final good in the second stage, where manufacturing the final product may take place at home as well as abroad. In that case, the above leasing contract does not help even though the entrepreneur's allocation of borrowed funds is not discretionary. The point is that, once the loan has been granted, there are resources he may allocate across divisions in order to improve his bargaining position for debt renegotiations.

5.1. Investment decision

The entrepreneur decides on capital investment when loan L has already been granted. He knows that the allocation of funds may affect what he has to pay back to financiers. For the time being we will also assume that the MNC does not invest in the alternative investment; it will become clear that this restriction will not be binding in the optimum. The incentive constraint of an opaque MNC then reads as

$$I_1^S \in \arg \max_{I_1} [R(I_1) + R(L + W - I_1) - \min\{H, \beta_1 I_1 + \beta_2 (L + W - I_1)\}], \quad (2)$$

⁶ On request, a detailed exposition of all proofs is directly available from the author.

Deriving its FOCs and comparing the respective payoffs leads us to:

Lemma 1. Define H^* as the largest promised repayment, depending on L and W , for which it does not pay to renegotiate. Then H^* and investment I_1^S simultaneously fulfill the following conditions

$$H^* = [R(\hat{I}_1^S) + R(L + W - \hat{I}_1^S)] - [R(\bar{I}_1^S) + R(L + W - \bar{I}_1^S)] + [\beta_1 \bar{I}_1^S + \beta_2(L + W - \bar{I}_1^S)], \quad (3)$$

$$I_1^S = \begin{cases} \hat{I}_1^S : R'(\hat{I}_1^S) = R'(L + W - \hat{I}_1^S) & \text{if } H \leq H^*, \\ \bar{I}_1^S : R'(\bar{I}_1^S) = R'(L + W - \bar{I}_1^S) + \beta_1 - \beta_2 & \text{if } H \geq H^*, \end{cases} \quad (4)$$

where $\beta_1 \bar{I}_1^S + \beta_2(L + W - \bar{I}_1^S) < H^* < \beta_1 \hat{I}_1^S + \beta_2(L + W - \hat{I}_1^S)$.

Intuitively, with H being small it never pays for the entrepreneur to renege on promised repayments because the liquidation value of assets is higher than what he promised to repay, irrespective of the capital allocation. With repayments being independent from the investment policy, the entrepreneur always invests symmetrically $\hat{I}_1^S = \frac{1}{2}(L + W)$ (i.e. marginal returns are balanced) as this implies maximum total returns. However, when H is very high, the entrepreneur always prefers to renege on it, and for this he is even better off when funds have been invested strategically biased, i.e. $\bar{I}_1^S < \frac{1}{2}(L + W)$. Yet he will not invest solely in low-tangible assets because this would imply a forgoing of too much of the total returns. Finally, for intermediate values of promised repayments the entrepreneur takes into account that investing strategically biased has not only a benefit (as repayments can thereby be beaten down). Its downside is that it also implies a deviation from a return maximizing investment policy. But there is a critical repayment obligation H^* , for which profits of investing symmetrically and complying with the contract's promises are for any $H > H^*$ smaller than the profits of investing strategically biased and breaking the contract.

Repayments are therefore a non-monotonic function of the promised repayment. As increasing the promised repayments does not impair the incentives for symmetric investment as long as they remain below H^* , actual repayments P increase one-to-one in H . However, if the entrepreneur promises to repay more than H^* he certainly will do both, invest strategically biased and renege on the promised repayments afterward. A marginal increase in H above H^* therefore implies that the amount actually paid by the entrepreneur will drop once and for all, and will not change anymore if H further increases. Hence, we further conclude

Lemma 2. For an opaque MNC the maximum enforceable repayments to financiers P^* are given by H^* .

When compared to a transparent MNC, an important implication of Lemma 2 is that even if a repayment $H \leq H^*$ is promised, there will be a tendency to invest more in assets that are less tangible. The reason lies in the entrepreneur's lack of ability to commit, and from his perspective it is best to split funds so that marginal returns are balanced.

5.2. The optimum loan contract

Having analyzed the entrepreneur's investment policy for an exogenously given amount of funds, let us turn to the question of how much he can borrow when the capital allocation cannot be

contracted upon. Note that financiers can perfectly anticipate the incentive for the entrepreneur and may even observe capital allocation, although it throughout remains non-verifiable by a third party (a court).

We assume that the entrepreneur is to make a take-it-or-leave-it offer to financiers at $T=0$ and proposes both a loan size L^S and a repayment H^S . From our analysis so far, we are then able to specify the incentive-compatible, maximum enforceable repayment P^* as a function of the size of the loan L , which is implicitly defined by Eqs. (3) and (4) and for which comparative statics yield:

Lemma 3. *For $W > 0$ the maximum the entrepreneur can commit to paying (P^*) is strictly positive and a continuous and monotonously increasing function of the loan size L with*

$$\frac{\partial P^*}{\partial L} = \begin{cases} R' \left(\frac{1}{2} (L + W) \right) - R'(L + W - \bar{I}_1^S) + \beta_2 \in (\beta_2, \beta_1) & \text{for } \beta_1 > \beta_2, \\ \beta_1 & \text{for } \beta_1 = \beta_2. \end{cases} \quad (5)$$

Intuitively, as an increase in the loan volume allows the entrepreneur to accumulate more assets, and since assets' returns can be pledged only up to their liquidation value, any additional dollar lent to the entrepreneur increases the maximum enforceable repayment by the projects' marginal liquidation value. This value is at most as large as the marginal liquidation value β_1 of the most tangible assets but higher than that of the least tangible assets β_2 . Moreover, with $W > 0$ the maximum enforceable repayment is strictly positive since any investment has a positive liquidation value to be pledged even if investments are financed solely by internal funds.

From Lemma 3 and by taking into account the financiers' participation constraint (which defines the maximum size of the loan as a function of what financiers can extract from the entrepreneur), we can derive the unique optimum loan contract.

Proposition 2. *For $W < I_1^{\text{fb}} + I_2^{\text{fb}}$ there is a unique optimum loan contract given by a pair (L^S, H^S) such that $L^S = \min \{L^*, I_1^{\text{fb}} + I_2^{\text{fb}} - W\}$ and $H^S = \gamma L^S$ with L^* being the loan size, for which the associated maximum enforceable repayments (according to the entrepreneur's incentive constraint) cover exactly its opportunity costs (according to the financiers' participation constraint). The implied investments are then given by $I_n^S = \frac{1}{2}(L^S + W)$ for all $n = 1, 2$.*

Any loan larger than L^* is not feasible since this calls for higher repayments to financiers than the entrepreneur is able to commit to pay. Hence, when external funds required for first-best investments $(I_1^{\text{fb}} + I_2^{\text{fb}} - W)$ exceed the maximum loan size L^* , the borrowing constraint is binding. Consequently, a financially constrained entrepreneur raises a loan L^* and offers a repayment $H^S = \gamma L^*$, and he will invest symmetrically and will not renege on H^S afterward. On the other hand, when $I_1^{\text{fb}} + I_2^{\text{fb}} - W$ is smaller than L^* , the borrowing constraint is not binding and the entrepreneur raises a loan just to fill his financial gap.

Before turning to some further results of the model, it should be noted that it is indeed not crucial to assume that the MNC will not use loans for the alternative investment. Since there is underinvestment, the marginal return on either project is never lower than the marginal return on the alternative investment. Hence it is never worthwhile to use scarce funds for that purpose.

6. A comparison of transparency and opacity

Diversity and opacity have several implications for the investment behavior of firms. The most important ones concern the role of the entrepreneur's incentives for the strength of his borrowing

constraint. To fully understand these incentives, it is (in reminiscence of the Slutsky substitution and income effect) useful to distinguish clearly between changes in diversity and changes in the overall tangibility of assets. At first, we consider the incentive effects of mere changes in diversity, i.e. simultaneous changes in β_1 and β_2 such that the average liquidation proceeds $\beta_1 + \beta_2$ are constant.

Conclusion 1. *Internal funds required for first-best investments do not depend on the degree of diversity when the MNC is transparent, while they do increase according to the degree of diversity when the MNC is opaque.*

A transparent MNC that is able to pursue first-best investments can do so irrespective of how diverse it is. The reason for this can be traced back to the financiers' ability to control the internal allocation of funds as it implies that the only thing that matters is the overall liquidation value, which by definition does not change with diversity when investments are held at their first-best levels. Formally, W_{crit}^C as defined in Proposition 1 does not vary when $\beta_1 + \beta_2$ are constant. However, when the capital allocation is not verifiable, a higher degree of diversity creates additional incentives for the entrepreneur to invest strategically biased. In order to counteract this disincentive, financiers curtail credit, and an opaque MNC consequently needs more internal funds in order to invest first-best optimally when diversity becomes more of an issue. This result can be derived from applying comparative statics to Eqs. (3) and (4).

At second, we further consider allocative efficiency and how it is affected by country-specific changes in the liquidation value of assets. Comparative statics applied to Eqs. (3) and (4) and to the FOCs associated with Eq. (1) yields:

Conclusion 2. *Consider a financially constrained MNC.*

1. *When it is opaque, a lower liquidation value of assets further restricts investments in both countries by the same amount, no matter where assets lose in value. However, total investment will decrease more sharply when assets in country 2 lose in value.*
2. *When it is transparent, a deterioration of assets in country n leads to lower investment in that country, while the effect on investment in the other country is indeterminate. Total investment will fall if assets in country 1 lose in value, while its response to a devaluation of assets in country 2 is ambiguous.*

When financiers cannot control the capital allocation, changes in β_1 and β_2 have no effect on the relative allocation of funds across MNC subsidiaries and hence on allocative efficiency. This follows from Proposition 2, according to which the entrepreneur always invests symmetrically. But changes in β_1 and β_2 have both, direct and indirect effects on the financiers' willingness to lend. The direct effect is that any deterioration of assets has, ceteris paribus, an adverse effect on the entrepreneur's debt capacity because financiers then collect less from the entrepreneur in case he defaults. The indirect effect is that the associated changes in the degree of diversity influence the incentives for the entrepreneur to invest strategically biased. A lower β_1 implies a lower degree of diversity. Hence, incentives to invest strategically biased are reduced. But according to Conclusion 2, the direct effect strictly dominates. The negative overall impact of a lower β_2 is relatively straightforward as both, the incentive and the direct effect, work in the same direction in this case, which however also implies that the amount borrowed will decrease by even more than in the case of asset deteriorations occurring in country 1.

The result is, however, completely different when opacity does not hamper financial contracting. A devaluation of assets in country 1 (a lower β_1) implies that the entrepreneur tends to be less willing to deviate from efficient investment because the benefits of easing the borrowing

constraint by forgoing returns are not as large as before. As, in addition, financiers are anyway less inclined to lend out funds when assets deteriorate, investments in both countries become even more financially constrained. Consequently, total investment falls. On the other hand, a devaluation of assets in country 2 (a lower β_2) makes a less efficient allocation more attractive to the entrepreneur and he will therefore direct more funds towards the project where assets are more tangible. This will, at least partly, offset the decreased willingness of financiers to lend such that the total effect on the borrowing constraint and, therefore, on overall investment is not clear in this case.

The final important aspect we want to focus on refers to the effects of variations in internal funds on the relative capital allocation, which also differ depending on whether the entrepreneur is able to pursue a commitment policy or not:

Conclusion 3. *Declining internal funds imply that*

1. *when the MNC is financially constrained and opaque, the share of I_2^S in total investment does not change;*
2. *when the MNC is financially constrained and transparent, the share of I_2^C in total investment is likely to decrease particularly if*
 - a. *diversity ($\beta_1 - \beta_2$) is high,*
 - b. *average tangibility ($\beta_1 + \beta_2$) is high, and*
 - c. *marginal opportunity costs of funds (γ) are low.*

According to the first part of Conclusion 3, changes in internal funds have no effects on the relative capital allocation when the entrepreneur cannot commit to any investment policy. Again, as we already know from Proposition 2, contracts will in this case always be designed so that the entrepreneur invests symmetrically. Therefore, variations in internal funds do not affect the relative distribution of funds at all but only total investment spending.

The second part basically follows from comparative statics applied to the FOCs associated with Eq. (1). Intuitively, a high average tangibility in combination with a high degree of diversity and relatively low marginal opportunity costs of funds implies that the banker can extract comparatively much given that the entrepreneur has invested most of his funds in highly tangible assets. On the flip side, the banker can extract only little when funds have been invested in the country where asset tangibility causes much concern. Hence, the banker substantially eases the financial constraint when the entrepreneur reduces investment in that country where asset tangibility is worst. As this reallocation absorbs most of the initial impact of a tightening of the borrowing constraint, the entrepreneur's optimum response to declining internal funds is to reduce the share of investment in assets that are of low value to financiers.

7. Discussion

Altogether, the model has three important empirical implications. In a nutshell, the model predicts that opaque MNCs suffer from tighter borrowing constraints and exhibit a stronger credit multiplier than their transparent counterparts. Additionally, the model also gives reasons for why the overall value of assets to financiers and the amount of funds lent out to the entrepreneur should be considered interdependent when the allocation of resources is verifiable.

To begin with, Conclusion 1 implies that for a given degree of diversity internal funds required for first-best investments are higher in the case of opacity than in the case of transparency. Basically, opacity forms an additional obstacle for financiers to collect loans. Any repayment

obligation that would satisfy financiers of a transparent MNC means that headquarters of an opaque MNC still has incentive to invest strategically biased. But when relatively more funds are invested into the country with lower asset tangibility, financiers would not be able to extract sufficiently high repayments from the entrepreneur during the course of debt renegotiations. Consequently, they are *ex ante* not willing to provide enough funds required for first-best investments although they would if allocation was controllable.

The next main empirical implication refers to the workings of a credit multiplier, which relates a company's internal funds to its total debt capacity. Its basic mechanism is simple. When firms invest own funds or cash flow into pledgeable assets, these assets can be used as collateral for further borrowing that allows for additional investment. The more tangible a company's assets are, the stronger is the implied cash flow sensitivity of investment.⁷ Our theory of corporate investment and diversity in terms of asset tangibility, however, puts this relationship into a new perspective. Although a company's debt capacity is always smaller when financiers additionally suffer from opacity, the credit multiplier of an opaque firm is higher than for a transparent firm. The reason is the following. When internal funds increase, a transparent company increases the share of assets that are less tangible in its production plan in order to reduce allocative inefficiencies. This has a dampening impact on its debt capacity, as financiers do not favor this new allocation. For an opaque company, however, disincentives to invest strategically biased are mitigated when internal funds increase. As financiers will honor this behavior, the credit multiplier is comparatively strong.

The third implication is that asset tangibility and the borrowing constraint should be considered as interdependent. Typically, asset tangibility is seen to be an exogenous variable that determines the debt capacity of a firm. But a transparent company's average degree of tangibility also increases when its borrowing constraint tightens for some exogenous reason. This is because headquarters then seeks to ease its financing restriction by committing to invest relatively more into highly tangible assets. On the other hand, as an opaque MNC always invests symmetrically, there is no such feedback from the borrowing constraint to the ratio of the value of tangible assets to total assets.

Given that theoretical considerations regarding credit constraints and capital allocation within MNCs are rare, the predictions of our model have not been directly tested yet. But there are some empirical results that point to the interaction between external borrowing and internal allocation—and even to the role of asset tangibility—that are at least consistent with our model results. To begin with, [Desai et al. \(2004\)](#) find that for affiliates of U.S. MNCs the ratio of tangible assets to total assets has a positive and significant coefficient in explaining parent borrowing but is insignificant in explaining external finance. In the light of our model, this finding is well reasoned. When capital allocation is contractible, a subsidiary with less valuable assets will not necessarily have less external finance when headquarters is anyway bound to direct resources via the company's internal capital market to those places where tangibility is higher.⁸

But perfectly transparent companies with higher degrees of diversity in terms of asset tangibility should actually borrow more from external sources and have thus higher total investment than their less diverse counterparts. Although [Desai et al. \(2004\)](#) do not address this issue explicitly, their results indicate that only imperfect bonding mechanisms apply to U.S. MNCs. The notion that bonding is not perfect for U.S. companies would be consistent with

⁷ The cash flow sensitivity of investment for conglomerates is studied by, e.g. [Shin and Park \(1999\)](#).

⁸ In addition, [Desai, Foley and Forbes \(in press\)](#) show that affiliates of U.S. MNCs in emerging markets – as opposed to local firms – use cross-border internal capital markets to capitalize on the competitiveness benefits of large currency depreciations. This pattern indicates that U.S. MNCs are, at least to some extent, able to pledge their highly tangible assets for investment in countries where collateral damages as a result of exchange rate changes.

further evidence of global diversification contributing to valuation discounts in addition to industrial diversification (Denis et al., 2002, see also Doukas and Pantzalis, 2003).

But according to theory, international diversification should have less adverse effects on the value of multinationals headquartered in countries where stronger bonding mechanisms are available. Evidence provided by Fauver et al. (2004) supports this view. These authors show that MNCs headquartered in Germany or in the UK exhibit lower valuation discounts than those from the U.S. In the light of our model, German companies are often firmly tied to banks that are able to closely monitor capital expenditures. Hence, German firms can be considered to be less opaque such that additional costs of global diversification, which may stem from incentives to invest strategically biased, are rather small. As regards differences between MNCs headquartered in the UK and in the U.S., the U.S. bankruptcy rules are often considered to favor the failing company in order to get it back in business, while the British rules are more concerned with creditors to get their money back. This institutional difference indicates that verifying the allocation of resources could be easier in the UK, which gives reasons for higher valuation discounts due to global diversification in the U.S.

Further supportive evidence for the model can be found by looking at the Japanese banking crisis in the 1990s. Klein et al. (2002) show that Japanese MNCs were not able to offset the decreasing supply of bank loans at home by raising additional funds in the U.S. From the model's perspective, the Japanese banking crisis was associated with enormous collateral devaluations in Japan. Hence, the degree of diversity increased considerably. As it is reasonable to posit that U.S. investors judge Japanese MNCs as fairly opaque, they had to face the additional risk that funds provided to U.S. affiliates would then be shifted to Japan. The willingness to provide external finance further diminished as, during the course of the deep Japanese recession, falling internal funds further amplified the adverse incentive effect of diversity.

8. Concluding remarks

In this paper we have developed a theory of corporate investment based on the notion of diversity in asset tangibility. Firms that are opaque to financiers can, in principle, conceal how they allocate funds internally. When, in addition, their subsidiaries differ with respect to tangibility, headquarters has an incentive to favor subsidiaries in those countries where the degree of tangibility is lowest. On the other hand, firms that are transparent concerning the internal capital allocation are able to commit to investing predominantly in countries where financiers will yield higher liquidation proceeds.

Our basic argument can, in principle, be applied to a broader set of questions, e.g. what implications do diversity and opacity of conglomerates have for macroeconomic issues such as the international transmission of business cycles, growth, and the effects of financial crisis. Although experiences with the Japanese banking crisis and the East Asian currency crisis have already been suggestive, a deeper analysis of these and related questions is arguably worthy of further research.

References

- Almeida, H., Campello, M., in press. Financial constraints, asset tangibility, and corporate investment. *Review of Financial Studies*.
- Bolton, P., Scharfstein, D.S., 1990. A theory of predation based on agency problems in financial contracting. *The American Economic Review* 80 (1), 93–106.
- Brusco, S., Panunzi, F., 2005. Reallocation of corporate resources and managerial incentives in internal capital markets. *European Economic Review* 49 (3), 659–681.

- Campello, M., 2006. Debt financing: does it boost or hurt performance in product markets? *Journal of Financial Economics* 82 (1), 135–172.
- Denis, D.J., Denis, D.K., Yost, K., 2002. Global diversification, industrial diversification, and firm value. *The Journal of Finance* 57 (5), 1951–1979.
- Desai, M.A., Foley, F.C., Forbes, K.J., in press. Financial constraints and growth: multinational and local firm responses to currency depreciations. *Review of Financial Studies*.
- Desai, M.A., Foley, F.C., Hines, J.R., 2004. A multinational perspective on capital structure choice and internal capital markets. *The Journal of Finance* 59 (6), 2451–2487.
- Diamond, D.W., Rajan, R.G., 2000. A theory of bank capital. *The Journal of Finance* 55 (6), 2431–2465.
- Diamond, D.W., Rajan, R.G., 2001. Liquidity risk, liquidity creation, and financial fragility: a theory of banking. *Journal of Political Economy* 109 (2), 287–327.
- Doukas, J.A., Pantzalis, C., 2003. Geographic diversification and agency costs of debt of multinational firms. *Journal of Corporate Finance* 9 (1), 59–92.
- Fauver, L., Houston, J.F., Naranjo, A., 2004. Cross-country evidence on the value of corporate industrial and international diversification. *Journal of Corporate Finance* 10 (5), 729–752.
- Gertner, R.H., Scharfstein, D.S., Stein, J.C., 1994. Internal versus external capital markets. *The Quarterly Journal of Economics* 109 (4), 1211–1230.
- Hart, O.D., Moore, J., 1994. A theory of debt based on the inalienability of human capital. *The Quarterly Journal of Economics* 109 (4), 841–879.
- Hart, O.D., Moore, J., 1998. Default and renegotiation: a dynamic model of debt. *The Quarterly Journal of Economics* 113 (1), 1–41.
- Inderst, R., Müller, H.M., 2003. Internal versus external financing: an optimal contracting approach. *The Journal of Finance* 58 (3), 1033–1062.
- Kiyotaki, N., Moore, J., 1997. Credit cycles. *Journal of Political Economy* 105 (2), 211–248.
- Klein, M.W., Peek, J., Rosengren, E.S., 2002. Troubled banks, impaired foreign direct investment: the role of relative access to credit. *The American Economic Review* 92 (3), 664–682.
- Lang, L., Stulz, R., 1994. Tobin's q , corporate diversification, and firm performance. *Journal of Political Economy* 102 (6), 1248–1280.
- Martin, J.D., Sayrak, A., 2003. Corporate diversification and shareholder value: a survey of recent literature. *Journal of Corporate Finance* 9 (1), 37–57.
- McNeil, C.R., Moore, W.T., 2005. Dismantling internal capital markets via spinoff: effects on capital allocation efficiency and firm valuation. *Journal of Corporate Finance* 11 (2), 253–275.
- Rajan, R.G., Servaes, H., Zingales, L., 2000. The cost of diversity: the diversification discount and inefficient investment. *The Journal of Finance* 55 (1), 35–80.
- Scharfstein, D.S., Stein, J.C., 2000. The dark side of internal capital markets: divisional rent-seeking and inefficient investment. *The Journal of Finance* 55 (6), 2537–2564.
- Shin, H.-H., Park, Y.S., 1999. Financing constraints and internal capital markets: evidence from Korean 'chaebols'. *Journal of Corporate Finance* 5 (2), 169–191.
- Shleifer, A., Vishny, R.W., 1997. A survey of corporate governance. *The Journal of Finance* 52 (2), 737–783.
- Stein, J.C., 1997. Internal capital markets and the competition for corporate resources. *The Journal of Finance* 52 (1), 111–133.
- Stein, J.C., 2002. Information production and capital allocation: decentralized versus hierarchical firms. *The Journal of Finance* 57 (5), 1891–1921.
- Stein, J.C., 2003. Agency, information, and corporate investment. In: Constantinides, G.M., Harris, M., Stulz, R.M. (Eds.), *Handbook of the Economics of Finance*, vol. 1A. North-Holland, Amsterdam, pp. 111–165.
- Stowe, J.D., Xing, X., 2006. Can growth opportunities explain the diversification discount? *Journal of Corporate Finance* 12 (4), 783–796.