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**Dividend Policy and Institutional Ownership:
Empirical Evidence using a Propensity
Score Matching Estimator**

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Abstract

This study investigates the relationship between institutional ownership and dividend payout behavior of the firm in Germany. Using a propensity scoring method estimator to control for endogeneity problems, we find evidence that neither institutional ownership nor bank control is statistically significant in determining dividend payouts. These findings are consistent with stylized facts regarding the nature of the German institutional environment, which, through the rights of management to retain a significant percentage of the net profits of the firm and lack of tax incentives, reduce agency costs associated with conflicts between management and shareholder interests regarding use of the firm's free cash flow.

I. Introduction

While the empirical evidence on the link between dividend policy and firm ownership has been well explored in the empirical literature for the US and the UK, including Rozeff (1982), Jensen, Solberg, and Zorn (1992), Eckbo and Verma (1994) and others, little attention has been paid to the potential link between institutional ownership and dividend policy – particularly in Germany. Short, Zhang, and Keasey (hereafter SZK) (2002) in their study of UK firms point out that this constitutes a truly neglected area of research given the fact that the institutional frameworks and ownership structures tend to vary around the world.¹

The purpose of this study is to empirically examine the link between German corporate governance and dividend policy for a large panel of firms from 1970-1986. Our methodology will directly address several of the econometric issues plaguing earlier studies on dividend policy. In particular, we note that in previous studies firm ownership and bank influence are assumed to be exogenous, ignoring the self-selection and mutuality of these relationships. For example SZK (2002) estimates a model of UK firms, regressing dividends on firm earnings and a dummy variable denoting the presence of significant institutional or managerial ownership. This specification treats the ownership variable as exogenous. Clearly, ownership patterns are not exogenously given or randomly determined. Instead, ownership patterns are determined as a result of self-selection mechanisms that are affected by dividend policies. Demsetz and Lehn (1985) convincingly state the case that ownership choices are in fact endogenous outcomes of

¹ See La Porta, Silanes, and Shleifer (1999) for a survey of the international corporate governance literature.

value-maximizing behavior. Himmelberg, Hubbard, and Love (2002) highlight the dangers of failing to recognize the joint endogeneity of ownership variables and balance sheet ratios.

In Germany, the endogeneity issue is particularly pressing as firms not only decide whether to issue stock, but choose the bank(s) with which to finance debt and underwrite its shares. According to Fohlin (1998), the firm's designation of their *hausbank* is a careful choice based on mutual trust and long-term relationships. Thus, not only ownership patterns but also banking relationships are not exogenous but endogenous to dividend policies and the firm. Under this situation, the usual OLS estimators are biased and misleading.

To circumvent this problem, one may consider the traditional econometric approaches such as Heckman's two-step treatment models, however they must satisfy an identification requirement of needing at least one variable that affects choice but does not have a partial effect on the outcome variable.² To resolve this problem we apply the propensity score matching (PSM) alternative to control for the endogeneity of institutional ownership and bank control.

This paper is organized as follows: Section 2 will provide a literature survey and Section 3 will discuss the incentives arising from agency costs and taxation of dividends in Germany. Section 4 contains a discussion of the data and econometric issues. Section 5 reports and discusses the empirical results, and Section 6 draws conclusions from our findings.

II. Literature Review

² It turns out in many empirical studies that this identification requirement becomes a problem. First of all, it is difficult to find reasonable instrumental variables. In our case, we failed to find meaningful variables that affect ownership patterns but did not impact dividend policy.

A. The Relationship Between Firm Ownership and Dividend Policy

Previous studies have shown that in countries like the US, firm ownership is relatively dispersed, leading to a limited ability of owners to monitor or control management's use of what Jensen (1986) refers to as "free cash flow." Thus, the dividend payout is one of the primary control mechanisms whereby shareholders can reduce management access to or abuse of discretionary funds.³ In countries with 1) a higher concentration of ownership 2) extensive cross-shareholding and 3) strong banking relationships, like Germany, or many other continental European countries, dominant shareholders are believed to have both the incentives and the ability to keep management in check.^{4 5}

There is an enormous literature describing the sources of firm incentives to pay dividends. However three dominant theories emerge based on firm incentives stemming from some combination of 1) tax differentials, 2) signaling, and 3) agency costs. This study will examine incentives arising from tax differentials and agency costs.

If for example, dividends are taxed at higher rates than capital gains, then investors will require higher rates of return as dividend yields increase. This theory suggests that a low dividend payout ratio will maximize firm value, and thus be preferred by the shareholder.

³ Discretionary funds being those which exist above and beyond the firm's investment outlay in discounted positive net cash flow projects.

⁴ See Cable (1985), Chirinko and Elston (1998), and others for details on German corporate governance structure.

⁵ See Barca and Becht (2001) and Gugler and Yurtoglu (2001) for studies on differences in corporate governance systems throughout Europe.

Results of empirical tests of this theory are however, mixed, and have not led to definitive conclusions regarding the actual importance of tax treatment on shareholder incentives. One possible reason for this is that in the real world, companies budget future dividend payments the same way that they budget any other cash outflow such as debt service requirements, capital expenditures, or any foreseeable demand for cash.

Gordon (1959), Lintner (1956) and Bhattacharya (1979) discuss the agency or transactions costs which arise when shareholders attempt to monitor and control managers. They argue that when shareholders and managers goals diverge, regular dividend payments can mitigate agency conflicts by distributing investment returns –the bird in the hand –thus reducing the scope of potential management abuse of resources. By extension it may also be true that stockholders are heterogeneous with respect to their risk preferences, information access, or tax margins, thus creating divergent goals between different stockholders groups. In this case shareholder identity and concentration would impact dividend behavior not only through agency costs which arise with the separation of firm ownership and control but also with costs associated with divergent goals between stockholders groups. Guglar and Yurtoglu (2001) argue that in countries with high concentration of ownership the conflict between large controlling and small outside shareholders is one of the main issues in corporate governance.

International Differences

Evidence supporting differences in these agency effects across countries is provided in La Porta, Silanes and Shleifer (1999), which compares shareholder relationships in 27 countries in 1995 and concludes that different ownership patterns significantly impact the agency problems

of the firm. They conclude that "...controlling shareholders pursue policies which benefit them at the direct expense of minority shareholders." Shleifer and Vishny (1986) and Allen, Bernardo and Welch (2001) find that institutional investors prefer to own shares of firms making regular dividend payments, and argue that large institutional investors are more willing and able to monitor corporate management than are smaller and more diffuse owners. Further they argue that dividend policies can be shaped to attract institutional investors, who can in turn provide monitoring services. For the UK, SZK (2002) examine three alternative dividend models, and show that dividend payout is positively related to institutional ownership. La Porta et al. (2000) offers evidence that US laws protecting the rights of minority shareholders are associated with higher dividend payout ratios, which is consistent with the use of dividends to control managerial actions. In the next section we will examine the potential incentives arising from agency costs and taxation of dividends for the firm in Germany.

III. Agency Costs and Taxation of Dividends in Germany

In Germany dividend taxation is imputed, which means that many things besides the statutory rate of the tax impacts the shareholder's tax liability on dividend income. Similar to the tax system in the US, German firms pay dividends only after corporate income taxes are deducted from their operating income. In Germany however, neither individual nor institutions pay "double" taxes on dividend income as in the US.⁶ Taxes paid by individuals on dividend income depend ultimately on: the marginal income tax rate of the investor, the individual's tax credit status, corporate taxes and the withholding amount of the dividend issuing firm; while

⁶ This is also referred to as "triple" taxation by section 243a of the US Internal Revenue Code.

shares held for longer than six months are exempt from capital gains tax. Dividend paying firms are taxed at a corporate tax rate of 50%. The dividend receiving firm, while liable for dividend income taxes of 50%, gets to claim the 50% tax credit and thus pays no additional tax on the dividend income.⁷

Amihud and Murgia (1997) and Bay (1990) calculate the imputed tax burden across investor classes in Germany with consistent results for the time period of our study. In sum, individual investors in the highest tax brackets (50% or greater) before 1990 were indifferent between income from capital gains or dividends, while those with a tax rate smaller than the implied marginal tax rate of 50% preferred dividends. We therefore conclude that individual investors have mixed tax incentives overall, which depend on whether they are in lower or upper tax brackets; while institutions have tax incentives which imply indifference between the two sources of income. It is unlikely that tax differentials alone provide a strong incentive for corporate governance actions regarding dividend policies and we look to the agency problems of the firm to suggest incentives that shape corporate governance affects on firm dividend policy.

A. Refutable Hypotheses

There are several interesting implications regarding the way agency problems impact the dividend process in Germany that readily lend themselves to empirical testing. First, we test the hypothesis that institutionally controlled firms hold stocks with higher payouts than non-institutionally controlled firms, as observed by Shleifer and Vishny (1986) for US and SZK

⁷ For a detailed example of taxation on dividend income, see Appendix A.

(2002) for the UK. We would expect to find no evidence that dominant institutional owners cause higher dividend payouts due to tax incentives, though agency theories might suggest that they are better able to strong-arm resources from management to pay dividends. Second, we are interested in testing Shleifer and Vishny's prediction that countries with strong laws protecting the rights of minority shareholders tend to have higher dividend payout ratios. This issue may be rather important in examining the German data, since Germany has unusually weak minority shareholder protection (Hellwig, 2001, and Gugler and Yurtoglu, 2001), in which case we would expect to see lower payouts, below that which is observed in the relatively more protective US of 57%-63% reported by Allen and Michaely (1994).⁸

Third, we wish to examine directly the impact of having strong banking relationships or bank control on the dividend behavior of the firm. Amihud and Murgia (1997, p. 407) conclude that bank ownership and control may lead to lower dividend payouts in order to leave greater security for debt. Since our data has 17 years of firm level financial and ownership information, we will be able to distinguish the extent to which these groups of owners may have impacted the dividend process over time.

IV. The Data and Econometric Issues

⁸ Amihud and Murgia (1997) estimate payout rates ranging from 20-40% in Germany from 1988-1992.

A. The Data

The main source of data for this study comes from the Bonn Database, which tracks the financial performance of a comprehensive set of German firms from 1970-1986 years.⁹ The database is a collection of financial reports of German industrial corporations quoted on the German stock exchange and statistical yearbooks.¹⁰ The sample we used is the 100 largest firms across 28 industrial branches (mostly manufacturing).¹¹ The number of firms in the sample is also fairly representative because the German exchange is considerably smaller than its American counterpart.¹²

B. Choice variables

For these 100 firms, we also have annual firm level information detailing the identity and ownership concentration of shareholders. These discrete data are reported in mutually exclusive categories defining the identity and concentration of the ownership structure for the firms, enabling us to identify a dominant shareholder group as follows. Firms are categorized as institutionally owned (see the “Institute” variable) if the largest shareholder is another firm - financial or non-financial. With the data categories, this implies that a single institution either

⁸The sample time period of 1970-1986 is also important as point of comparison with the current stock of US studies available for this period.

⁹Sources for the Bonn Database include annual business reports of firms and the *Statistisches Jahrbuch*.

¹⁰These are the 100 largest German firms in terms of 1986 gross revenues. Data before 1970 is not used because of incomplete data. Data after 1986 is not used because of the substantial changes in German accounting laws.

¹¹For example in 1980 there were only about 459 listed firms incorporated as AG and KgaA firms.

owns more than 50% of the outstanding shares or owns at least 25% and no one else owns more than 25%.¹³ Non-Institutional owners include those with the largest number of the firm's shares being held by foreigners, family, government, or management.

The bank variable is intended to measure if a bank has the incentive and ability to monitor and control firm decisions, including the use of free cash flow and dividend policies. Chirinko and Elston (1998) provide detailed evidence supporting the role of banks in monitoring and control of firms with highly dispersed ownership structures in Germany. The multi-faceted relationship banks hold with firms in Germany goes beyond the usual creditor relationship in market based systems, and justifies examining the potentially important role banks may play in firm policies.¹⁴ The bank variable was constructed using annual information regarding the percent of bank ownership of the firm, percent of bankers on the supervisory board (SB), whether they are chair of the SB, and total number of votes exercised by banks at annual shareholder meetings. We operationalized this information by defining a firm as bank controlled, if the bank owns more than 25% of the shares of the firm, or if total exercised votes of the bank at shareholder meetings (including proxy votes) were greater than 50%, or if total votes are between 25% and 50% and the chair of the SB is a banker.¹⁵

¹² Note that in the source data 25% is a key percentage because it represents a minority blocking vote at shareholders meetings and German law requires disclosure of ownership for any party owning 25% or more of outstanding stock.

¹³ For other studies on the influence of German banks on firm see Cable (1985), Elston and Audretsch (2002).

¹⁵ Banks traditionally buy the bulk of firm shares at a discount from the firm and then place them with customer investment portfolios managed by the bank. This allows banks to collect the proxy votes associated with these

Outcome and Control Variables

Measures of dividends vary between studies, so we have provided two alternative ones to estimate dividend behavior. Dividend payouts, or the “DivPay” variable, is defined as the sum of dividends paid out by the firm divided by the firm’s net income after taxes or NetInc. Dividend growth (“Divgrow”) is the annualized percentage growth in common and preferred stock. Firm total debt to equity ratio is measured by the variable “DEquity.” “Employ” is the variable measuring the number of employees.

Endogeneity and PSM Methodology

In previous studies such as Guglar and Yurtoglu (2001), SZK (2001) and other empirical institutional studies, ownership has been assumed to be an *exogenous* firm-specific attribute hypothesized to affect dividend policy. However, there is every reason to believe that ownership and control issues are in fact *endogenously* determined by many of the same firm-specific features that affect dividend policy.

In this study, we employ the PSM method to evaluate the effects that *endogenous* institutional ownership and bank influence have on dividend behavior. Appendix B contains details on why the PSM methodology is appropriate for this study. Briefly, the PSM method, initially developed by Rosenbaum and Rubin (1983), is an effective tool for assessing the effect of a particular “treatment,” where this word can be (and has frequently been) broadly defined in

shares, which can be added to their own and exercised at shareholder meetings. According to Monopolkommission reports, when adding these sources of proxy votes, the overall proportion of votes controlled by the banks jumps to over 36% for the largest 100 and over 50% for the largest 10 firms.

a variety of ways. We define institutional ownership and bank control as the “treatment” in this study. Traditionally, the treatment effects have been estimated in econometric models with dummy endogenous regressors, which permit classifying entities (persons or organizations) into two different groups: treated and control (also called “comparison” group). The traditional econometric approaches include the Heckman’s two-step treatment model that involves a probability model estimation, such as probit or logit, in its first step.

The PSM method is quite different from the traditional econometric techniques. In particular, it does not require the identification restriction, thus permitting us to avoid the often impossible job of finding good instrumental variables. Instead, PSM permits one to estimate the treatment effect by simulating a randomized experiment in a non-parametric fashion. That is, observations in the treatment group are matched with observations not receiving the treatment (the control group) that are as alike as possible. Consequently, each observation in the treatment group is mirrored by an observation in the control group. The anticipated result is that the differences in the outcomes across each matched pair will be due to only the treatment’s effect and *not* to observable differences between pairs – just as in a randomized experiment.

V. Empirical Results

Table 1 lists the variables used in our analyses, their definitions and descriptive statistics. The outcome variable means will be compared across the two states of the choice variables, which in this study are measures of institutional ownership and bank control.

Table 2 here

Table 2 shows the means and their differences for the outcome and control variables according to choice variable status – Institute or Bank. That is, Institute in column one shows means for all firms in which an institution is the dominant stockholder of the firm. Column two contains means for all other, non-institutionally owned, firms in the sample. Columns three and four display the differences in those means and t-statistics for testing the null hypothesis that the means are equal. Columns 5 – 8 contain information comparable to the first four columns except that they pertain to descriptive statistics of firms with bank control or Bank. Note that the results contained in Table 2 are pre-PSM and do not reflect any control for nonrandom selection into choice variable status. The main interest in this table should be as a comparison with the parallel post-PSM results found in Table 4. It is important to note that failing to control for endogeneity results in statistical significance of both of our corporate governance variables, which disappears if we properly control for it.

Tables 3 and 4 here

Table 3 shows the probit results from the first stage of the PSM method: estimating the propensity scores that will be used to match firms. This table contains results for two models: the dependent variables are Institute in one model and Bank in the other. These probit estimation results will be used as a means of matching observations in the treatment group with those in the control group. Given that the intrinsic control mechanism of the PSM is based on observables, relevant observed factors need to be included in the probit specification. One important consideration is the dynamic persistent effect of dividend policy. To address this, we include the

lagged variable of dividend outcome variables in the probit specification. The coefficient of the lagged dividend payout variable is significant at the 1% level in the probit models in both cases, Institute and Bank, while the coefficient of the lagged dividend growth variable is insignificant. To be consistent, we adopt this specification with the lagged variables included for all cases.

We initially estimated the probit model with time and industry dummy variables. They show that the industry fixed effects are highly significant, whereas time fixed effects are not. Accordingly, we report the results of the model specification without time dummies. The probit estimation results show that three factors are significant in both models. Larger firms (as measured by employment or *Employ*) are more likely to see an institution as their dominant stockholder and are also more likely to have a bank control. Similarly, higher values for *DEquity* are associated with a higher likelihood of a firm both having an institution as a dominant shareholder and having bank control.¹⁶ Conversely, firms with higher net income in the current period are less likely to be controlled by either an institution or a bank. Certain firm characteristics do not influence choice variable status. Neither three of the four lagged employment variables nor the time dummy variables have an effect.

As mentioned previously, the aim of PSM is to simulate a randomized experiment in which those firms with institutional ownership and bank control are matched with like firms without those features. The anticipated consequence is that the differences in the dividend outcomes across each matched pair will be due to only the effect of institutional ownership or bank control. Table 4 presents the results after applying the PSM method employing the nearest

¹⁶ The p-value for *DEquity* in the Bank model is .06.

neighbor matching method. Part (a) contains results when a 5% margin is used in matching. Part (b) displays parallel results after employing a 1% margin. These two variations are used as robustness tests.¹⁷ We notice that the results are nearly identical across the 5% and 1% margin methods. This suggests that the results are not solely the consequence of using one specific margin.

First of all, we examine the effect of institutional ownership. Columns 2 and 3 in Table 4 report the means of the dividend outcomes in each of the treatment and control groups. Column 4 reports the difference in the mean dividend outcomes across each matched pair along with the t-statistic for testing the significance of that difference. These differences are viewed as the treatment effects on the dividend outcomes. They show that – unlike in Table 2 - those differences are not statistically significant. In other words, after accounting for confounding factors, we find no significant difference in dividend behaviors across institutional ownership status. This result sharply contrasts that of SZK (2002) who show strong support for a significant and positive association effect between dividend payout policy and institutional ownership. Our results favor the notion that institutional ownership does not have significant impacts on dividend policy. If PSM works properly, the factors that likely confound the results in Table 2 should be accounted for and, consequently, the results in Table 4 should be more accurate.

¹⁷ Kernel estimation results are similar.

Columns 5 - 7 in Table 4 report the results for the case of bank ownership. Like the situation for institutional ownership, the results for bank control differ between pre- and post-PSM analyses. Before applying PSM, firms with bank relationships pay higher dividends and experience the same dividend growth as those without bank control. After PSM, firms with bank control and those without are seen to both pay the same levels of dividends and experience equal dividend growth. Again, we find no difference in dividend behaviors across bank ownership status.

To ensure robustness of our results, we further investigate the appropriateness of using the PSM. One legitimate concern about PSM matching is whether or not the matched pairs are truly alike. If there exist observable differences in the matched pairs, the results reported in Table 4 might be partially due those differences and not solely because of ownership status. In that case we have gained little by applying PSM other than possibly shrinking the bias in the reported “treatment effects.”

Table 5 here

Table 5 displays the outcome of investigating this issue. It shows the results of testing for the difference in mean values for each of the control variables in both models: institutional ownership and bank control. The table shows the mean values for the firms in each situation (institutionally owned or not and bank controlled or not), the differences and t-statistics testing the null hypothesis that the means are equal. Panel (a) shows the results of matched samples after applying PSM, while Panel (b) reports the results before applying PSM. It is clear from Panel (a) that for each of the variables used in the probit model, the firms in the “treated” group

(Institute = 1 or Bank =1) are like the firms with which they are matched. On the contrary, from Panel (b), we observe that the differences in means for each of the control variables of the unmatched samples are often significant. This reassures us that the differences in dividend outcomes reported in Table 4 are likely not due to observable factors, which is the goal of applying PSM.

Summary and Interpretation

The finding that institutional ownership does not lead to lower/higher dividend payouts does not support the theory that large institutional shareholders are expropriating small outside shareholders through pressure to receive earnings as capital gains rather than dividends. That is, while smaller shareholders may prefer dividends because of the tax advantages (for lower income brackets), we do not find evidence that institutional owners cause lower dividend payouts.

Our interpretation of the evidence regarding the insignificance of institutional control on dividend policy stems from stylized facts regarding the unique environment of German corporate governance. We feel that the traditional agency problems arising from the conflicts between shareholders and management may be greatly reduced by: 1) the German commercial code which allows management the option to retain earnings of 50% or more of the firm's net income before any dividend decision or payout is made, thus we argue, reducing the scope of the agency conflict over whether funds should be paid as dividends or retained since the size of the funds in question are greatly reduced 2) the indifference of tax incentives for institutions receiving income as dividends vs. capital gains, and, 3) the possibility that any institutional preference for

the “bird in the hand” as evidenced by SZK (2002) for the UK, may be cancelled out by opposing preferences for the “bird in the bush” consistent with the reasoning that institutions are generally more long-run oriented and patient in their investment approach.^{18,19}

Evidence on dividend behavior segmented by bank control reveals that it too does not significantly impact the dividend payout, thus providing no support for the hypothesis that bank control leads to lower dividend payouts in order to leave greater security for debt. This finding is again, consistent with known stylized facts that document the use of collateral as the sine qua non for bank loans to secure debt in Germany.²⁰ Recent studies suggest that the first response of banks to firms under financial distress is to request immediate additional collateral and reduce credit lines - both of which are quicker, more credible responses to a failing firm than waiting until annual shareholders meetings to lobby for revision in the firm’s dividend policy.²¹

Finally, using an alternative dividend payout measure for comparison with US results we find that the average dividend payout in the study was 63.78% calculated as a percentage of net firm profits. These payout results are comparable to the 57-63% found by Allen and Michaely

¹⁸ See section 58 paragraph 2 of the *Aktiengesetz* (Stock Corporations Code).

¹⁹ On the other hand, if institutional ownership provides monitoring, the function of dividends in providing monitoring might be reduced. Furthermore, if raising outside capital is costly enough, then stockholders might not wish to maximize dividend payouts.

²⁰ For a general discussion on Germany’s use of collateral to secure loans see Hellwig (2001).

²¹ For recent studies on bank response to financial distress in Germany see Edwards and Fisher (1994) and Harhoff and Koerting (1998).

(1994) for the US.²² These findings fail to support the hypothesis that countries with weak laws protecting the rights of minority shareholders have lower dividend payouts –at least for Germany during this time period. We hypothesize that while minority shareholder laws may be weak in some ways due to 1) the inability of shareholders to engage in class action lawsuits and 2) management’s right to retain 50% of net profits, dominant institutional shareholders also do not have a tax incentive to pressure management to lower dividends. We conclude that it is not in the interests of institutional shareholders to pressure management either pay or to forego dividends in hope of future capital gains, since neither is taxed favored in Germany. In addition, these results are consistent with our direct tests on the importance of institutional effects provided in Table 4.

VI. Conclusions

While minority shareholder laws may be weak in Germany, our evidence suggests that dividend payouts are comparable to those in the US, which may stem in part from the fact that German institutions do not have a tax disadvantage (or advantage) for earnings distributed as dividends. This tax based indifference in receiving income as dividends vs. future capital gains may serve to reduce the sources of agency problems associated with conflicts of interests

²²These are somewhat higher than estimates from Amihud and Murgia (1997) for Germany from 1988-1992. Note that this observation is not intended to imply conclusive evidence such as that which might result from a rigorous comparative study.

between opposing classes of shareholders, thus providing a better alignment of dominant institutional and minority shareholder interests.

Findings support the hypotheses that neither institutional ownership nor bank control is statistically related to dividend payouts if we control for endogeneity of the corporate governance structure. While these results may differ from previous results, ours is more consistent with stylized facts regarding the German institutional environment which, though rights of management to retain 50% or more of net profits, and lack of tax incentives for institutional shareholders to receive income from dividends vs. potential future capital gains, unwittingly reduce the agency costs associated with conflicts between management and shareholders regarding the use of net profits of the firm.

From a methodological perspective, the rather striking difference in estimates we observe when we control for the endogeneity of the ownership structure and bank control suggests that there is good cause for doing so. Broadly speaking, this suggests that failure to control for endogeneity of corporate governance while investigating the dividend process may lead to misleading results regarding its impact on the dividend behavior of the firm.

Table 1.
Description of Key Variables

Variables	Mean	Standard Deviation	Definition
Outcome Variables			
DivPay	0.762	0.343	Dividend payout; sum of dividends divided by net income.
DivGrow	0.163	1.542	Growth Rates of the sum of dividends on common stock and dividends on preferred stock, in millions of DM
Ownership/Control Choice Variables			
Institute	0.489	0.500	= 1 if a financial or non-financial firm is the largest holder of stock in the firm, and 0 otherwise.
Bank	0.132	0.339	= 1 if bank relationship and 0 otherwise
Control Variables			
DEquity	3.795	17.61	Total debt to equity ratio
Employ	9,697.6	25,950	Number of employees
IND1-IND9			Industry dummies
Y70-Y86			Year dummies

Table 2.
Differences in Means in Outcome Variables (Pre-PSM)

Outcome Variable	Institute	Non- Institute	Diff.	t-stat	Bank	Non- Bank	Diff.	t-stat
	(1)	(0)			(1)	(0)		
DivPay	0.726	0.793	-0.067	-3.54 (.000)	0.813	0.753	0.061	2.25 (.024)
DivGrow	0.071	0.247	-0.163	-1.92 (.056)	0.076	0.178	-0.163	-0.79 (.431)

P-values are provided in parentheses.

Table 3.
Probit Estimation Results

Indep. Variables	Institute				Bank			
DivPay _{t-1}	-0.754	(-4.60)			-0.126	(-0.50)		
DivGrow _{t-1}			-0.079	(-0.97)	-0.126	(-0.50)	0.023	(0.38)
NetInc _t	-0.005	(-2.17)	-0.007	(-2.84)	-0.145	(-2.25)	-0.016	(-2.28)
NetInc _{t-1}	-0.011	(-2.89)	-0.005	(-1.38)	-0.006	(-0.98)	-0.005	(-0.85)
NetInc _{t-2}	-0.003	(-1.43)	-0.006	(-1.93)	-0.004	(-1.09)	-0.003	(-1.02)
1000*Employ	0.025	(4.75)	0.022	(4.36)	0.050	(5.91)	0.050	(5.89)
DEquity	0.084	(3.86)	0.081	(3.74)	0.011	(2.23)	0.012	(2.30)
Constant	1.234		-0.724		-0.905		-0.987	
Industry dummies	Included		Included		Included		Included	
Time dummies	Omitted		Omitted		Omitted		Omitted	
N	990		958		885		864	
Log-likelihood	-514.8		-500.5		-311.0		-302.6	
Pseudo R ²	0.248		0.245		0.185		0.192	
LR stat. for overall insig [*]	339.9	(0.00)	325.2	(0.00)	140.7	(0.00)	143.8	(0.00)
LR stat. adding time dummies [*]	2.96	(0.999)	2.72	(0.999)	13.1	(0.665)	12.16	(0.733)
LR stat. omitting Ind. Dummies [*]	172.66	(0.00)	194.74	(0.00)	127.56	(0.00)	126.38	(.000)

t-statistics are given in the parentheses.

* p-values are given in the parentheses.

The probit model is specified as: $Y_{it}^* = \beta'X_{it} + \alpha W_{it} + u_{it}$, where W_{it} is a matrix of variables for time and industry dummies. Here, $Y_{it} = 1$ if firm i declares dividends at period t ($Y_{it}^* > 0$), and $Y_{it} = 0$ otherwise.

X_{it} includes a set factors influencing firm dividend policy including net income, net income from earlier time periods, firm size (employees) and firm debt to equity ratio.

The time dummy variables are omitted because they were found to be jointly insignificant.

Table 4.

Differences in Means in Outcome Variables (Post-PSM)

(a) 5% margin

Outcome Variables	Institute			Bank		
	Treated (1)	Control (0)	diff (t-stat)	Treated (1)	Control (0)	diff (t-stat)
DivPay	0.710	0.676	0.038 (1.20)	0.794	0.802	-0.008 (-0.192)
DivGrow	0.059	0.359	-0.301 (-1.11)	0.055	0.023	0.032 (0.641)

P-values of the t-test on the difference in means are provided in parentheses.

(b) 1% margin

Outcome Variables	Institute			Bank		
	Treated (1)	Control (0)	diff (t-stat)	Treated (1)	Control (0)	diff (t-stat)
DivPay	0.707	0.697	0.010 (0.386)	0.797	0.821	-0.024 (-0.543)
DivGrow	0.059	0.368	-0.309 (-1.25)	0.060	0.018	0.041 (0.814)

P-values of the t-test on the difference in means are provided in parentheses.

Note: The PSM with kernel estimation was also estimated. The results remain the same.

Table 5.
Sub-Group Means of Control Variables
t-statistics are provided in parentheses.

Variables	Institute			Bank		
	Treated (1)	Control (0)	diff (t-stat)	Treated (1)	Control (0)	diff (t-stat)
Panel (a): Post-PSM						
In the DivPay PSM						
DivPay _{t-1}	0.710	0.736	-0.027 (-0.926)	0.783	0.768	0.015 (0.412)
NetInc	11.79	9.23	2.57 (0.872)	11.99	15.89	-3.89 (-0.671)
Employ	5,527	4,467	1,059 (0.831)	7,099	9,101	-2,003 (-0.595)
DEquity	2.091	2.197	-0.106 (-0.487)	5.792	5.100	0.691 (0.176)
In the DivGrow PSM						
DivGrow _{t-1}	0.075	0.204	-0.130 (-1.22)	0.099	0.119	-0.020 (-0.338)
NetInc	11.79	9.23	2.57 (0.871)	11.99	15.89	-3.89 (-0.672)
Employ	5,527	4,468	1,059 (0.831)	7,099	9,101	-2,003 (-0.595)
DEquity	2.091	2.197	-0.106 (-0.487)	5.792	5.100	0.691 (0.176)
Panel (b): Pre-PSM						
In the Non-Matched Samples						
DivPay _{t-1}	0.718	0.770	-0.052 (-2.569)	0.795	0.737	0.058 (2.019)
DivGrow _{t-1}	0.072	0.200	-0.128 (-1.48)	0.078	0.149	-0.071 (-0.581)
NetInc	10.23	60.03	-49.79 (-8.38)	11.63	40.74	-29.11 (-3.27)

Employ	4,653	14,504	-9,850 (-7.87)	6,727	10,149	-3,421 (-1.82)
DEquity	5.675	2.045	3.630 (4.17)	5.330	3.570	1.761 (1.35)

APPENDIX A*Example of Dividend Taxation*

Prior to 1993, the dividend withholding tax (quellensteuer) in Germany was 25%.²³ For example, if a company declares a 100 DM dividend payment, then they must pay 50% corporation tax or 50 DM, less withholding 25% of 50 DM or 12.50, so then 52.50 DM is actually distributed to the shareholder. The shareholder is then required to report the total 100 dividend income, less personal income taxes of 45% or 45 DM, plus the corporation tax credit plus the withholding, leaving a final tax bill, in this case a tax credit of 17.50 DM.²⁴ Dividend income to firms is taxed as regular business income at 50%. Capital gains tax for the individual investor is zero if the stock is held more than 6 months, but is taxed as personal income otherwise.

Dividend Taxes paid on 100 DM Dividend Income*

1) Individual Investor

Personal Income Tax on 100 DM Div. ($T_{\text{pers}} = .45$)	-45
Tax credit	50
Dividend withholding	<u>12.50</u>
Taxes owed/refunded on dividend payout	-17.50 DM

2) Corporate Investor

Corporate Income Tax on 100 DM Div. ($T_{\text{corp}} = .50$)	-50
Tax credit	<u>50</u>
Taxes owed/refunded on dividend payout	0 DM

²³ Withholdings are held by the relevant bank or brokerage account. Tax code revisions in 2001 have since simplified the process of taxing dividends. The dividend withholding tax was revised downward to 20%, and the corporate tax revised to 25%. In addition, individuals are also no longer able to use tax credit for corporation taxes paid and the dividend withholding tax became 25%, plus 5.5% of 25% for the obligatory solidarity supplemental which was affected in 1993.

²⁴ Tax liabilities for non-German residents will further depend on any tax treaties between Germany and the country of residency of the stockholder.

APPENDIX B

The Propensity Scoring Estimator (PSM)

Traditionally, the treatment effects have been estimated in econometric models with dummy endogenous regressors, which permit classifying entities (persons or organizations) into two different groups: treated and control (also called “comparison group”). For instance, consider:

$$Y_{it} = \beta'X_{it} + \alpha D_i + u_{it}, \quad t = 1, 2, \dots, T \quad (1)$$

where $D_i = 1$ for individual entities in the treated group and $D_i = 0$ for those in the control group. Here, Y_{it} is the observed outcome of individual i at period t , X_{it} includes a set of observed characteristics, and u_{it} is the error term denoting unobserved characteristics. We assume that $E(u_{it} | X_{it}) = 0$. Then, α represents the average treatment effect. When assignment to the treatment or control group is random, D_i can be considered as exogenous, and the standard OLS estimator is consistent. This occurs in data with randomized experiments or controlled social experiments, but not in the nonrandom or non-experimental data that are common in practice. When assignment to the treatment group is nonrandom, selection bias in estimating α can occur because u_{it} and D_i are correlated, which yields:

$$E(u_{it} | D_i, X_{it}) \neq 0 \quad \text{and} \quad E(Y_{it} | D_i, X_{it}) \neq \beta'X_{it} + \alpha D_i. \quad (2)$$

Thus, the OLS estimator does not yield consistent estimates of α and β . This lack of consistency is the result of the endogeneity problem, $E(u_{it} | D_i, X_{it}) \neq 0$, caused by participation (or the treatment) being based on each individual’s decision-making procedure. This procedure is often specified in terms of an index function:

$$I_i^* = Z_i'\delta + v_i, \quad (3)$$

where $D_i = 1$ if $I_i^* > 0$ and 0 otherwise. The traditional econometric approaches include the Heckman’s two-step treatment model that involves a probability model estimation, such as probit or logit, in its first step.

Although both approaches have been popular, they entail a few major difficulties. First, they need to satisfy an identification requirement. That is, we must have at least one variable in Z_i that is not included in X_i , implying the need for at least one variable that affects choice but is not correlated with u_{it} . This identification requirement often becomes a serious problem when it is difficult (sometimes impossible) to find such instrument variables. In the absence of such an exclusion restriction, the model is not identified and estimation becomes difficult. Second, the so-called LaLonde’s (1986) critiques suggest that non-experimental estimates vary widely, are sensitive to model specification, and differ greatly from the experimental estimates.

The PSM method is quite different from the traditional econometric techniques. In particular, it does not require the identification restriction, thus permitting us to avoid the difficulty of finding valid (good) instrumental variables. Instead, PSM permits one to estimate

the treatment effect by simulating a randomized experiment in a non-parametric fashion. The matching stage aims to match observations in the treatment group with observations in the control group that are as alike as possible – based on observable factors. The presumption is that any two observations with the same values for these factors will display no systematic differences in their reactions to the treatment. Thus, these paired observations meet the conditions of a randomized experiment. That is, each observation in the treatment group is mirrored by an observation in the control group. The anticipated result is that the differences in the outcomes across each matched pair will be due to only the treatment’s effect and not to those observable differences. In fact, PSM results are considered by many to be fairly trustworthy. For instance, whereas previous econometric estimations may be subject to criticism, PSM can duplicate closely LaLonde’s results obtained from experimental data; see, Dehejia and Wahba (1999).²⁵

The matching method is considered to be selection on observables, which occurs when the dependence between u_{it} and D_i is due to observed variables, Z_i , that affect selection into the treatment. Specifically, by matching, we can have: $E(u_{it} | D_i, X_{it}, Z_i) = E(u_{it} | X_{it}, Z_i)$. That is, by controlling for the observed selection variables, Z_i , we can remove the dependence between u_{it} and D_i . The net effect is free of the selection bias problem. The matching condition can be explained as:

$$(Y_{i1}, Y_{i0}) \perp D_i | Z_i \tag{4}$$

where \perp denotes independence, and where Y_{i1} denotes the outcome for individual i if the treatment occurs ($D_i = 1$) and Y_{i0} denotes the outcome if the treatment does not occur ($D_i = 0$). The above condition is referred to the conditional independence assumption (CIA), implying that given observable control variables, assignment to the treatment group is random and is independent of the outcome. Given Z_i , the non-treated outcome for individual i (Y_{i0}) can be constructed, which is what the outcome would have been for that same treated individual ($D_i = 1$) had they not been treated. Then, the treatment effect is given as:

$$\alpha = E(Y_{i1} - Y_{i0} | Z_i, D_i = 1) = E(Y_{i1} | Z_i, D_i = 1) - E(Y_{i0} | Z_i, D_i = 1), \tag{5}$$

where the second term after the last equality is hardly estimable if matched pairs are not available. In general, the matching estimator is calculated by

$$\hat{\alpha} = \text{Error!}[Y_i - \text{Error!}\omega_{ij} Y_j] \gamma_i \tag{6}$$

¹⁵ Heckman, Ichimura and Todd (1998) and Heckman, Ichimura, Smith and Todd (1998) provide extended versions of the matching estimator. Smith and Todd (2000) suggest that the differences-in-differences matching estimator performs better than other methods in replicating closely the Lalonde’s experimental results.

where T and C denote the treatment and control groups respectively; and where ω_{ij} is the (kernel) weight applied to the matched observation j for the observation i in the treatment group, and γ_i represents the re-weighting on the treated observation. One simple case is the nearest neighborhood matching method, in which case the matching estimator becomes:

$$\hat{\alpha} = \frac{1}{N_T} \sum_{i=1}^{N_T} \gamma_i (Y_i - Y_j) \quad (7)$$

where N_T denotes the number of matched observations. This amounts to finding an observation from the control group ($D_i = 0$) that matches each observation in the treatment group ($D_i = 1$), and comparing the means of these matched groups. The above condition in (4) is difficult to implement in practice since Z_i involves a vector of observable variables. Rosenbaum and Rubin (1983) showed that the same condition is met when the propensity score, $P(Z_i) = P(D_i = 1 | Z_i)$, replaces Z_i in (4). That is,

$$(Y_{i1}, Y_{i0}) \perp D_i | P(Z_i) \quad (8)$$

Given that the propensity score $P(Z_i)$ is a scalar, the above condition facilitates matching because of the dimension reduction from k^* (dimension of Z_i) to one. A major contribution of condition (8) is to shrink the dimensionality of observable characteristics used for matching observations. Using the propensity score yields a more efficient estimate of the treatment effect. The propensity score is obtained as the predicted probability $P_\lambda(Z_i)$ from a probit or logit model. Matching is then performed using like propensity scores. Various matching algorithms can be used. The caliper matching selects one (a set of) comparison observation(s) whose $P_\lambda(Z_i)$ is (are) within some pre-defined distance (bandwidth) of treated unit's $P_\lambda(Z_i)$. Kernel matching creates a kernel weighted average over multiple units in the comparison group.

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