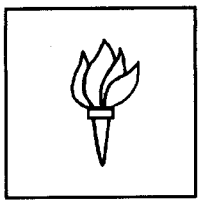

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Investment Opportunities and the Design of Debt Securities.

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Abstract

We investigate whether convertibility provisions and restrictive covenants operate as substitute methods for reducing agency costs of debt. In a study of 192 recent debt issues, we find that an issuer's investment opportunities are negatively related to the presence of covenants and positively associated with the incidence of convertibility. We also document a negative relation between covenants and convertibility after controlling for investment opportunities. The results support an interpretation that covenants impose costs by limiting managers' choices, leading firms that value managerial flexibility to prefer convertibility provisions as a method of reducing the agency costs of debt.

Investment Opportunities and the Design of Debt Securities

Marcel Kahan and David Yermack*

1. Introduction

A company pursuing valuable investment opportunities finances its projects through some combination of debt and equity. Because of imperfect information and the costs of writing contracts, a company can lower its cost of financing by designing debt and equity securities in an efficient way. For debt securities, the bundle of rights given to lenders often includes covenants, which restrict the issuer's operating and financial policies, and also rights to convert the debt into equity. Further, convertibility provisions are often attached to call options retained by the issuing company, allowing the company to buy back the bonds after a period of time.

In this paper, we propose and test theories about these features of debt contracts and an issuing company's investment opportunity set. We argue that restrictive covenants and convertibility provisions function as substitute devices for reducing the agency costs of debt, and that an important purpose of convertible debt is the avoidance of covenants. Many covenants limit managers' choices about investment and operating policy, and this loss of flexibility could

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impose large indirect costs upon firms with growth opportunities. We therefore conjecture that investment opportunities influence firms to eliminate covenants from their debt contracts and instead use convertibility provisions to limit the agency costs of debt.

We test our theories empirically using a sample of 192 corporate bonds issued by U.S. companies in 1993 and 1994. We find that the incidence of restrictive covenants depends negatively upon investment opportunities, while the presence of convertibility provisions has positive associations with investment opportunities. The negative relation between investment opportunities and covenants is present as well among non-convertible bonds. Further, we find a negative association between covenants and convertibility after controlling for the presence of investment opportunities. This implies that covenants and convertibility are used as substitute, rather than complementary, mechanisms for reducing agency costs in debt contracts.

Our findings are consistent with prior empirical research that has found links between investment opportunities and the presence of convertibility provisions. Our findings represent an extension of these studies because we control directly for the credit quality of the issuing company. Moreover, our theories about the substitute use of covenants and convertibility permit a more complete explanation of the high incidence of convertible debt issued by growth-oriented firms.

We present further results that extend the empirical literature on security design, showing that convertible debt is more likely than straight debt to be callable by the issuing company, and that the terms of call options in convertible debt are unusually favorable to the issuer. These findings support Stein's (1992) theory about the importance of attaching call options to convertible debt.

The remaining sections of this paper are organized as follows. Section 2 contains a review of the literature on investment opportunities and security design, and develops specific hypotheses for testing. Section 3 describes the data set. Section 4 presents our empirical analysis of how covenants, convertibility, and call provisions are related to investment opportunities and to one another. Section 5 contains conclusions.

2. Literature review and hypothesis development

Numerous authors have identified conflicts between debtholders and equityholders as the rationale for attaching covenants, convertibility, and call provisions to debt securities. These augmentations of standard debt contracts can reduce the likelihood of a firm's investment policy being manipulated to benefit equityholders at the expense of debtholders. The following passages review existing theories of how growth opportunities, convertibility, covenants, and call provisions are related to each other, and develop empirical hypotheses for testing these theories.

2.1. Convertibility and investment opportunities

Jensen and Meckling (1976) recognize that equityholders in a levered firm may invest in risky projects with high probabilities of extreme outcomes, since the benefits of this strategy would mainly accrue to equityholders while the costs would mainly fall upon debtholders. Firms with low credit quality (e.g., those with high-risk debt) appear to have the greatest incentives to undertake this asset substitution, possibly violating the optimal investment strategy of accepting only positive NPV projects. The problem can be mitigated by making debt securities convertible into shares of common stock, since convertibility will require equityholders to share their gains

with debtholders. Haugen and Senbet (1981) present a model with these implications, while Green (1984), John and John (1993), and others develop related models that show convertibility provisions reducing investment-related agency costs of debt.

The model of Stein (1992) offers a different rationale for convertible debt. Stein's theory follows the argument of Myers (1977) that equityholders in firms with risky debt will under-invest in positive NPV projects, since most of the gains would lead to increases in the value of debt rather than equity. This theory implies that low-quality firms (those with risky debt issues) that have valuable investment opportunities should finance themselves with equity rather than debt. However, firms with attractive investment opportunities may face prohibitive costs when attempting to raise equity in the public markets, due to the information asymmetries identified by Myers and Majluf (1984). Therefore, Stein argues that low-quality firms with investment opportunities will issue convertible debt in expectation of converting it into equity if investments succeed. He thus characterizes convertible debt as a "backdoor" source of equity.

The key empirical prediction of Stein's model is consistent with Jensen and Meckling's (1976) analysis of asset substitution: Convertible debt should be issued by low-quality firms that have investment opportunities. Among empirical papers, unpublished investigations by Mikkelson (1980) and Essig (1991) have found positive associations between the incidence of convertibility and variables serving as proxies for investment opportunities, including research and development (r & d) spending, capital expenditures, and the fraction of a firm's assets that are intangible. These studies, however, do not control for the credit quality of the issuer's debt when testing whether convertibility and growth opportunities are related. Further, Essig uses as an independent variable the fraction of convertible debt already present in a firm's capital

structure, which may be more related to past than to existing growth opportunities.

In our analysis of convertibility provisions, we expect to strengthen the empirical support for the predictions of Jensen and Meckling (1976) and Stein (1992) when we test the hypothesis:

> *H1(a): Among firms with equivalent credit quality, bonds are more likely to have convertibility provisions if the issuer has a large investment opportunity set.*

A variant of this hypothesis states that funds raised through convertible issues are especially likely to be used for financing capital investment:

> *H1(b): Among firms with equivalent credit quality, convertible bonds are more likely than ordinary bonds to serve as sources of funds for capital investment.*

2.2. Covenants and investment opportunities

Restrictive covenants have not received the same attention as convertibility provisions in the literature on how to resolve agency costs of debt. Smith and Warner (1979) describe in general terms the role of covenants in resolving debtholder-shareholder conflicts in areas such as investment policy, dividend policy, and sales of assets. An empirical study by Malitz (1986) finds an inverse relation between company size and the incidence of covenants, which she interprets as evidence that more covenants are included in debt contracts when investors lack information about a firm's investment opportunities. However, this interpretation has not been followed in the literature, as company size is rarely cited as a measure of growth opportunities. Long, Malitz, and Sefcik (1994) find that convertible bonds contain fewer covenants against the further issuance of debt than ordinary bonds, and they find no statistically significant difference in dividend covenants. They do not offer a theoretical rationale for these patterns.

We conjecture that growth opportunities play an important role in determining the presence of covenants in bond issues. Covenants restrict managerial discretion over future financing and investment decisions. If set too tightly, covenants may prevent managers from taking actions that increase the value of the firm. For example, covenants limiting the total debt or the amount of secured debt a company can issue may impair managers' ability to finance valuable investment opportunities; covenants restricting investment choices and transactions with affiliates may inhibit the ability of companies to exploit such opportunities; and sale of asset covenants could limit both the financing and investment flexibility of the company. (These covenants are briefly described below.)

We expect less use of covenants in bonds issued by companies with growth opportunities, because the need for managers to retain discretion over financing and investment decisions is especially great in growth-oriented firms. One rationale for this hypothesis is that managers of growth firms have an unusually large degree of private information about investment opportunities (see, e.g., the model of Holmström and Ricart i Costa, 1986). This specific knowledge increases the difficulty of writing contracts that specify *ex ante* what actions managers should take. Moreover, the presence of attractive investment opportunities may itself reduce the need for restrictive covenants, as managers should rationally pursue positive NPV projects instead of devoting their efforts to exploiting bondholders through such actions as asset substitution or excessive dividends. We thus expect fewer, and less tight, covenants in firms with valuable growth opportunities. We test the following hypotheses:

> *H2(a): Among firms with equivalent credit quality, bonds should have fewer covenants if the issuer has a large investment opportunity set.*

H2(b): Among firms with equivalent credit quality, the parameters of bond covenants should be set less tightly if the issuer has a large investment opportunity set.

2.3. Covenants and convertibility

The passages above argue that growth opportunities have great influence on the design of debt securities. Other authors have come to this conclusion, including Barclay and Smith (1990), who examine the relation between the maturity structure of debt and growth opportunities, and Smith and Watts (1992), who study associations between growth opportunities and a wide range of corporate financing choices. Our theories imply that one should observe an inverse association between growth opportunities and the use of covenants in debt contracts, as well as a positive association between growth opportunities and convertibility provisions. Together, these patterns would predict a negative empirical relation between the presence of covenants and convertibility provisions, due to the influence of growth opportunities on each variable.

We believe an inverse association will exist between convertibility and covenants, regardless of the importance of growth opportunities. These two devices for reducing agency costs should function as substitutes for one another under many conditions, with the presence of one contract term implying a reduced need for the other. The valuable rights delegated to holders of convertible debt should reduce the need for covenants that restrict bad behavior by managers in any setting, regardless of the presence of growth opportunities. Similarly, any company objecting to loss of managerial flexibility connected with covenants can propose convertibility as an alternative method of mitigating debt-related agency problems. We therefore predict that a substitute rather than complementary relationship exists between convertibility provisions and

restrictive covenants, independent of the importance of growth opportunities. We test the hypotheses:

H3(a): Among firms with equivalent credit quality and growth opportunities, convertible bonds should have fewer covenants than ordinary bonds.

H3(b): Among firms with equivalent credit quality and growth opportunities, the parameters of bond covenants should be set less tightly if a bond is convertible.

If we do find an inverse association between covenants and convertibility after controlling for growth opportunities, the result would cloud our interpretation of inverse associations found between growth opportunities and either covenants or convertibility. Therefore, we must strengthen our tests of these associations by controlling for the substitute relation that we may find between covenants and convertibility. To do this, we segment our sample of debt issues into convertible and non-convertible subsamples. We test the hypotheses:

H4(a): Convertible bonds should have fewer covenants if the issuer has a large investment opportunity set.

H4(b): Non-convertible bonds should have fewer covenants if the issuer has a large investment opportunity set.

H4(c): The parameters of covenants in convertible bonds should be set less tightly if the issuer has a large investment opportunity set.

H4(d): The parameters of covenants in non-convertible bonds should be set less tightly if the issuer has a large investment opportunity set.

2.4. Call provisions in convertible debt

Stein (1992) predicts that convertible debt issued by firms with growth opportunities will be attached to call options, which enable equityholders to force conversion of the debt into equity

after a modest amount of time should a project prove successful.[1] The call options are necessary for convertible debt to serve as a solution to the debt overhang problem, since equityholders might be discouraged from pursuing risky investments if convertible debtholders were slow to convert their bonds into stock. To our knowledge, Stein's hypothesis about the attachment of call provisions to convertible bonds remains untested:

> *H5(a): Call provisions are more likely to appear in convertible bonds than ordinary bonds.*

Within the universe of convertible bonds, the hypothesis should hold with increasing strength as the size of the investment opportunity set grows:

> *H5(b): Convertible bonds are more likely to include call provisions if the issuer has a large investment opportunity set.*

A further implication of Stein's theory is that the call provisions attached to convertible bonds should be especially easy for the issuing company to exercise, and that this relationship should strengthen in the presence of valuable growth opportunities:

> *H5(c): Call provisions should be exercisable within a shorter period of time, and at lower premiums over face value, if they appear in convertible bonds rather than ordinary bonds.*

> *H5(d): Call provisions in convertible bonds should be exercisable within a shorter period of time, and at lower premiums over face value, if the issuer has a large investment opportunity set.*

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[1] Related models with somewhat different implications for the presence of call provisions appear in Brennan and Kraus (1987) and Constantinides and Grundy (1989).

3. Sample selection and data description

To test our theories about the interaction between investment opportunities and security design, we use Moody's *Annual Bond Record* to construct a sample of all convertible bonds issued by public U.S. companies in 1993 and 1994, as well as a control sample with the same distribution of issue years and credit ratings. We exclude all secured or guaranteed bond issues, private placements, and bonds issued by closed-end mutual funds.

Our sample screen yields 64 convertible debt issues, 44 in 1993 and 20 in 1994. We obtain data about each issue from the prospectus filed with the SEC. Table 1 presents descriptive statistics for our sample of convertible bonds. Consistent with the theories discussed above, we find that most convertible bonds are issued by companies with low credit ratings: 54 issues, or 84% of the sample, are rated by Moody's as Ba or lower, implying below-investment grade or "junk" status.

We construct a parallel sample of non-convertible bonds by selecting at random two non-convertible public debt issues with the same credit rating and year of issue as each convertible bond. We use all non-convertible bonds listed by Moody's as the universe for our control sample, again excluding those which are secured, guaranteed, private placements, or issued by foreign or non-public companies, as well as companies that also issued convertible bonds in the same year. We also exclude a small number of straight debt issues with maturity of less than five years. Those companies with multiple issues of straight debt are limited to one appearance in each year of the control sample (we choose one issue at random from such companies). We match on credit rating in an attempt to eliminate as many differences as possible between our subsamples that are related to issuer quality rather than investment opportunities. We match on

issue year to control for the impact of macroeconomic variables, and also to control for any developing trends in the structure of debt contracts.

For both our convertible and non-convertible subsamples, we collect data for six types of restrictive covenants:

Debt: These covenants limit the company's ability to issue new debt.

Secured debt: These covenants limit the company's ability to issue secured debt.

Investment: These covenants restrict the types of investments the company is permitted to make.

Sale of assets: These covenants require the company to use the proceeds of certain asset sales to make an offer to repurchase the bonds.

Affiliate transactions: These covenants restrict the ability of the company to engage in transactions with non wholly-owned subsidiaries, controlling shareholders, or sister companies.

Restricted payments: These covenants limit dividends and share repurchases. Usually the limitation follows a standard formula, with aggregate payments over the life of the bond capped at a fixed dollar amount (the "initial reservoir") plus a certain fraction of future net income.

We construct (0, 1) dummy variables for the presence of each type of covenant in each bond issue. We collect data about the terms of restricted payment covenants in order to test hypotheses about how tightly covenants are set. We also collect information about call provisions for those bonds to which they are attached.

Table 1 presents descriptive statistics for the sample of convertible bonds alongside those for the control sample. No significant differences exist in the industry distribution or average firm size across the two groups of companies. Bonds in the two sub-samples also have very similar maturities and value of proceeds.

Convertible issues on average represent a far greater fraction of the issuing companies' prior long-term debt. Moreover, companies issuing convertible bonds have a lower dividend yield than the control sample, although the difference is not quite statistically significant (t-statistic = 1.54). These characteristics are consistent with convertible issuers also having higher growth opportunities. Companies with growth opportunities should have been expected to avoid prior debt issues because of the Myers (1977) debt overhang problem. These companies should also have lower current earnings relative to their share price and want to retain a greater fraction of their earnings, both of which would imply a lower dividend yield.

We gather data on whether our sample companies have issued other public debt prior to the issue included in our sample, using bond rating guides published by Moody's and Standard & Poor's. We find that companies issuing convertible debt have significantly less publicly traded debt (as a fraction of total assets) and are significantly more likely to have no other public debt outstanding, compared to issuers of non-convertible debt. These patterns appear to support our theory that managerial flexibility serves as an important motive for issuing convertible debt. One element of debt contracts that affects managerial flexibility is the ability to renegotiate or waive contract terms, and prior studies have found that public debt is far more difficult to renegotiate than privately placed debt (see, e.g., Gilson, John, and Lang, 1990) due to the larger number of lenders involved. Since we expect our sample of convertible debt issuers to include companies that place a high value upon managerial flexibility, we should expect that these firms in the past have avoided issuing public debt.

4. Empirical results

The following sections present empirical tests of our hypotheses about debt contracts. Section 4.1 explores the association between convertibility provisions and investment opportunities. In section 4.2 we test theories about how restrictive covenants are related to growth opportunities. Section 4.3 contains tests for an inverse association between covenants and convertibility after controlling for growth opportunities. Section 4.4 explores the sensitivity of our key results to our choice of variables for measuring growth opportunities. Section 4.5 investigates associations between call provisions, convertibility and growth opportunities.

4.1. Convertibility and investment opportunities

The backdoor equity model of Stein (1992) and the research of others cited above predicts a positive association between investment opportunities and the incidence of convertibility in debt securities. A straightforward test of this relationship should come from examining companies' stated intentions for the use of proceeds from debt issues. Table 2 presents this information for all convertible and non-convertible bonds in our sample. The intended use of proceeds appears in the prospectus for each issue. We assign company responses to three broad categories: (1) refinancing of existing debt issues; (2) capital investment; and (3) general corporate purposes, including additions to working capital. Because most firms report more than one intended use of proceeds, totals in each column do not add to 100%.

Table 2 indicates that issuers of convertible debt are significantly more likely than straight debt issuers to earmark the proceeds for capital investment. A correspondingly greater fraction of straight debt issuers state that they will use the funds for refinancing. This pattern

supports the hypothesis of a positive association between investment opportunities and the inclusion of convertibility in debt contracts.

Table 3 presents results of a probit regression model used to test the same hypothesis. For the entire sample of 192 debt issues, we estimate a model with the binary dependent variable equal to one if a debt issue is convertible. Explanatory variables are firm size (the log of total assets), leverage in the firm's capital structure before the debt issue (total debt over total assets), and r & d expenditures over sales, a variable commonly used to proxy for the presence of growth opportunities. Financial statement data is obtained from Compustat, and balance sheet items are measured at the start of the fiscal year in which the debt issue occurs. Missing values for r & d expense are assumed to equal zero, although the results in Table 3 are qualitatively unaffected if these observations are deleted instead.

Coefficient estimates for the probit model indicate a positive and significant association between the likelihood that a bond is convertible and the intensity of a firm's r & d spending. The result increases in significance after including industry dummy variables in the model, as shown by the estimates in the right column of Table 3. We interpret these results as further evidence that firms with investment opportunities are more likely to include convertibility provisions in their debt contracts.

Other estimates in Table 3 indicate that convertible debt is more likely to be issued by smaller companies, and by companies with relatively low amounts of leverage. Our finding of an inverse connection between leverage and convertibility contradicts earlier research by Mikkelson (1980) and Essig (1991). A major difference between our study and theirs concerns the composition of the sample; by design our convertible and straight debt issues have the same

distribution of credit ratings, where no such controls appear to be present in either the Mikkelson or Essig samples. Because firms with low credit ratings are especially likely to issue convertible debt, and because high leverage is a major cause of low credit ratings, the findings of Mikkelson and Essig of a positive association between leverage and convertibility may actually reflect the tendency of firms with low credit quality to issue convertible debt. Because our sample includes an equal distribution of credit ratings for convertible and non-convertible issuers, the negative relation we find between leverage and convertibility may reflect the importance of investment opportunities in establishing a firm's credit quality. Companies with high growth opportunities probably have less stable and predictable cash flows and more intangible assets than other firms. To achieve the same credit rating, these firms may have to be less leveraged than firms without a high-growth orientation.

4.2. Covenants and investment opportunities

In Section 2.2. above, we detailed reasons why restrictive covenants may be inefficient or unnecessary in firms with growth opportunities, and we conjectured that, for such companies, convertibility provisions serve as an attractive alternative for controlling agency costs of debt. We therefore predict that companies with valuable investment opportunities will be less likely to issue debt with restrictive covenants and, to the extent they issue securities with covenants, such covenants will be set less tightly.

To examine the relation between growth opportunities and covenants, we estimate a series of probit models similar to the model in Table 3. The dependent variable for each model is the presence of one of the six covenants that we analyze. Explanatory variables include firm

size, leverage, industry dummies, and r & d expense over sales as a proxy for investment opportunities. Results are summarized in the first column of Table 4, which shows the sign and significance of the estimated coefficient for the r & d variable in each model. As predicted, we find a markedly negative association between investment opportunities, as measured by r & d over sales, and the incidence of covenants in all six cases when our probit regressions are estimated over the entire sample of 192 debt issues.

It is possible that the positive association between investment opportunities and convertibility provisions accounts for these findings, since we argue elsewhere in this paper that an inverse association exists between covenants and convertibility provisions, independent of the level of growth opportunities. To add robustness to our tests of the association between covenants and growth opportunities, we therefore delete all convertible bonds from the sample and reestimate our regressions over the sample of 128 straight debt issues. The second column of Table 4 presents the results. We continue to find a negative and significant relation with growth opportunities for five of the six covenants. The absence of a significant result for the covenant limiting secured debt is likely due to the lack of variability in the data, as this covenant is present in 95% of the non-convertible bonds in our study. Our results appear to confirm that a negative association exists between growth opportunities and covenants exists independent of the influence of convertibility provisions on the presence of covenants. (We do not repeat the analysis for convertible bonds, because these bonds have a paucity of covenants as shown by table 5 and discussed in the following section.)

An implication of our main hypothesis is that an inverse association should exist between the tightness of covenants and the size of investment opportunities. The restricted payment

covenant provides a convenient means of testing this further hypothesis, since this covenant contains standard numerical terms that can be compared across issues. Most restricted payment covenants limit future dividends and share repurchases according to a formula comprised of a fixed dollar amount (the initial reservoir) plus a percentage of subsequent net income. We find that the percentage of net income is almost invariant across issues -- of the 89 bonds in our sample with restricted payment covenants, 83 issues permitted the use of 50% of net income for restricted payments -- so we do not conduct tests of the variation of this covenant term. However, the size of the initial reservoir of funds varies considerably across companies, and we conduct tests to see whether the reservoir is more or less restrictive when the investment opportunity set is large.

We form two dependent variables by dividing the restricted payment reservoir by net income and by total assets. We run OLS regressions of these two variables against firm size, leverage, one-digit SIC industry dummy variables, and our measure of growth opportunities, r & d expense over sales. Consistent with our predictions and with the results on covenant incidence, we find a positive association between growth opportunities, as measured by r & d over sales, and both measures of the relative size of the restricted payment reservoir, with results significant below the 5% level. These results are consistent with the covenant being set less tightly for firms with high growth opportunities.

4.3. Covenants and convertibility

We predict that firms use covenants and convertibility as substitute, rather than complementary, devices for controlling the agency costs of debt. We expect to find an inverse

association between covenants and convertibility after controlling for the size of investment opportunities.

An elementary test of this hypothesis appears in Table 5, which describes the incidence of six types of covenants in our two subsamples of debt issues. An overwhelming difference in the likelihood of covenant use is apparent between the convertible and non-convertible groups, with a clear majority of most straight debt issues containing covenants compared to only a small handful of convertible issues. These data are consistent with our hypothesis that debt issues with covenants are not likely to be convertible, and vice versa.

We test this relation further by reestimating the probit model of Table 4 and adding as an explanatory variable a (0, 1) dummy variable indicating the presence of a convertibility provision. Our measure of growth opportunities, r & d expense over sales, remains in the model as a control variable. Table 6 presents the results for five probit regressions using our covenant dummy variables as dependent variables. Regressions are not estimated for the sixth covenant, provisions restricting asset sales, because this covenant does not appear in any of the convertible issues. Table 6 shows the sign and significance of estimates for both the convertibility dummy variable and r & d over sales growth opportunity variable. As expected, the estimated coefficient for convertibility is negative and highly significant in all five cases, and the estimated coefficient for the r & d variable is negative and significant for four of the five covenants. These results indicate that convertibility exerts an influence on the presence of covenants that is independent of the effect of growth opportunities. Moreover, even after controlling for convertibility, an inverse association remains evident between growth opportunities and the presence of covenants. We conclude that the evidence supports our hypothesis that companies using covenants in their debt

contracts are unlikely also to include convertibility provisions, and vice versa, regardless of the importance of growth opportunities for security design choices.

Given the virtual absence of restricted payment covenants in the convertible sample, our hypotheses that convertible bonds contain less tight covenants cannot be reliably tested.

4.4. Alternative measure of investment opportunities

Using research & development expenditures as a proxy for a company's investment opportunities, we have found evidence that convertibility provisions in debt contracts are positively associated with growth opportunities and that restrictive covenants are less likely to appear in debt contracts when the issuer has growth opportunities. The negative relation between covenants and growth opportunities also holds after controlling for the presence of convertibility. We test the robustness of these results to the use of an alternative proxy for investment opportunities, the ratio of a firm's market value over book value, which is an approximation of Tobin's Q. We construct our measure of Tobin's Q by dividing the market value of common stock, plus the book value of preferred stock and total liabilities, over the book value of total assets. We reestimate our probit models for the incidence of convertibility provisions and covenants, using this approximation of Tobin's Q in place of the r & d over sales variable. As shown in the second column of Table 7, our range of results for covenants is mostly supported in this alternative model, but we no longer find a significant association between investment opportunities and convertibility provisions.

4.5. Call provisions in convertible debt

Following Stein (1992), we expect convertible bonds to include a disproportionately large incidence of call provisions. Firms issuing convertible debt may have the underlying goal of adding equity to their capital structures, and call provisions can enable the issuer to force debtholders to convert their securities into equity in a timely way. Our related hypotheses are that callable, convertible debt will have more generous terms from the issuer's viewpoint for both the time until the debt may first be called, and the premium of the call price over face value, so that the call provisions are relatively easy for the issuer to exercise.

Table 8 presents sample means for the incidence of call provisions, the time at which call options may first be exercised, and the average exercise price on the first permissible call date (as a percentage of each bond's face value). As predicted, convertible debt is significantly more likely than straight debt to include call provisions; our finding that 94% of convertible issues in 1993 and 1994 were callable agrees strongly with Stein's hypothesis about the association of these two contract terms. Our further hypotheses are also supported by the data in Table 8, as callable debt on average has both a significantly shorter time to the first call date and a significantly lower call price than straight debt.

Further tests of our hypotheses about call provisions in convertible debt are available from regression analysis of the sub-sample of 64 convertible debt issues. Because nearly all of our convertible bonds have call provisions, we cannot conduct a reliable test of whether a positive association exists between the size of investment opportunities and the incidence of call provisions among convertibles. However, we can test within our sample of 60 callable, convertible issues whether the call provisions' key parameters -- the time until the first

permissible call date, and the price at which bonds may first be called -- are more generous when the investment opportunity set is large. We run OLS regressions of these two variables against our measure of growth opportunities, r & d expense over sales, and the other variables used in the model in Table 3. We find a significantly negative association as predicted between the call price and r & d expense over sales. We do not find a significant association between the time until the first call date and the growth opportunity variable. We conclude that call provisions have more generous (e.g., lower) prices from the issuer's point of view when growth opportunities are large. The result is robust to augmenting the regression model to include other features of each debt contract. When the model is reestimated after adding a dummy variable for convertibility and variables for the time until first permissible call and each bond's coupon rate, the coefficient on the growth opportunity variable of r &d over sales remains negative and significant.

5. Conclusions

Our paper presents evidence about the significance of growth opportunities for the design of debt securities. We find the that firms with high growth opportunities are more likely to issue convertible debt, that debt securities issued by firms with high growth opportunities contain fewer and less tight covenants, and that, after controlling for growth opportunities, convertible debt contains fewer covenants than ordinary debt. These findings are consistent with our conjecture that financing and investment flexibility is more valuable, and covenants therefore more costly, for companies with high growth opportunities. For such firms, convertibility provisions appear to serve as a relatively more attractive device for controlling agency costs of

debt.

We believe our results support a new rationale for the association between growth opportunities and convertible debt that has been found in prior studies as well as this paper. Firms with growth opportunities may issue convertible debt in order to escape the loss of operating flexibility that accompanies restrictive covenants. Although previous authors such as Stein (1992) also predict a positive association between convertibility provisions and growth opportunities, their theories have no specific implications about the relations between growth opportunities and covenants or convertibility and covenants. Our paper offers an integrative approach to predicting the incidence of covenants and convertibility as a function of growth opportunities. The results appear to establish growth opportunities as an important variable influencing covenant design, independent of the presence of convertibility provisions.

Our results also support a theory that covenants and convertibility are used as substitute, rather than complementary, methods for controlling the agency costs of debt, regardless of the size of growth opportunities. When a bond contains restrictive covenants, issuing companies appear to find convertibility provisions unnecessary, and vice versa. An important rationale for the existence of convertible debt may therefore be the avoidance of covenants in firms that require a high degree of operating flexibility.

We also present results about how call provisions in debt contracts are related to convertibility and growth opportunities. Our findings indicate that call provisions have a significantly positive association with the presence of convertibility in debt issues, as predicted by Stein (1992). Moreover, we find that callable, convertible debt is designed to be redeemed by the issuing company at more attractive prices when growth opportunities are large.

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Table 1

Characteristics of sample.

Descriptive statistics for 192 public debt issues in 1993 and 1994. The sample of convertible bonds includes all public issues reported by Moody's Annual Bond Record, excluding guaranteed, secured, and foreign issues. The control sample was randomly selected from non-convertible public issues reported by Moody's, subject to constraints that the control sample have the same distribution of credit ratings and issue dates as the convertible sample. All dollar values are in 1994 units. Total assets are measured at the start of the fiscal year in which each issue occurs. Issue size is calculated by dividing the amount raised by the long-term debt outstanding at the start of the issue fiscal year. Issue size calculations exclude eight exchange offers. Significance levels for differences in means are based on t-tests assuming unequal variances.

	Convertible sample	Control sample	
Sample size	64	128	
Year of issue			
1993	69%	69%	
1994	31%	31%	
Moody's rating			
Baa	16%	16%	
Ba	27%	27%	
B	56%	56%	
Caa	2%	2%	
Company size (mean of total assets, millions)	$3,318	$4,358	
Industry			
Manufacturing	28%	34%	
Financial	19%	14%	
Services	19%	13%	
Wholesale and retail trade	17%	16%	
Communications	3%	6%	
All other	14%	17%	
Maturity (mean, years)	10.7	10.0	
Issue size			
Dollar value (mean, millions)	$141	$148	
Percent of prior long-term debt	163%	59%	***
Dividend yield (percent of start-of-year stock price)	0.74%	1.14%	
Outstanding public debt / total assets	0.05	0.11	***
Firms with no public debt issues outstanding	67%	47%	***

*** Difference significant at 1% level

Table 2

Use of proceeds of debt issues.

Companies' stated purposes for use of proceeds of 64 convertible and 128 non-convertible public debt issues in 1993 and 1994. Details of the sample construction appear in Table 1. Information about the use of proceeds was obtained from prospectuses filed by the issuer of each bond. Totals do not sum to 100% because many issues have more than one stated purpose listed in the prospectus. Significance levels for differences are based on t-tests assuming unequal variances.

	Convertible sample	Control sample	
Refinancing	70%	87%	**
Capital investment	50%	28%	***
General corporate purposes	44%	42%	

*** Difference significant at 1% level

** Difference significant at 5% level

Table 3

Probit coefficient estimates: Determinants of convertibility provisions in debt issues.

Coefficient estimates for a probit model of the incidence of convertibility provisions in debt issues. The sample consists of 64 convertible and 128 non-convertible debt issues in 1993 and 1994. The dependent variable equals one if the debt issue includes a convertibility provision. Standard errors appear below each estimate. The left column presents estimates for a model without industry dummy variables, while the right column presents estimates for a model that includes SIC one-digit industry dummies. The research and development variable is assumed to equal zero when Compustat reports a missing value, although the results are qualitatively unaffected if these observations are deleted instead.

	Estimate	Estimate
Intercept	0.799 **	n/a
	(.393)	
Firm size	-0.148 ***	-0.167 ***
(log of total assets)	(0.055)	(0.060)
Leverage	-0.533 **	-0.431 *
(total debt over total assets)	(.241)	(.245)
Research and development expense / sales	8.657 *	12.756 **
	(4.664)	(5.984)
One-digit industry dummy variables	No	Yes
Number of observations	192	192

** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

Table 4

Incidence of covenants as a function of investment opportunities.

The incidence of restrictive covenants in debt contracts as a function of investment opportunities. The table shows the outcomes of probit regression estimations of models of the incidence of covenants. The main explanatory variable in each model is research & development expenditures over sales, which serves as a proxy for the size of each firm's investment opportunity set. Other variables are identical to those in table 3, and all models include one-digit SIC industry dummy variables.

Each cell shows the sign and significance level for the estimated coefficient on (r & d / sales). The left column presents estimates for the entire sample of 64 convertible and 128 non-convertible bonds. The right column presents estimates for the subsample of non-convertible bonds.

	Sign and p-value of probit coefficient for (research & development / sales)	
Covenant	**Entire sample**	**Non-convertible sample**
Debt	- *** 0.00	- *** 0.00
Secured debt	- * 0.07	+ 0.40
Investment	- ** 0.02	- ** 0.04
Sale of assets	- ** 0.00	- ** 0.02
Affiliate transactions	- *** 0.00	- ** 0.02
Restricted payments	- *** 0.00	- *** 0.00

*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

Table 5

Incidence of covenants in convertible and non-convertible bonds.

The incidence of restrictive covenants in a sample of 64 convertible and 128 non-convertible bonds issued in 1993 and 1994. Information about covenants was obtained from prospectuses issued with each bond. Significance levels for differences are based on t-tests assuming unequal variances.

Covenant	Convertible sample	Control sample	
Debt	2%	74%	***
Secured debt	6%	95%	***
Investment	2%	45%	***
Sale of assets	0%	66%	***
Affiliate transactions	6%	73%	***
Restricted payments	2%	73%	***

*** Difference significant at 1% level

Table 6
Incidence of covenants as a function of convertibility.

The incidence of restrictive covenants as a function of the inclusion of convertibility provisions in debt contracts. The table shows the outcomes of probit regression estimations of models of the incidence of covenants. The main explanatory variable in each model is a dummy variable for whether a debt issue is convertible. A second key explanatory variable is reserach & developmen expense over sales, which represents a proxy for the size of each firm's investment opportunity set. Other variables are identical to those in Table 3, and all models include one-digit SIC industry dummy variables.

Cells in the left column show the sign and significance level for the estimated coefficient on the dummy variable for convertibility. The right column shows the same statistics for estimates for the (r & d / sales) variable. Regressions are estimated over a sample of 64 convertible and 128 non-convertible bonds issued in 1993 and 1994. No regression is estimated for the sale of assets covenant because this covenant does not appear in any convertible debt issue.

	Sign and p-value of probit coefficients for independent variables:	
Covenant	**Convertibility dummy**	**R&D expense / sales**
Debt	- *** 0.00	- *** 0.00
Secured debt	- *** 0.00	+ 0.67
Investment	- *** 0.00	- ** 0.02
Affiliate transactions	- *** 0.00	- ** 0.02
Restricted payments	- *** 0.00	- *** 0.00

*** Significant at 1% level

** Significant at 5% level

Table 7

Incidence of convertibility and covenants as functions of alternative measures of investment opportunities

The incidence of convertibility provisions and restrictive covenants as a function of investment opportunities. The table shows the results of probit estimations of models of the incidence of convertibility provisions and covenants. A + or - sign indicates an estimate significant at the 5% level, while a 0 indicates an insignificant estimate. All models include the control variables from Table 3 as well as one-digit SIC industry dummy variables. The left column summarizes results from Tables 4 and 6, which presented estimates for models with (research & development / sales) as a proxy for investment opportunities. The right column shows results for models with Tobin's Q serving as the measure of investment opportunities. The Q-ratio is approximated as the market value of common stock, plus the book value of debt and preferred stock, divided by the book value of total assets.

Proxy for investment opportunities:	R & D / sales	Tobin's Q
Convertibility	+	0
Covenants (entire sample)		
Debt	-	-
Secured debt	-	0
Investment	-	-
Sale of assets	-	0
Affiliate transactions	-	-
Restricted payments	-	-
Covenants (entire sample, dummy variable included for convertibility)		
Debt	-	-
Secured debt	-	0
Investment	-	-
Affiliate transactions	-	0
Restricted payments	-	-
Covenants (non-convertible sample only)		
Debt	-	-
Secured debt	0	0
Investment	-	-
Sale of assets	-	0
Affiliate transactions	-	-
Restricted payments	-	-

Table 8

Call provisions in convertible and non-convertible bonds.

Descriptive statistics about call provisions in convertible and non-convertible bonds. The sample includes 64 convertible issues and 128 non-convertible issues from 1993 and 1994. The first line of the table shows the fraction of each sub-sample that is callable by the issuing company before expiration. The second line shows the average time in years to the first permissible call date for callable bonds. The third line shows the average call price at the first permissible call date, as a percentage of each bond's face value. Significance levels for differences are based on t-tests assuming unequal variances.

	Convertible sample	Control sample	
Incidence of call provisions	94%	70%	***
Average time to first permissible exercise (years)	3.4	5.0	***
Average price at first call (% of face value)	102.8%	104.2%	***

*** Difference significant at 1% level