Shareholder protection and dividend policy: an experimental analysis

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Abstract

For nearly half a century, the literature on dividend payments has questioned why firms pay dividends at all. Two competing models have emerged to explain this. In low investor protection regimes, corporate insiders give dividends to signal trust. In high-protection regimes, outside investors have the power to demand dividends. Using a unique laboratory experiment, our results back the empirical literature, favoring the complement (outcome) model over the substitute model. An increase in outside shareholders' rights increases dividend payments, reducing overall efficiency. The efficiency loss moving from low- to high-protection treatments can occur via multiple channels, and we find significant evidence of losses through each. One benefit of laboratory analysis is that some of these channels are not observable outside the lab (such as insider expropriations). Additionally, we find that high investor protection causes a greater efficiency loss than dividend taxes do.

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1 Introduction

The literature on dividend payout policies follows the trends in how firms behave. For example, research agendas have grown around the question of why companies began moving away from dividends in the late 1970s, why share repurchases became more popular than dividends since the mid-1990s, and why firms currently hold so much cash without increasing dividends.[1] Before all these, and beginning with the seminal paper by Modigliani and Miller (1958), researchers studied why firms pay dividends in the first place. Likely explanations came from the agency literature which assumes that corporate insiders have means of expropriating cash holdings in ways that reduce shareholder value.[2] For example, they could invest in projects that yield personal benefits to the insiders but reduce overall earnings, they could dilute the holdings of outside investors by issuing shares to insiders, or they could simply pay the insiders more with the excess cash. Dividends reduce cash holdings and so constrain insiders from expropriating them for their own benefit. Two competing mechanisms for dividend payouts emerged from this setting. One arises from shareholders having strong legal protection and demanding dividends in order to constrain insiders. The second emerges from insiders using dividends to build a reputation for not expropriating funds, in which case dividends substitute for shareholder legal protection.

La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) posit that if shareholder rights and dividends are complements dividend payout ratios should be higher in countries with stronger legal protection (the outcome model), but if they are substitutes dividend ratios should be higher with weak shareholder protection (the substitute model). Their empirical analysis of 4,100 corporations in 33 countries supports the outcome model. Many subsequent papers have used other data sets and other empirical strategies to determine whether dividends and corporate governance are substitutes or complements. We add to this literature by running an experiment in which treatments differ by the strength of shareholder protection.

Our experiment has two main treatments, both of which allow insiders the opportunity to expropriate funds for their own benefit. In the low-protection treatment insiders determine dividend payouts, and in the high-protection treatment outsiders do. This second treatment captures the idea advanced by La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) that in high corporate governance regimes investors can demand dividends. When we compare dividends across treatments we find that dividend/cash ratios are five times higher in the high-protection treatment, an effect with the same direction but a much larger magnitude as found by La Porta et al. Thus, the laboratory results provide more evidence favoring the outcome model over the

[1]See, for example, Fama and French (2001) for the decline in dividends, Grullon and Michaely (2002) and Skinner (2008) for the rise in repurchasing, Bates, Kahle, and Stulz (2009) for the abundance of cash on-hand, and Farre-Mensa, Michaely, and Schmalz (2014) for a recent survey.

[2]The seminal paper in the agency literature is Jensen and Meckling (1976).

substitute model.

There are particular reasons why laboratory experiments can add significant value to the literature on agency models of corporate dividend strategies. The explanations for dividends rest on the premise that unless otherwise controlled, insiders expropriate corporate funds for their own benefit, but empirical work based on financial data must, for the most part, proceed without observing insider expropriations. For example, La Porta et al.'s estimates came entirely from sales and dividend data along with national laws. Berkman, Cole, and Fu (2009) represents one exception, reporting direct evidence from Chinese firms of expropriation by large shareholders (tunneling) through loan guarantees, and Jiang, Lee, and Yue (2010) represents another based on Chinese intercorporate loans. The laboratory experiment allows us to observe insider behavior directly, and we find that the expropriation/cash-on-hand ratios are 20 percentage points higher in the high-protection treatment than in the low one.

The most striking contribution from the experimental approach is that we can observe efficiency of the investor-insider relationship and, moreover, can trace any inefficiencies to their sources. In the low-protection treatment, the outsider has 100 tokens and can invest any fraction of that in the firm. The amount retained by the investor does not grow in value, but the amount invested with the firm grows by 30% per period, and we refer to this new amount as the firm's cash on hand, or cash for short. In period 2 the insider can allocate any portion of the firm's cash back to the outsider (dividend) or to his own personal account (expropriation), and as with the outsider's personal account, funds in the insider's personal account do not earn interest. The outsider observes the dividend payment but not the expropriation, so from this point forward cannot infer the amount of cash on hand. The amount left as cash again grows by 30%, and in period 3 the insider can make another expropriation/dividend allocation. There is no interest earned between periods 3 and 4, but in period 4 the outsider can invest any funds in his personal account back with the firm. Periods 5 and 6 are the same as periods 2 and 3, with 30% growth in cash before the periods and expropriation/dividend allocations during the periods. Following the final period-6 expropriation/dividend decision, any remaining cash is allocated 60% to the outsider and 40% to the insider. The high-protection treatment is the same except that instead of the insider determining dividend payments, the outsider determines them.[3]

This game generates three sources of inefficiency. Irrespective of the treament, surplus is maximized when the outsider invests all 100 tokens in the first period and nothing is removed until period 6. Funds taken out of the firm and placed in personal accounts do not grow, and so both dividends and expropriations reduce efficiency.[4] Furthermore, funds not invested by the

[3]In the high-protection treatment if the sum of the dividend demanded by the outsider and the expropriation demanded by the insider exceed the amount available in cash-on-hand, the insider's expropriation is allocated in full and the outsider receives the remainder.

[4]The one exception is a dividend paid in period 3, because cash-on-hand does not earn interest between periods 3 and 4 and the period-3 dividend payment can be reinvested in period 4, making the period-3 dividend

outsider do not grow either, so uninvested funds are a third source of inefficiency.

Paradoxically, increased outsider protection reduces outsider investment, leading to markedly lower efficiency in that treatment. In the game combined earnings of the two players can reach as high as 286 tokens, and as low as 100 tokens if the outsider never invests, a 186-token difference. In the low-protection treatment the two parties capture 71 of the 186 possible difference, but in the high-protection treatment they only manage to accumulate 15 more tokens than the outsider started with. Combined earnings are a highly-statistically-significant 55 tokens *lower* in the high-protection treatment than in the low-protection one, which corresponds to a one-third decrease in efficiency. Most of this loss comes right at the beginning, with the outsider investing 17 fewer tokens, or 45% less, in period 1 of the high-protection treatment. Efficiency deteriorates still further from there, with losses from dividends, expropriation, and failure to reinvest all larger in the high-protection treatment. In our experiment, then, strong investor protection leaves the firm with far less money to work with than weak protection does.

Our diminished efficiency finding contrasts with the empirical literature on how legal and financial institution strengths correlate with firm value and economic growth. La Porta, Lopez-de Silanes, Shleifer, and Vishny (2002) show that increased shareholder protection against insider expropriation correlates with increased firm value,[5] and Knack and Keefer (1995) find that countries with better citizen protection against government expropriation have higher economic growth and income. On the other hand, Bae, Baek, Kang, and Liu (2012) find that firm value increases when corporate governance controls the expropriation ability of large shareholders, not insiders, and Gompers, Ishii, and Metrick (2010) find a similar result about controlling the expropriation ability of the privileged investors in dual-class firms. In these firms outsider investors receive one vote per share but insider investors receive more, and Gompers, Ishii, and Metrick (2010) find that firm value decreases with privileged investor voting rights.[6] In our high-protection treatment investors have the power to give themselves dividends, which can be considered a form of expropriation by large or privileged investors. We enhance the Bae et al. and Gompers et al. findings by showing that controlling shareholders not only increases firm value by reducing expropriation by the outsiders, but also by increasing their investment in the firm and by reducing *insider* expropriation as well. Because it allows for expropriation by both the investor and the insiders, our study suggests that expropriation by large shareholders may be a larger problem than expropriation by insiders.

Our experiment has relevance for the literature on dividend policy and taxes. We ran versions of both the low-protection and high-protection treatments in which dividends were taxed. While

potentially efficiency-neutral.

[5]See also Durnev and Kim (2005).

[6]Jordan, Liu, and Wu (2014) find that a substitute model holds for the privileged shareholders in dual-class firms, in that they use dividend payouts to commit to not expropriating cash-flow.

we found that taxes reduce combined earnings, the efficiency loss came directly from the taxes themselves, because we found no statistically significant effect on initial investment or dividends, but we did find that taxes led to an *increase* in expropriations. The non-effect of taxes on dividends is consistent with empirical studies of taxes and dividends, where the consensus result is that investor protection matters more than taxes for dividend policies.[7]

2 Experimental Design

There are at least two sets of critical features needed for an experiment to be able to provide evidence if dividends and investor protection are compliments or substitutes. First, the experiment must embed the ability for subjects to build trust. In the substitute model, agents operating a firm on the inside use dividends as a costly signal thought to increase trust and secure future investment from principals investing from the outside. As a result, the experiment must give subjects enough time and repeated interactions to build trust during each run, along with a way for principals to respond to the signals.

Second, the experiment must have a mechanism to exogenously vary the level of shareholder protection. In order to maximize external validity, we use the hypothesized reason that dividends are paid within both the substitute and outcome models to motivate the way in which dividends are paid within the experiment. Varying this across treatments provides both a change in the level of outsider protection and a change in the mechanics of how dividends are paid, as desired. This mechanism is discussed in detail later.

We use a novel experimental design crafted with both of these important features in mind. The design mimics a principal investor purchasing shares in a firm and actual effort decisions of an employee at that company acting as the potential shareholder's agent. As in actual investment decisions, there are elements of trust, shirking, and patience which interact to affect decision making. To that end, the design bears some conceptual resemblance to both the trust game and the centipede game (Berg, Dickhaut, and McCabe (1995) and Rosenthal (1981)).

We recruited undergraduates for the experimental lab at the University of Tennessee, Knoxville to participate in the experiment. The experiment was run entirely using z-Tree.[8] We ran six sessions of 16 subjects each. Each subject plays 12 games, and each game has 6 periods. This totals to 576 observations at the game level. Subjects are paid based on exactly one of the twelve games they play, which is chosen at random on the session level. Tokens were earned at a rate of 10 tokens = \$1. This was paid on top of a \$10 participation fee.

There were 6 treatments, set up in a 2×3 design. Subjects never varied across the binary

[7] See Chetty and Saez (2005) and Alzahrani and Lasfer (2012) for the interplay of tax rates and payout policy, as well as the survey by Farre-Mensa, Michaely, and Schmalz (2014).

[8] See Fischbacher (2007).

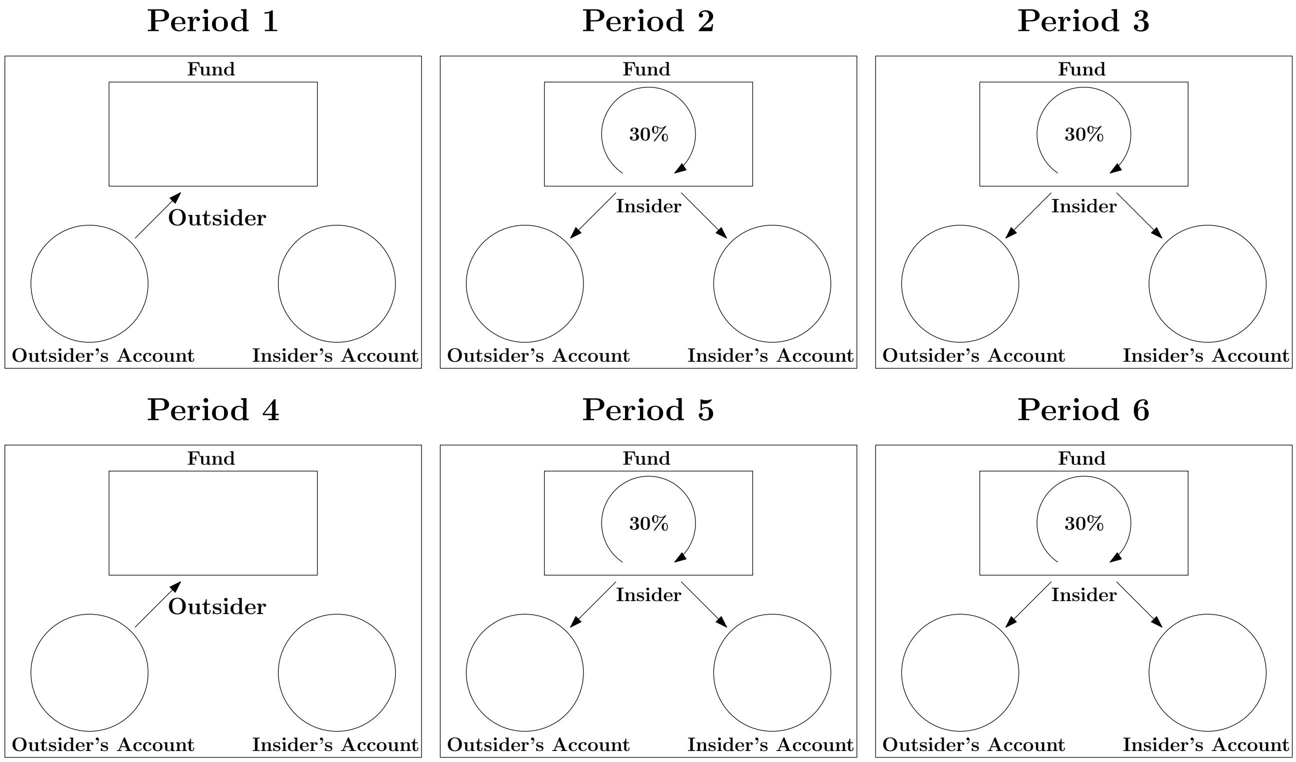

Figure 1: Visualization of the dividend treatment experimental design with low outsider protection

dimension, but they rotated in the other dimension across the twelve games following the pattern *AAA BBB CCC AAA*. More details regarding the treatments are discussed later.

For each game, subjects are randomly and anonymously paired. Rematching occurs, with replacement, before each game. Within each pair, there are two roles, the outside investor (principal) and the corporate insider (agent). Each subject always plays the same role throughout the entire session.

Each player has a personal account. The amount of tokens in their account at the end of the game is the number of tokens they earn for that game. That is, for a given game, if that game is chosen as the payoff game for that session, then subjects are paid according to the number of tokens in their account at the conclusion of that game. In addition to the two accounts, there is also a "fund," which represents a firm, or more specifically, represents a firm's cash on hand. The firm periodically earns interest (as described below) at a rate of 30%.

The flow of the 6 periods is shown in Figure 1. Consider first our main treatment (low outsider protection with untaxed dividends, or "LU"). In the beginning, the outsider is endowed with 100 tokens in her account, while the insider has 0 in hers. The firm also has 0 tokens. In period 1, the outsider has the opportunity to invest any amount of her tokens in the firm.

Moving into period 2, the firm's fund earns 30% interest (rounded to the nearest whole

Table 1: Experimental Treatments

	Protection Treatment	
Dividend Treatment	Low Protection	High Protection
No Dividends	LN	HN
Untaxed Dividends	LU	HU
Taxed Dividends	LT	HT

NOTE: All subjects remain either an insider or outsider for entire session. Protection treatment never varied within a session.

number of tokens). The insider then has the opportunity to move tokens from the fund to his own account and to the outsider's account. Movements to his own account represent insider expropriations, and movements to the outsider's account represent dividend payments. It is crucial to note that the outsider cannot observe either the firm or the insider's account. From this point forward, the outsider can never infer either of these values.[9] Period 3 then operates exactly identically to period 2.

Period 4 is the reinvestment period. No interest is earned moving into period 4. Instead, the outsider again has the opportunity to invest tokens from her personnal account into the firm's fund. Recall that she cannot see the current value of the firm. She can, however, receive a signal about firm value in the form of period 3 dividends.[10] The outsider can invest any portion of her account, which at this point can range from 0 tokens (if all was inititally invested and no dividends were paid) to 169 tokens (if all was initially invested and all was repaid as period 3 dividends).

Periods 5 and 6 operate exactly as periods 2 and 3. Following period 6, any tokens remaining in the firm's fund are split according to a known 60:40 ratio in favor of the outsider. Again, this is all depicted in Figure 1.

Now consider the treatments, which again follow a 2×3 design. The treatment discriptions and corresponding abbreviations are given in Table 1. First varying in the binary dimension, we switch from low to high outsider protection. The mechanism through which this change occurs mimics the competing desctriptions by the substitute and outcome models regarding why dividends are paid. In the substitute model, corporate insiders pay dividends to signal trustworthiness. This was the situation we set up in the LU treatment previously described. In the outcome model, outside investors demand dividend payments. Hence, in the HU treatments, outsiders are able to directly take dividends from the firm.

[9]This parallels investors' inability to check firms' books or insiders' shirking on demand.

[10]Period 2 dividends also send a signal, but sending that signal in period 2 rather than in period 3 does not make sense from the insider's perspective because they forgoe interest by doing so.

It is critical to note that the outsider still cannot observe the value of the firm in the high-protection treatments. The investor can request any amount in dividends, and if that much is not available, then the total remaining value of the firm will instead be paid. In the case that the sum of the dividends demanded by the outsider and the expropriations taken by the insider together overdraws the firm's cash on hand, the insider receives first dibs. That is, the insider is paid the amount that he requested, and the remainder goes to the outsider. This mimics the ability of an agent to expropriate before equity investors are repaid.

Looking at the variation in treatment design along the trinary dimension, there is one mechanism that varies. There is again a difference in how dividends are paid. For both the low- and high-protection treatments, the tax treatments introduce a 25% tax on dividends paid in periods 2, 3, and 5. There is no tax in period 6 because dividends merely reflect a distributional conern at that point. These treatments are abbreviated as LT and HT, as shown in the bottom row of Table 1. This creates an efficiency loss in either using dividends to either send a signal or prematurely taking dividends.

Moving instead up to the top row of Table 1, treatments LN and HN completely eliminate the dividend channel in periods 2, 3, and 5. Again, they exist in period 6 only for distributional concerns. Because they serve as a baseline where no signaling is possible, the no-dividend treatments are sometimes referred to as the "baseline" treatments.

Each subject faced a total of 3 treatments across the 12 games they played. These varied only within the trinary dimension, cycling through one column of Table 1. Each of the 6 sessions started in a different treatment cell and worked downward, rotating back to the top following the tax treatment. Treatments were run in sets of 3 games. That is, calling treatments A, B, and C for simplicity, a subject starting on A would play the 12 games as AAA BBB CCC AAA.

At the end of each session, we administered a questionnaire to the subjects. The questionnaire did not affect payouts in any way. It consisted of a Holt-Laury risk ladder and standard demographic questions. This was done while payout envelopes were stuffed so that it added no time to the experiment. Average session times were less than 90 minutes and average payouts were $22. This includes the tokens earned within the game, which were exchanged at a rate of 10 tokens to $1, and a $10 show-up fee for all participants.

2.1 Hypotheses and Game Discussion

The protocols faced by the subjects are new to the laboratory, so the first task entails testing for evidence of rational responses. The design builds in two ways to test for within-treatment and across-treatment rationality. The first such test arises from the low-protection treatments where the insider makes all of the allocation treatments.

The insider can pay dividends to the outsider in periods 2, 3, 5, and 6. Recall that the cash on hand also grows at the beginning of these periods. Thus, paying out dividends too early creates lost potential income. For example, funds not paid out in period 2 grow by 30% in period 3. A dividend payout path (d_2, d_3, d_5, d_6) with $d_2 > 0$ generates less surplus than the alternative path $(d_2 - \epsilon, d_3 + \epsilon, d_5, d_6)$ that delays a payment of $\epsilon < d_2$ from period 2 to period 3, because the payout delay grows the surplus by $.3\epsilon$ in just one period. The same holds for delaying the period-5 dividend until period 6, as well as for an expropriation path (e_2, e_3, e_5, e_6) with $e_2 > 0$ or $e_5 > 0$. These considerations lead to the following hypothesis.

Hypothesis 1a. In the low-protection treatments, dividend payouts and expropriations are lower in periods 2 and 5 than in periods 3 and 6, respectively.

In order to understand why Hypothesis 1a specifically ignores high-protection treatments, it helps to examine the similarities between each protection regime and previous experiments. The low-protection treatment has much in common with the oft-studied trust game of Berg, Dickhaut, and McCabe (1995). In the trust game, player 1 begins with an endowment and can invest any fraction of that in the trust relationship. The amount invested is tripled, and then player 2 allocates the proceeds between himself and player 1. The low-protection treatment extends the trust game by (i) allowing the insider to allocate the proceeds before they have fully grown, (ii) providing the outsider an opportunity to invest more midway through the growth process, and (iii) identifying a default 60:40 outsider-insider split at the end of the game. Experiments on trust games have found initial investments averaging about half of the endowment and a slightly positive return on the initial investment (e.g. Berg, Dickhaut, and McCabe (1995)).[11] The design of the low-protection treatment was influenced by the trust game, and the 30% growth rate was chosen to yield a near tripling of the original investment.

The high-protection game is very different, and more closely resembles the centipede game of Rosenthal (1981) than the trust game. In the centipede game, players alternate choosing whether to continue the game or end it, with each continuation choice leading to an increase in the surplus. Whenever the game ends, the player whose turn it was to make a decision receives more than half of the available surplus, thereby alternating who would receive the

[11] Rietz, Sheremeta, Shields, and Smith (2013) extend the trust game into a more dynamic setting by having player 1 invest with player 2, who can then invest any fraction of that with player 3. Investments are tripled at both stages, and at the end of the game player 3 first makes an allocation between herself and player 2, who then makes an allocation between herself and player 1. Greiner, Ockenfels, and Werner (2012) take a different approach, with players participating in a series of trust games in which their endowments in period $t > 1$ are their accumulated earnings from the prior periods. Most closely related to our paper, Lunawat (2013) adapts a trust game by adding randomness to the interest rate that the insider can observe but the outsider cannot. The insider could disclose the actual interest rate in the disclosure treatment but not in the non-disclosure treatment. She finds that outsiders invest more in the non-disclosure treatment, providing another instance of increased corporate governance reducing efficiency.

larger share. The game has a fixed endpoint, and so backward induction leads players to try to end the game in their favor one period before their opponents do.[12] In the high-protection treatment of our investment game, the outsider has an incentive to guarantee his allocation through dividends before the insider expropriates it, and vice versa, and this should intuitively lead to backward unraveling and low initial investment. For this reason, Hypothesis 1a only examines low-protection treatments, where this incentive is not present.

The second gameplay-rationality hypothesis arises from the fact that in some treatments dividends are taxed but in others they are not. Taxes raise the price of dividends, so one would expect less use of dividends in the tax treatments than in the untaxed treatments. Because behavior may differ between the high-protection treatments and the low-protection ones, a test of a rational response to the price increase must compare dividends in the high-protection tax treatment to the high-protection untaxed treatment and in the low-protection tax treatment to the low-protection untaxed treatment. The baseline no-dividend treatments differ from the corresponding tax treatments in that dividend payouts can only occur in period 6 in the baseline but can occur in periods 2, 3, 5, and 6 in the tax treatments, so the baseline treatments cannot be used to test for this type of rationality.

Hypothesis 1b. Dividends are lower in the taxed dividend treatments than in the corresponding untaxed dividend treatments.

Allowing for reinvestment in period 4 allows for an interesting test. The substitute model predicts that outsiders pay dividends to signal their trustworthiness. To accomodate such behavior, the game allows dividends twice before the reinvestment period. Without the reinvestment opportunity, the insider would have no reason to signal. Note that the insider can only send this signal in the low-protection treatment, when she controls dividend payments. We formalize this postulation into the following hypothesis, which omits period 6 because it pertains to distribution preferences.

Hypothesis 1c In the low-protection dividend treatments, dividends are higher in periods 2 and 3 than in period 5.

The next hypothesis is our main one, and it is driven by the literature started by La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) testing the outcome model against the substitute model. The outcome model implies that dividends are higher in the high-protection treatment, the substitute model predicts the opposite, and the preponderance of the empirical evidence favors the outcome model. Our hypothesis states that behavior in the lab mirrors that in the real world.

[12] For experimental evidence see McKelvey and Palfrey (1992) and Levitt, List, and Sadoff (2011).

Hypothesis 2. Dividend/cash on hand ratios are higher in the high-protection treatments than in the corresponding low-protection treatments.

We look at dividends over cash on hand for two reasons. One is consistency with the empirical literature, which has looked at dividends as a fraction of cash on hand and as a fraction of cash flow. In our design, cash on hand corresponds to the amount invested in the firm, which is the maximal amount subjects could allocate to personal accounts in any of the payout periods 2, 3, 5, or 6. The design also generates cash flow in the form of interest on invested funds, but by design cash flow equals 30% of cash on hand, so analyzing that ratio separately cannot yield different results.

The second reason for using the dividend/cash on hand ratio is that it allows for differences in investment behavior across treatments. If the outsider invests less in one treatment than in another, the insider would have fewer funds to disperse in the first treatment. That might lead to lower dividends, which could lead to a false conclusion concerning the outcome model versus the substitute model based more on initial investment behavior than on subsequent payout behavior. Normalizing by cash on hand removes this concern.

The third set of hypotheses relates to efficiency. If the outsider invests all 100 tokens in the first period and subjects allow interest to accrue until period 6, their earnings would sum to 286 tokens.[13] Because neither personal account grows over time, failure to invest the full amount, dividends, expropriations, and failure to reinvest all represent leakages from the system that lead to efficiency losses.

We can measure the efficiency of the relationship by summing the tokens the two parties earn during the seven periods. The empirical literature is silent on efficiency because it is unobservable in the data, but there is no reason for efficiency to be the same across investor-protection regimes. The outcome model predicts higher dividends in the high-protection treatment, which would reduce efficiency there, but those leakages could be offset by differences in expropriations, reinvestment behavior, or initial investment. For this reason we offer the following null hypothesis.

Hypothesis 3a. The high-protection treatments generate the same total surplus as the corresponding low-protection treatments.

The experiment allows for tracing any differences in surplus back to the source of the leakage. The literature is again silent on how efficiency is affected via each leakage channel, so we also

[13] In the no-tax treatments the minimum-achievable surplus is 100 tokens which arises when the outsider invests nothing. In the tax treatments the minimum can be slightly lower and occurs in the following scenario. The outsider invests all 100 tokens in period 1, receives a dividend payout of the entire 130 in period 2, but the 25% tax on dividends reduces it to 98 tokens (after rounding). She reinvests all of this in period 4, it grows to 127 which she receives as a dividend in period 5, but after taxes it is only worth 95.

offer the related null hypothesis agnostically.

Hypothesis 3b. Leakages from initial investment, reinvestment, dividends, and expropriations are the same in the high-protection treatments as in the corresponding low-protection treatments.

However, implications can be drawn about how these channels *might* behave given findings related to each. Bae, Baek, Kang, and Liu (2012) and Gompers, Ishii, and Metrick (2010) find that increases in the power of large and privileged shareholders correlate with reductions in firm value. In essence, large or privileged shareholders can expropriate funds in much the same way that insider managers can, leading to a contest to see who can get the funds out of the firm first. Backward unraveling then leads to the outsiders withholding investment in the first period, culminating in extremely low firm valuations. Within the context of our experiment, the high-protection treatments represent the increase in large shareholders' power, and the resulting game more closely resembles this backward unraveling. Initial investment might be expected to be lower in the high-protection treatment, thus increasing leakage.

Leakages through dividends directly mirror the effects on the ratio of dividends to cash on hand. By including cash on hand in the analysis, any change in initial investment is accounted for. Thus, an increase in the ratio implies a greater loss due to leakages, as the outcome model predicts high outsider protection will cause, while a decrease implies less leakages, as the substitute model predicts high protection will cause.

Insider expropriation is generally unobservable in financial data. For this reason, predicting the impact of outsider protection regimes on expropriations based on existing empirical literature is difficult, and thus our link to predicting how leakages relate to protection regimes is tenuous at best. Berkman, Cole, and Fu (2009) examine insider expropriation in the form of "tunneling" from Chinese firms through loan guarantees, and Jiang, Lee, and Yue (2010) examine it via Chinese intercorporate loans. Both find that larger expropriations are correlated with smaller firm size. In our experiment, firm size is directly related to initial investment, and thus their results suggest lower initial investment should spark higher insider expropriations. If we take at face value the previously discussed link suggesting higher outsider protection spurs lower initial investment, then our high-protection treatments should yield higher insider expropriations, and thus cause a larger loss in efficiency via this channel. Again, due to the multiple leaps of faith required to reach these conclusions, our null for Hypothesis 3b remains agnostic.

Hypotheses 2, 3a, and 3b all relate to corporate payout policies. It would be possible to add a number of behavioral hypotheses. For example, fairness preferences would suggest that dividends and expropriations should be approximately equal in size, an aversion to being behind would suggest that the insider makes a sufficient period-6 expropriation to guarantee that he does not earn less than the outsider, and so on. Exploring these hypotheses might add to the behavioral literature, but it would detract from the focus of the paper on dividend payout policies, so we leave these avenues unpursued.[14]

The key to our design rests in switching control of dividends from the insiders to the outsiders. Beyond this there were a number of design choices that had to be made, and these included the length of the game, especially the choice to have a fixed endpoint for the relationship rather than allowing for one that would mimic an infinitely-repeated game. We chose to do this because an infinite number of rounds would allow for supergame strategies that would promote cooperation, which in turn would take the form of increased combined earnings. Dividends, expropriations, and reinvestment choices could all be driven by punishment strategies, and the existing literature in finance does not think about payout policy in this way. Consequently, we believe that our design isolates the theorized rationales for dividends more than an infinite-round version of the game would.

The prevailing theories predict a number of different behaviors, and we made design choices in order to allow these behaviors to occur and to be testable. As mentioned, we allow for dividends before the reinvestment period in order to test signaling, and we allow for two dividend and expropriation periods between investment periods to detect unraveling. Most importantly, though, our design had to capture the essences of weaker and stronger investor protection regimes. The choice here was driven primarily by the outcome model, which posits that dividends occur because strong shareholders demand them. Rather than having outsiders request dividends from the insiders, we chose to let the outsiders simply take them. Giving insider claims precedence over outsider ones in case the simultaneous claims exceeded cash on hand had the effect of giving insiders some control over how much outsiders could demand, but not too much control. In all we contend that the design captures the salient aspects of investor protection laws and allows for the behavior posited in empirical studies of the topic. We find evidence in line with the hypothesized rationales for dividend payments, and we also find some new results.

3 Results

Table 2 provides an overview of the variables of interest across the six experimental treatments. The labels "Low" and "High" refer to the low-protection and high-protection treatments, respectively, and the remaining labels refer to whether dividends can be paid and whether they are taxed in periods 2, 3, and 5. The second column of the table introduces the codes we use to refer to the different treatments, with LN referring to the low-protection, no-dividend treatment, and so on. The table aggregates dividends and expropriations from periods 2, 3, and 5, leaving

[14] Breuer, Rieger, and Soypak (2014) explore behavioral issues in dividend payout policy using firm-level data on dividends and country-level data on behavioral characteristics like time preferences along with risk, loss, and ambiguity attitudes.

Treatment	Code	Initial investment	Total dividend	Total expropriations	Final firm value
Low, no dividends	LN	38.4	-	6.3	108.5
Low, untaxed dividends	LU	38.2	2.0	7.7	107.8
Low, taxed dividends	LT	31.0	1.3	7.5	82.7
High, no dividends	HN	20.0	-	18.4	33.5
High, untaxed dividends	HU	20.8	13.2	23.1	6.6
High, taxed dividends	HT	19.1	10.1	20.9	8.3

Total dividends = dividends in periods 2, 3, and 5
Total expropriations = expropriations in periods 2, 3, and 5
Final value of the relationship = dividends and expropriations in period 6 + final amount split

Table 2: Experiment summary statistics

out period 6 because those payments are more for allocating the final cash on hand differently than the prescribed 60:40 outsider-insider split. The final firm value represents the amount of cash on hand the two parties have available to allocate in periods 6 and 7, and this value comes from funds remaining invested in the firm at the end of five periods. The maximum that this value can attain is 286 when the outsider invests everything in the first period and neither party removes any funds prior to period 6, and the minimum value is 0, which occurs when the outsider invests nothing.

Hypothesis testing requires disaggregating by period, but still the aggregated data can reveal several striking patterns. Insiders do, in fact, expropriate funds, and they expropriate more in the high-protection treatments than in the corresponding low-protection ones. The primary question for the this paper relates to comparing dividends across the low-protection and high-protection treatments, and firms pay more aggregate dividends in the high-protection treatments than in the corresponding low ones. This is consistent with the outcome model and the findings in La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000), but these numbers do not account for how much cash was on hand for dispersal each period. Taxing dividends leads to a small reduction in payouts. Finally, low-protection treatments have lower initial investment and produce less-valuable firms than high-protection ones do.

3.1 Gameplay Rationality

As argued in Section 2, the experiment allows for a straightforward prediction based solely on subject rationality. In particular, in the low-protection treatments the insider alone has control of how cash on hand is allocated, and can therefore time allocations to take advantage of the fact that cash on hand grows between periods. Consequently insider allocations through dividends and expropriations should be larger in period 3 than in period 2, and larger in period 6 than in period 5.

Testing such a hypothesis is a way to validate an experimental design that is new to the literature. To do so we estimate the following specification:

$$Payout_{ipgt} = \sum_{t\in\{N,U,T\}} \left[\beta_{2t}\mathbf{1}_{p\in\{2,3\}} + \beta_{3t}\mathbf{1}_{p=3} + \beta_{5t}\mathbf{1}_{p\in\{5,6\}} + \beta_{6t}\mathbf{1}_{p=6}\right] + \varepsilon_{ipgt}. \quad (1)$$

In equation (1) the dependent variable is the number of tokens paid either as dividends or expropriations. Because we restrict the sample to only the low-protection treatments, we use number of tokens paid, rather than tokens as a percent of cash on hand, for ease of interpretation. $\mathbf{1}$ is the indicator function, i indexes individuals, and t indexes treatments (N= no dividends, U= untaxed dividends, and T= taxed dividends). Subjects play each treatment several times, and g indexes the time the treatment is being played, which we refer to as a game. Finally, p indexes the period within the game. There are four periods in which dividends could be paid: $p = 2, 3, 5, 6$. The coefficient β_{2t} measure average dividends in tokens common to periods 2 & 3 of treatment t. β_{5t} is defined similarly for periods 5 & 6. The coefficients β_{3t} and β_{6t} capture the marginal effects of advancing one period on payouts. We estimate equation (1) via OLS including subject random effects.

Hypothesis 1a posits that the marginal effects for periods 3 and 6 are nonnegative, highlighting that subjects exploit the ability to earn interest before either paying dividends or expropriating tokens. Hypothesis 1a can be tested in estimating equation (1) by rejecting the joint null hypothesis: $H_0 : \beta_{3t} = \beta_{6t} = 0\ \forall\, t$. Hypothesis 1b posits taxes on dividends decrease dividend payments. Hypothesis 1b can be tested in estimating equation (1) by rejecting the joint null hypothesis $H_0 : \beta_{3T} = \beta_{3U},\ \beta_{6T} = \beta_{6U}$.

Table 3 shows results from estimating equation (1).[15] The first two columns have dividends as the dependent variable, and the third and fourth columns have expropriations. Columns 2 and 4 remove the first instance that each game is played, that is, games 1, 4, and 7. For dividends we use only the untaxed and taxed dividend treatments since dividends cannot be paid in the no dividends treatment. Since expropriations are always available to the insider, we include all three low protection treatments. For the dividend portion of hypothesis 1a, we find that the average dividends are 1.3 tokens higher in period 3 relative to period 2 (significant at the 10% level). The effect is even more pronounced later in each game: period-6 dividends are 16 tokens higher than period-5 dividends (significant at the 5% level). Average dividends in periods 2 and 5 were not significantly different from zero.

[15]The coefficients for pooled periods 5 and 6 had to be dropped for for both treatments LU and LT in column 2 due to a collinearity issue; when dropping games 1, 4, and 7, no dividends were paid out during period 5 in the low-protection treatment for either untaxed or taxed dividends.

Table 3: Treatment by Period Effects on Dividends and Expropriations

	Div		Exprop	
	(1)	(2)	(3)	(4)
Trimmed:	None	1, 4, 7	None	1, 4, 7
LN x (P2 or P3)			2.594*	1.958
			(1.277)	(1.378)
LN x P3			-0.010	0.125
			(1.894)	(2.255)
LN x (P5 or P6)			1.094	0.417
			(0.661)	(0.409)
LN x P6			60.542***	66.347***
			(10.892)	(13.739)
LU x (P2 or P3)	0.156	0.167	2.063**	0.847*
	(0.107)	(0.138)	(0.883)	(0.491)
LU x P3	1.260*	1.319	1.771	2.764*
	(0.692)	(0.908)	(1.511)	(1.585)
LU x (P5 or P6)	0.438	0.000	1.792**	1.056
	(0.431)	(.)	(0.675)	(0.746)
LU x P6	16.063**	14.986**	63.146***	68.639***
	(6.705)	(6.039)	(11.988)	(14.737)
LT x (P2 or P3)	0.365	0.139	3.521***	1.486**
	(0.221)	(0.092)	(1.211)	(0.650)
LT x P3	-0.083	0.069	-1.240	0.569
	(0.129)	(0.047)	(1.585)	(1.514)
LT x (P5 or P6)	0.677	0.000	1.719**	0.639
	(0.465)	(.)	(0.698)	(0.612)
LT x P6	4.042*	5.889**	43.333***	43.792***
	(1.971)	(2.712)	(9.332)	(10.858)
N	768	576	1152	864
r2	0.125	0.112	0.365	0.364

Standard errors in parentheses
Notes: All errors are clustered at the subject level. Only low-protection treatments are used.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For the expropriation portion of hypothesis 1a, the period-6 marginal effects are large and significant in each of the LN, LU and LT treatments (60.5, 63.1, and 43.3 respectively). Put another way, period-6 expropriations are roughly at least an order of magnitude larger than all other expropriation coefficients. However, unlike in the dividends regressions, in no treatment was the marginal effect of period 3 significantly different from zero. This is expected: with dividends, there is an opportunity to build trust with period-3 dividends. Conversely, with expropriations there is only an efficiency loss from expropriating in period 3. Insiders do, though, display some degree of impatience for expropriating tokens: in each of the LN, LU and LT treatments, average expropriations across periods 2 and 3 are significantly greater than zero, although magnitudes are small (2.6, 2.1, and 3.5 respectively).

Turning to the second gameplay rationality hypothesis 1b, in the taxed dividend treatments we observe that subjects only paid dividends significantly greater than zero in period 6. Hence, taxes appear to significantly influence dividend behavior in a way consistent with the hypothesis. We can reject the joint null hypothesis that taxes have no effect, that is, $\beta_{3T} = \beta_{3U}$ and $\beta_{6T} = \beta_{6U}$ using an F-test ($p = 0.0415$).

Hypothesis 1c predicts that, in the low-protection treatments, dividends in periods 2 and 3 are higher than in period 5. This hypothesis stems from the substitute model's postulation that insiders pay dividends as a means to signal trustworthiness to outside investors. This is not predicted in high-protection treatments, where investors choose their own dividends. Hence, in looking at hypothesis 1c, we both look for evidence to reject the null in low-protection treatments and check the corresponding high-protection treatments as a test for false-positives. We also examine the extent to which introducing a dividend tax, which effectively increases the cost of signaling, dampens that signaling.

Table 5 shows the period-by-period effects of each treatment on dividends over cash on hand. The first pair of columns represent one regression, with the first column representing the low-protection treatments and the second representing the marginal impact of switching to high protection. The second pair does the same but trims off games 1, 4, and 7.

For the LU treatment, we test the coefficient for period 3 against that for period 5. We can reject the null that the two are equal ($p = 0.074$), lending support to hypothesis 1c. When taxes are introduced in treatment LT, the effect goes away ($p = 0.487$). Additionally, unlike in treatment LU, there is no reason to see signaling in treatment HU. Testing the coefficient for period 3 against that for period 5 here, we cannot reject the null ($p = 0.494$). Thus, we find evidence for trust signaling in the untaxed low-protection treatment, as the substitution model predicts. However, either switching to the high-protection treatment or introducing a dividend tax effectively negates any traces of signaling.

In sum, we find gameplay results very consistent with rational gameplay and our first set of hypotheses. We also find evidence that insiders are impatient, even when there is no incentive for them to be. This impatience finding highlights a strength of our design: because we include a baseline treatment with no dividends across both the high and low protection scenarios, we can difference out this impatience effect to focus solely on how protection affects dividend payouts and efficiency losses from expropriations.

3.2 The La Porta et al. Hypothesis

Turning to the paper's primary question of how dividend payouts change with investor protection, the outcome model predicts dividend payout ratios will be higher in the high-protection treatment than in the low ones, and the substitute model predicts the opposite. The former has found more support in the literature, beginning with La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000). These tests, using financial data, typically regress dividend/cash-on-hand ratios on control variables that include a measure of investor protection. We do the same here.

Figure 2 shows dividend payouts averaged across all periods as a percent of cash on hand for each of the six treatments. There are, by definition, no dividends in the LN and HN treatments. Dividends in treatments HU and HT are both significantly larger than in LU and LT, respectively. The differences are statistically significant. Consistent with hypothesis 1b, taxes appear to decrease dividend payouts. However, the effects of taxes are very much second order to the effects of shareholder protection treatments.

To test the precise magnitudes of moving from low to high shareholder protection, we estimate the following regression restricting the sample to only those treatments in which dividends were paid:

$$Dratio_{igt} = \beta_{LU}\mathbf{1}_{t\in\{LU,HU\}} + \beta_{HU}\mathbf{1}_{t=HU} + \beta_{LT}\mathbf{1}_{t\in\{LT,HT\}} + \beta_{HT}\mathbf{1}_{t=HT} + \epsilon_{igt}. \tag{2}$$

In equation (2), the variable *Dratio* is the ratio of dividends to cash on hand expressed as a percentage. β_{LU} and β_{LT} measure the average dividend payouts in the untaxed and taxed dividends low-protection treatments, respectively, aggregated across all periods. The coefficients β_{HU} and β_{HT} capture the marginal effects of switching to the untaxed and taxed dividend high-protection treatments. In line with Hypothesis 2, our data support the outcome model when $\beta_{HU} > 0$ and $\beta_{HT} > 0$. Such a finding would imply the marginal effect of switching to the high dividend treatment is to increase dividend payout. Conversly, a finding of $\beta_{HU} < 0$ and $\beta_{HT} < 0$ would support the substitute model.

We estimate equation (2) using OLS, with three modelling notes. First, we exclude individual fixed effects because there is no high versus low protection variation within subjects. This was an experimental choice to eliminate contamination across treatments. Second, we cluster

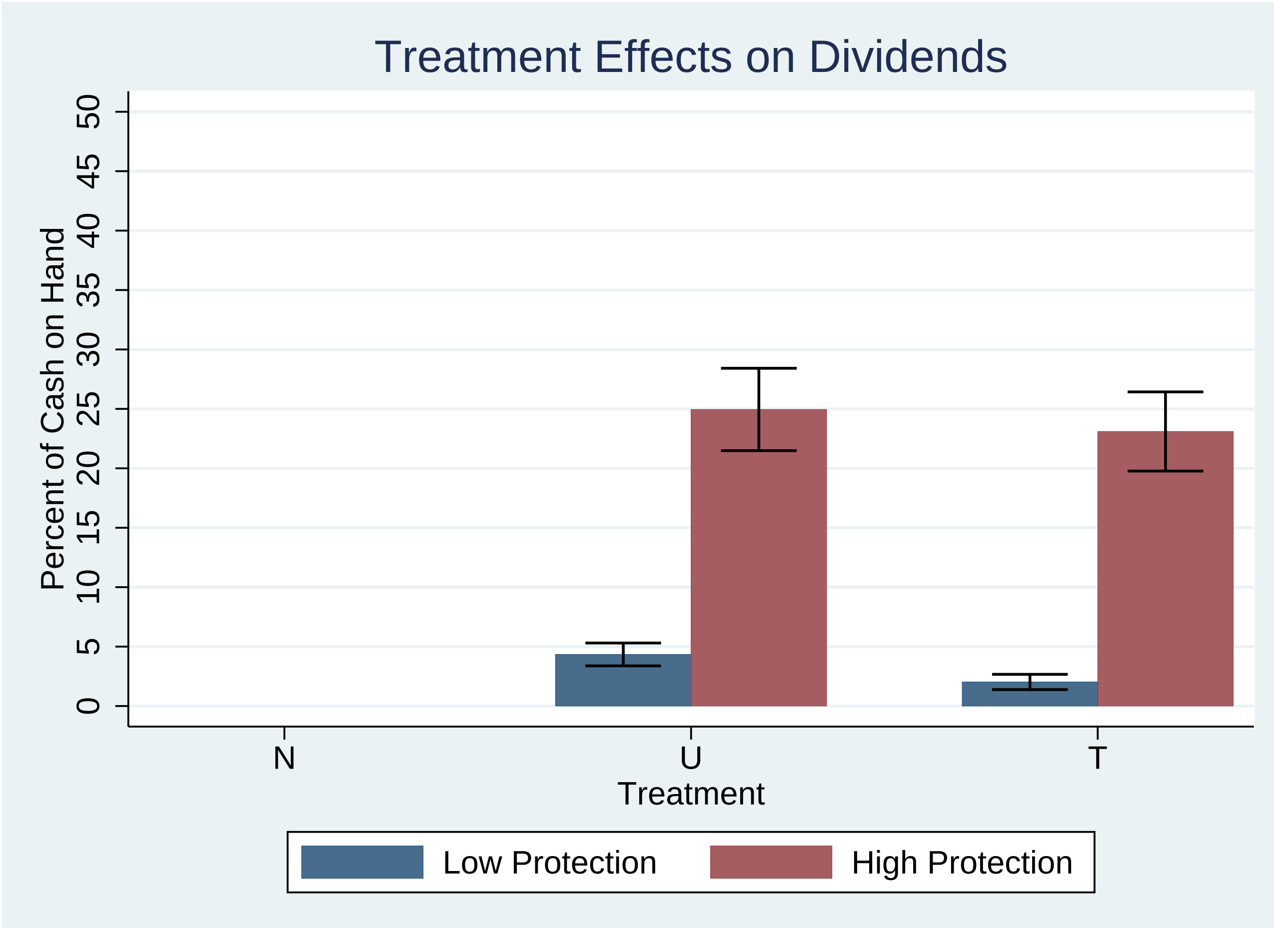

Figure 2: Treatment Effects on Dividends as a Percent of Cash on Hand

standard errors at the subject level to allow for correlation in dividend behavior within subjects. Lastly, we multiply the dividend to cash on hand ratio by one hundred so that coefficients are in percentage points.

The first two columns of Table 4 show the estimated coefficients from equation (2). The first column uses the full sample, while the second column removes the first iteration of each treatment to eliminate any learning effects within a treatment. The third and fourth columns show results for the same estimating equation with expropriations as a percent of cash on hand as the dependent variable; we discuss those results at length below. The results show strong support for the outcome model, with dividend ratios a highly-significant 21 percentage points larger in the high-protection treatments than in the low ones (i.e., both $\hat{\beta}_{HU} > 0$ and $\hat{\beta}_{HT} > 0$). Looked at differently, high investor protection generates dividend ratios that are 5 times larger in the no-tax treatments and 10 times larger in the tax treatments when compared to low-protection regimes.

To investigate the results in a disaggregated way, Table 5 shows results from estimating

Table 4: Treatment Effects on Dividends and Expropriations (as a Percent of Cash on Hand)

	$\frac{\text{Div}}{\text{CoH}}$		$\frac{\text{Exprop}}{\text{CoH}}$	
	(1)	(2)	(3)	(4)
Trimmed:	None	1, 4, 7	None	1, 4, 7
LN or HN			19.820***	19.454***
			(1.789)	(2.202)
HN			15.877***	17.097***
			(3.650)	(4.647)
LU or HU	4.342***	3.855***	21.928***	21.231***
	(0.961)	(0.989)	(1.611)	(1.965)
HU	20.610***	21.861***	20.595***	20.988***
	(3.466)	(4.122)	(4.076)	(5.629)
LT or HT	2.026***	1.697***	23.334***	23.274***
	(0.642)	(0.619)	(2.995)	(3.055)
HT	21.075***	21.353***	21.054***	20.408***
	(3.328)	(4.643)	(4.586)	(5.584)
N	806	539	1256	852
r2	0.302	0.290	0.395	0.378

Standard errors in parentheses

Notes: All errors are clustered at the subject level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

equation (2) by period. That is, we estimate

$$Dratio_{ipgt} = \Sigma_{p \in \{2,3,5,6\}} \, \Sigma_{t \in \{U,T\}} \left[\beta_{Ltp} \mathbf{1}_{t \in \{Ltp, Htp\}} + \beta_{Htp} \mathbf{1}_{Htp} \right] + \epsilon_{ipgt}. \tag{3}$$

This allows us to compare the relative magnitudes of any dividends used as signals in the low protection treatments versus dividend behavior in the high protection treatments. Rows of the table are paired corresponding to periods of the game, with the first row in each pair pertaining to the relevant period of untaxed dividend treatments and the second pertaining to the taxed dividend treatment. The first column can be interpreted as the coefficient for the low-protection treatment and the second column shows the marginal effect of moving to the high-protection treatment. The third and fourth columns show robustness to excluding the first game each individual plays in each treatment.

Coefficients in the high-protection treatment columns are marginal effects, and so positive coefficients provide support for the outcome model. With one exception all of these coefficients

Table 5: Treatment Effects on Dividends (as a Percent of Cash on Hand) by Period

Trimming:		None		1, 4, 7	
		L or H	H	L or H	H
P2	U	0.322*	25.150***	0.245	26.883***
		(0.191)	(4.199)	(0.175)	(4.828)
	T	0.889	23.034***	0.321	22.281**
		(0.589)	(7.064)	(0.229)	(8.509)
P3	U	5.345**	18.968***	5.338**	17.475**
		(2.494)	(6.802)	(3.112)	(7.908)
	T	0.611	29.334***	0.434	31.710***
		(0.375)	(5.035)	(0.315)	(6.663)
P5	U	0.534	29.801***	0.000	33.816***
		(0.512)	(5.851)	(0.000)	(7.408)
	T	1.491	15.815***	0.000	17.918***
		(1.144)	(4.655)	(0.000)	(5.529)
P6	U	10.949***	-2.207	9.668***	-9.668***
		(3.509)	(6.291)	(3.310)	(3.310)
	T	5.103***	15.734**	6.009	12.778
		(1.851)	(7.783)	(2.363)	(11.552)
N		806		539	
r2		0.326		0.327	

Standard errors in parentheses
Notes: All errors are clustered at the subject level. Each cell represents a single coefficient in the regression (or corresponding standard error). The row gives the cell's period and dividend treatment. The column gives its protection treatment. Treatments with no dividends in periods 2, 3, and 5 are excluded.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

are positive, highly significant, and large. The sole exception comes from period 6 dividends in the no-tax treatments, and this could be driven by the high period 6 dividends in the LU treatment rather than low ones in the HU treatment. Still, the disaggregated results support the outcome model, and the laboratory experiment aligns well with the results from studies using financial data.

The outcome model is driven by investors with high protection demanding higher dividends, while the substitute model is driven by firms paying dividends to build a reputation for good stewardship of the invested funds. Any evidence of using dividends to signal good stewardship would appear in Table 5, and signaling would lead to positive payouts in the low protection treatments in period 3, before the reinvestment opportunity. Table 5 shows that this occurs in the LU treatment, with insiders paying an average of 5.3% of the available cash as dividends in that period, but it does not occur in the LT treatment, with the insiders paying an insignificant 0.6% of cash as a period-3 dividend. The signaling effect present in the untaxed dividend treatment is fully dampened by taxing dividends, which increases the cost of signaling.

In sum, our results are very much consistent with the outcome model as the primary driver of dividend behavior. However, we also find evidence consistent with the proposed signaling rationale for the substitute model of dividends. Also consistent with the substitute model, increasing the cost of signals significantly decreases observed signaling behavior. While we find evidence of both models, dividends are almost two orders of magnitudes higher in the high protection treatments in periods where signaling is inconsistent with rational gameplay (e.g., periods 2 and 5). Dividends are over three times larger in the high protection treatment as the low protection treatment when they can act as signals.

3.3 Efficiency Hypotheses

Results from testing the first two sets of hypotheses show that our lab results are broadly consistent with empirical results from financial data in that the outcome model is the primary determinant of dividend payouts. The primary advantage of the experimental approach, though, is that we observe behavior and outcomes that remain hidden in the financial data. Expropriations are difficult to identify from financial data, of course, but so is total investment relative to possible investment: financial data show how much outsiders invested, but not how much they chose *not* to invest with the firm. Both expropriations and non-investment decisions are observable in the lab.

Observing expropriations and investment allow us to test how shareholder protection levels affect the total efficiency induced by low versus high shareholder protection.[16] Expropriations

[16] Importantly, total efficiency in our laboratory experiment is conditioned on the particular type of remuneration scheme we used in the experiment. In the field, insider remuneration schemes could vary systematically with

and non-investment decisions are two of the three sources of inefficiency in the outsider-insider relationship, the third being dividends. Tokens invested with the firm grow by 30% per period. However, tokens allocated to individual accounts do not. Therefore uninvested tokens are leakages from the system or, alternatively, are sources of forgone earnings. Uninveseted tokens, by the outsider, dividend payouts to the outsider in periods 2, 3, and 5, and expropriations by the insider in periods 2, 3, and 5 all lead to forgone earnings.[17]

Figure 3 shows the evolution and sources of cumulative forgone earnings for our two main treatments- the low and high protection untaxed dividend treatments- across each of the three channels averaged across all such games. The computations are as follows: Funds kept by the outsider in period 1 do not grow in period 2, and so the only forgone earnings in period 2 are 0.3 times the amount kept in the outsider's individual account in period 1. There is no growth between periods 3 and 4, so we combine these into one period for the purposes of the graph, and there are three potential sources of forgone earnings in period 3-4: forgone growth from lack of investment, forgone growth from funds paid as dividends in period 2, and forgone growth from funds paid as expropriations in period 2. These three sources (non-invested funds, dividend payouts, and expropriations) continue through periods 5 and 6. Thus, the bars in period 2 depict the forgone growth that would have occurred between periods 1 and 2, the bars in 3-4 add to that the forgone growth that would have occurred between periods 2 and 3, the period-5 bars add forgone growth between periods 4 and 5, and the period-6 bars add forgone earnings from growth between periods 5 and 6.

Three patterns emerge immediately from Figure 3. First, forgone earnings are substantial, and they are larger for the high-protection treatment than the low one. By inspection, Figure 3 rejects Hypothesis 3a: the high protection treatment creates lower surplus than the low protection treatment. We explore this hypothesis in greater detail below, but the difference is striking. Second, in the low-protection treatment nearly all of the efficiency loss stems from non-investment, while all three channels matter in the high-protection treatment. Third, in both treatments most of the efficiency loss arises from lack of initial investment, and initial investment is sensitive to the investor protection regime.

Figure 3 provides evidence that total efficiency is higher in the low protection treatment. Our design allows us to investigate the composition of efficiency leakage across the high and low protection treatments. We first delve into hypothesis 3b, utilizing our experimental design that allows us to detect leakage through each channel, unlike with standard financial data. Hypothesis 3b agnostically postulates that leakages from investment, dividends, and expropriations are the

shareholder protection levels. We found little to no research linking executive compensation to shareholder protection level. This is a promising future line of research for both field and lab data.

[17]Note that tokens paid as dividends in period 3 could feasibly be reinvested by the outside in period 4 resulting in no efficiency loss. We almost never observed this behavior in the experiment, though.

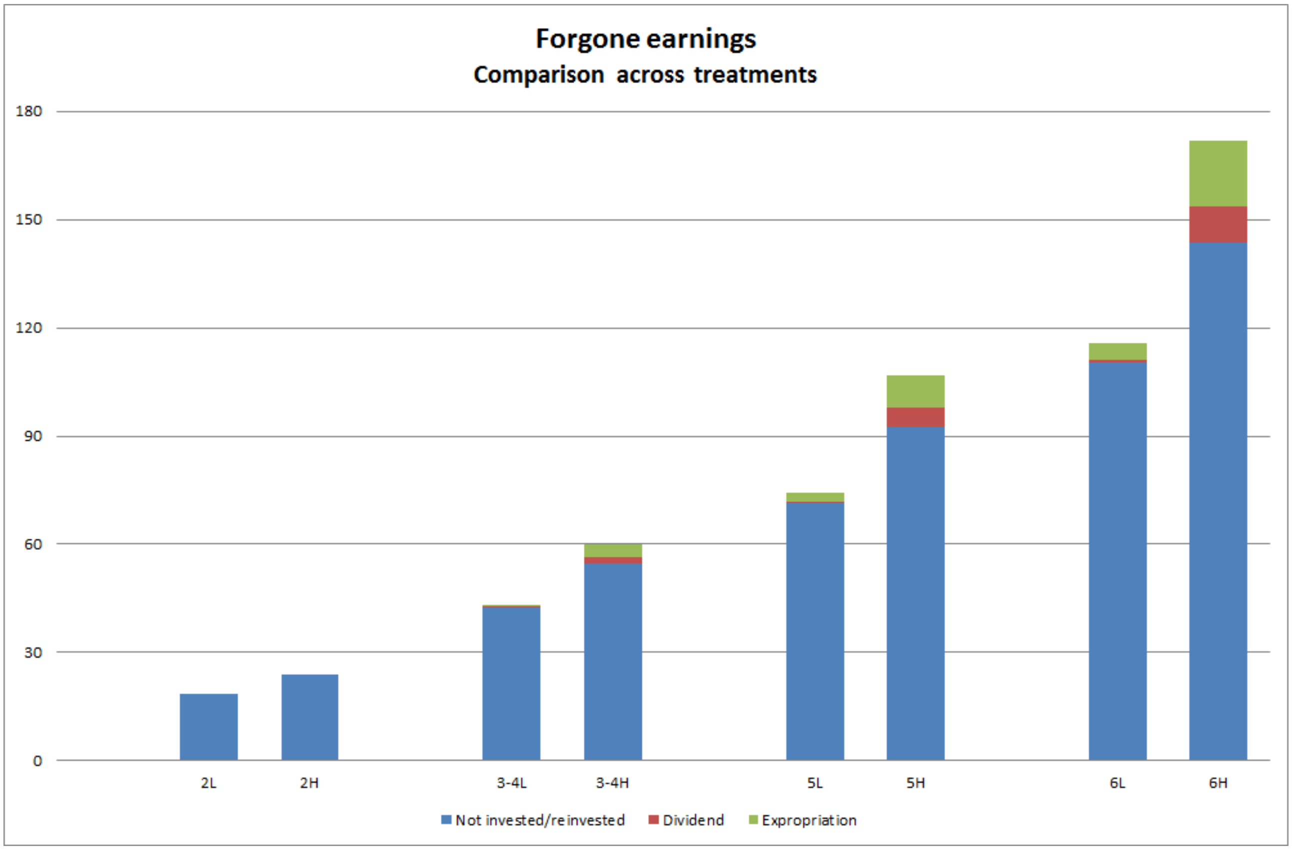

Figure 3: Efficiency loss by channel

same in high-protection treatments as the corresponding low-protection treatments. That is, for each leakage channel, within a given dividend treatment, the marginal impact of switching from low to high outsider protection is zero. We examine these each in turn, beginning with expropriation.

Figure 4 shows the effects of each treatment on expropriations as a percent of cash on hand. Analogous to equation (2), we estimate the following equation, now using expropriations over cash on hand as the dependent variable:

$$\begin{aligned} Expratio_{igt} = &\beta_{LN}\mathbf{1}_{t\in\{LN,HN\}} + \beta_{HN}\mathbf{1}_{t=HN} + \beta_{LU}\mathbf{1}_{t\in\{LU,HU\}} + \\ &\beta_{HU}\mathbf{1}_{t=HU} + \beta_{LT}\mathbf{1}_{t\in\{LT,HT\}} + \beta_{HT}\mathbf{1}_{t=HT} + \epsilon_{igt}. \end{aligned} \quad (4)$$

As before, the error term is clustered at the subject level. Note that here, because expropriations are possible in all treatments, no-dividend treatments are included. The blue bars in Figure 4 represent the estimates for the low-protection treatments, or $\hat{\beta}_{LN}$, $\hat{\beta}_{LU}$, and $\hat{\beta}_{LT}$, respectively.

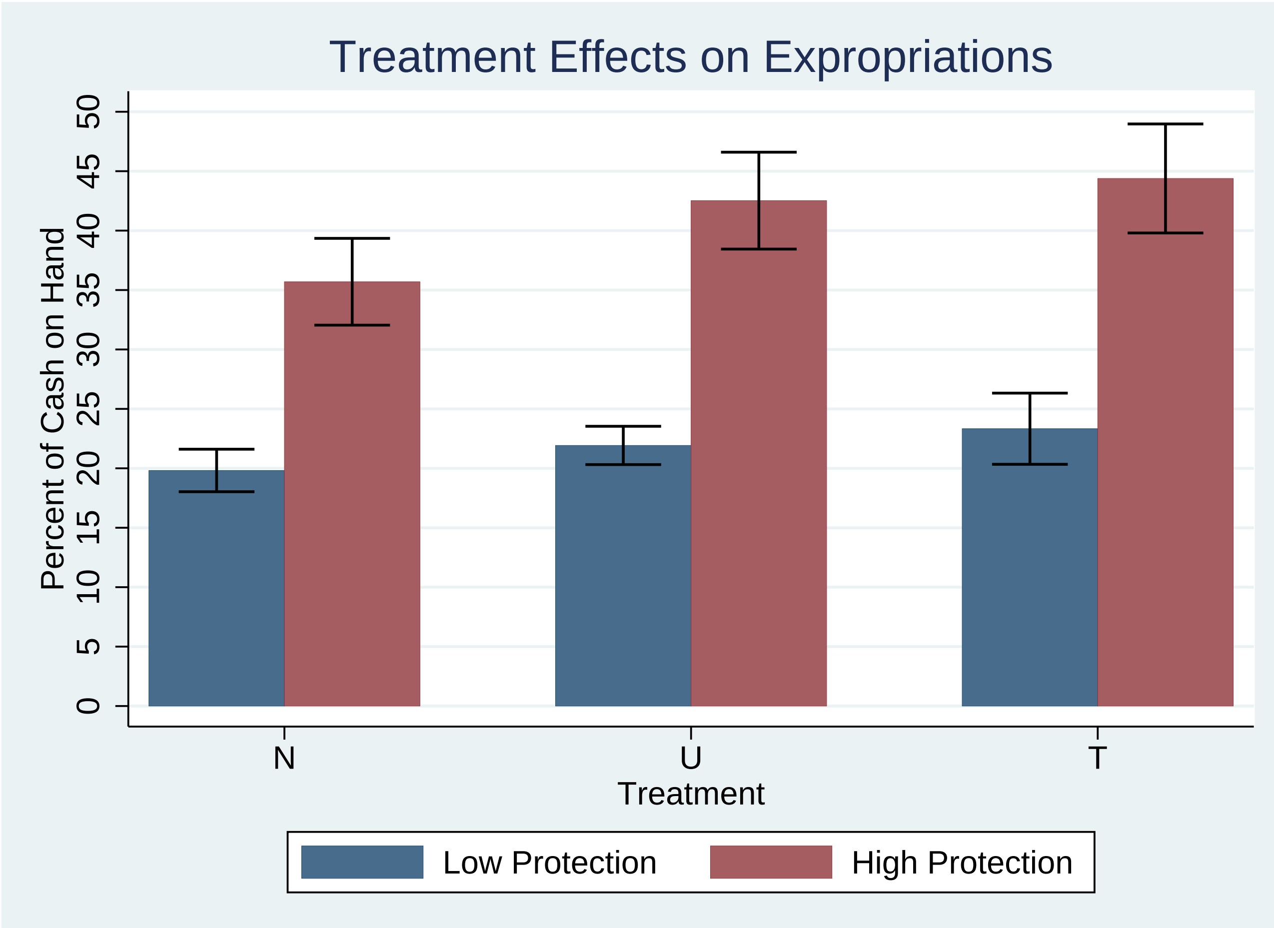

Figure 4: Treatment Effects on Expropriations as a Percent of Cash on Hand

The coefficients on the high-protection terms in equation (4) represent the marginal impact of high-protection treaments over respective low-protection ones, so the red bars in Figure 4 are instead the sum of each dividend treatment's respective low- and high-protection coefficients. The black bars show each estimate plus or minus one standard error.

In general, an increase in expropriations implies a loss in efficiency. It is clear by looking at Figure 4 that, within each dividend treatment, switching from low to high investor protection causes a significant increase in expropriations as a percent of cash on hand. This increase is statistically significant, thus rejecting Hypothesis 3a as it pertains to leakage through the expropriation channel.

In order to see how the switch in protection treatment impacts expropriation leakages, we separate expropriations by period. To test for differences in for expropriations across the H and L treatments within each period, we estimate the period by period analog of equation (4):

$$Exp\ ratio_{ipgt} = \Sigma_{p\in\{2,3,5,6\}}\ \Sigma_{t\in\{N,U,T\}} \left[\beta_{Ltp}\mathbf{1}_{t\in\{Ltp,Htp\}} + \beta_{Htp}\mathbf{1}_{Htp}\right] + \epsilon_{ipgt}. \quad (5)$$

The dependent variable in equation (5) is again expropriations as a percent of cash on hand. The coefficient of interest for each period and each dividend treatment (e.g., no dividends (N), untaxed dividends (U) and taxed dividends (T)) is β_{Htp}. β_{Htp} describes the marginal effect of moving from the low to high protection treatment on expropriations in dividend treatment t for period p. A significant coefficient rejects Hypothesis 3b: if $\hat{\beta}_{Htp} > 0$ and is significant, the high protection treatment has signficantly higher expropriations in treatment t for period p. As before, we cluster standard errors at the subject level.

Table 6 shows the results from estimating equation (5) via OLS. The first column of coefficients reports average expropriation rates in the different periods of the low-protection treatments, and the second column reports marginal effects for the high-protection treatments. The third and fourth columns demonstrate robustness to excluding the first game of each treatment.

Expropriation rates are positive and significant in every period of every treatment, and high protection leads to significantly more expropriation in all but three instances, period 3 of the no-dividend treatments, period 6 of the untaxed dividend treatments, and period 6 of the tax treatments. The picture that emerges from Table 6 is that insiders expropriate more when there is more investor protection.

Perhaps the most surprising result from Table 6 is that high protection leads to more expropriation even in the baseline treatments. In the baseline treatments, dividends can only be paid in period 6. Because the insider has primary claim to funds if both the insider and outsider claim them simultaneously in period 6, the outsider has no real control over allocations in either of these no-dividend treatments. Still, the insider expropriates in every period of the low protection treatment. This implies a similar impatience of the insider as observed of the outsider in the period-level dividend regressions in the previous subsection. This impatience is amplified in the high protection treatments: $\hat{\beta}_{HU2}$, $\hat{\beta}_{HU5}$ and $\hat{\beta}_{HU6}$ are all significant and large in magnitude. Providing the outsider with marginally more control leads to a substantial increase in insider expropriation behavior.

The difference in the marginal impact of introducing (untaxed) dividends in the high-protection treatment and that in the low-protection treatment can be more clearly seen using a standard difference-in-difference estimator. Again, it is split apart by periods:

$$Exp\ ratio_{ipgt} = \sum_{p\in\{2,3,5,6\}} \left[\alpha_p + \beta_{Up}\mathbf{1}_{t\in\{LUp,HUp\}} + \beta_{Hp}\mathbf{1}_{t\in\{HNp,HUp\}} + \beta_{DDp}\mathbf{1}_{t=HUp}\right] + \varepsilon_{igpt} \quad (6)$$

Table 6: Treatment Effects on Expropriations (as a Percent of Cash on Hand) by Period

Trimming:		None		1, 4, 7	
		L or H	H	L or H	H
	N	7.025**	18.751**	5.808	17.475**
		(3.080)	(7.001)	(3.966)	(8.100)
P2	U	6.395**	31.799***	3.642	33.816***
		(2.974)	(5.459)	(2.969)	(7.941)
	T	12.546***	27.363***	9.142**	30.818***
		(4.602)	(7.140)	(4.428)	(8.248)
	N	7.422***	6.348	5.606*	7.214
		(2.603)	(4.327)	(3.099)	(4.993)
P3	U	6.715***	17.358**	6.228**	23.800***
		(2.011)	(6.926)	(2.593)	(8.327)
	T	7.283**	17.635***	6.269*	17.762**
		(3.207)	(4.875)	(3.182)	(6.794)
	N	0.927*	27.937***	0.476	30.407***
		(0.520)	(5.468)	(0.451)	(8.289)
P5	U	3.689***	45.818***	2.229*	44.132***
		(1.025)	(6.610)	(1.241)	(8.975)
	T	7.167**	51.252***	4.411	55.440***
		(2.768)	(7.594)	(2.974)	(8.279)
	N	63.319***	17.506**	65.622***	21.073***
		(5.623)	(6.766)	(6.145)	(7.689)
P6	U	68.686***	2.609	70.268***	3.194
		(4.631)	(9.582)	(4.633)	(11.827)
	T	66.533***	-2.578	72.852***	-13.078
		(6.198)	(9.771)	(7.187)	(12.518)
N		1256		862	
r2		0.628		0.642	

Standard errors in parentheses
Notes: All errors are clustered at the subject level. Each cell represents a single coefficient in the regression (or corresponding standard error). The row gives the cell's period and dividend treatment. The column gives its protection treatment.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Treatment Diff-in-Diff by Period on Expropriations over Cash on Hand

	Trimming:	None	1, 4, 7
		(1)	(2)
Diff-in-Diff	P2	25.843***	29.986***
		(6.794)	(9.386)
	P3	23.407***	30.433***
		(7.706)	(9.020)
	P5	36.775***	32.702***
		(8.053)	(11.796)
	P6	-58.396***	-64.048***
		(9.713)	(13.046)
N		869	612
r2		0.321	0.342

Standard errors in parentheses
Notes: All errors are clustered at the subject level. Tax treatments are excluded. The first column uses the full (remaining) sample. The second trims off games 1, 4, and 7.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As before, the dependent variable is expropriations as a percent of cash on hand. There is now a dummy that provides a baseline for each period, α_p, as well as period-specific unconditional marginal impacts of both untaxed dividends, captured by β_{Up}, and high outsider protection, captured by β_{Hp}. The coefficients of interest are the period-specific diff-in-diff estimates, β_{DDp}.

Table 7 shows the estimates for the diff-in-diff coefficient for each period. Column 1 shows the results for the full sample (excluding tax treatments), and column 2 trims off games 1, 4, and 7 for each individual as a robustness check. Standard errors are again clustered at the individual level.

The diff-in-diff coefficient represents the difference in the marginal impact of introducing untaxed dividends in the high-protection treatments relative to that impact in the low-protection treatments. For periods 2 and 5, this coefficient measures the difference in the degree of impatience created by dividends between the high-protection and low-protection scenarios.[18] The first row shows that, for period 2, introducing dividends in the high-protection scenario increases expropriation (as a percent of cash on hand) by a highly significant 25 percentage

[18]For period 3, low-protection dividends serve as a trust signal, while high-protection dividends do not. This difference is not present in periods 2 and 5, and so while impatience may play a role in explaining the period-3 coefficient, it may not be the sole factor. There is still a highly significant 23 percentage point difference in period 3, though.

points more than in the low-protection scenario. In period 5, the high-protection increase is a highly significant 36 percentage points higher than the low-protection increase.

The difference in increased impatience can potentially be explained as a backward unraveling that is present in the high-protection treatment but not in the low, although this still does not explain the early expropriations in the no-dividend treatments seen in Table 6. The mechanics and implications of the unraveling are discussed in Section 4.

Whereas estimating equations (5) and (6) above tests hypothesis 3.b in the context of expropriations, we estimate the following equation to test hypothesis 3.b for efficiency losses due to underinvestment:

$$Tokens_{igt} = \Sigma_{t\in\{N,U,T\}} \left[\beta_{Lt}\mathbf{1}_{t\in\{Lt,Ht\}} + \beta_{Ht}\mathbf{1}_{Ht}\right] + \epsilon_{igt}. \quad (7)$$

We estimate equation (7) using "tokens" as a measure of efficiency in three different ways– initial investment in period 1, the total number of tokens at the end of the game, and the cash on hand in period 6 after interest is earned but before any allocation decisions are made. As before, in each case we estimate average efficiency across the the low and high protection treatments in each dividend treatment t as β_{Lt}. The coefficient of interest is β_{Ht}, which is the marginal effect of moving to the high protection regime within a dividend treatment t. Each of these measures generates one observation per game.

Table 8 presents the results from estimating equation (7) by OLS with standard errors clustered at the subject level for each measure of efficiency: initial tokens invested, total combined tokens achieved, and final cash on hand. The first group of columns uses the full sample, while the second group trims out the first game in each treatment. Outsiders can invest anywhere between 0 and 100 tokens in the first period, and combined payoffs can range from 100 if the outsider invests nothing to 286 if the outsider invests everything and there are no subsequent leakages.[19]

The first column of Table 8 shows that in our main untaxed dividend treatment, outsiders initially invest an average of 38 of their 100 tokens in the low-protection environment, but invest only 20 tokens in the high-protection one. This occurs despite the fact that they have more ability to recover their investment through their own actions in the high-protection treatments. Since $\hat{\beta}_{HU} = -17.32$, which represents the marginal impact of switching from low to high protection given untaxed dividends, and is significant at the 5% level, we reject the null hypothesis that the low and high protection treatments have the same efficiency level through the investment channel.

Comparing coefficient estimate rows 1 and 2 to rows 3 and 4, initial investment is identical

[19]In tax treatments, the lowest possible number of tokens achievable is 95, although we never observed this outcome.

Table 8: The Effects on Initial Investment, Total Funds, and Final Cash on Hand

Trimming:		None			1, 4, 7		
		(1) Init Inv	(2) Total Tokens	(3) Final COH	(4) Init Inv	(5) Total Tokens	(6) Final COH
N	L or H	38.365***	170.469***	108.479***	38.167***	170.889***	109.847***
		(7.062)	(13.246)	(20.260)	(8.007)	(14.891)	(22.947)
	H	-18.385**	-42.802***	-74.958***	-24.111***	-51.403***	-87.292***
		(7.829)	(14.136)	(21.345)	(8.570)	(15.597)	(24.171)
U	L or H	38.167***	170.438***	107.802***	37.764***	171.278***	110.417***
		(7.418)	(13.270)	(20.310)	(8.316)	(15.035)	(23.086)
	H	-17.323**	-55.479***	-101.229***	-19.278**	-59.694***	-106.903***
		(8.289)	(13.528)	(20.490)	(9.062)	(15.164)	(23.126)
T	L or H	30.958***	153.198***	82.740***	26.528***	147.236***	75.292***
		(5.733)	(11.247)	(17.967)	(5.604)	(10.722)	(17.146)
	H	-11.885*	-40.635***	-74.396***	-10.611	-36.500***	-68.069***
		(6.464)	(11.527)	(18.258)	(6.379)	(11.046)	(17.556)
	N	576	576	576	432	432	432
	r2	0.432	0.878	0.434	0.403	0.874	0.427

Standard errors in parentheses
Notes: All errors are clustered at the subject level. The first group of columns uses the full sample. The second group trims off games 1, 4, and 7.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

in corresponding no-dividend and untaxed dividend treatments. In particular, outsiders invest about 38 tokens in both the LN and LU treatments, and invest about 20 tokens in both the HN and HU treatments. The switch from low protection to high protection only changes who makes the dividend payout decision. When these dividends are possible throughout the game, it makes sense that this change could impact investment decisions; it could affect the size and timing of later expropriations, potentially affecting the cash on hand available for dividends, thus decentivizing initial investment.

When dividends are only available as a means of final allocation, however, the reasoning for the decrease in initial investment is less clear. The likely explanation is that the switch from low to high outsider protection induces the attitude of a race to withdraw firm value sooner, even if it does not directly create one. Regardless of the reason, as shown in Table 8, the marginal impact of switching from low to high protection given only period-6 dividends, $\hat{\beta}_{HN} = -18.39$, is significant at the 5% level (when naïve and exposed games are pooled). Thus, we reject the null for hypothesis 3b when looking at the impact on initial investment for no-dividend treatments, as we did for dividend treatments.

Table 8 also shows that taxes reduce investment, although not significantly. For the low-protection treatment, taxes reduce initial investment by 7 tokens ($p = 0.101$), and in the high-protection treatment, taxes reduce investment by only 2 tokens ($p = 0.736$). There are several reasons why this could be the case. For example, the dividend treatments allow dividends in periods 2, 3, 5, and 6, while the no-dividend treatments prohibit dividends until period 6, essentially making tax rates infinite for the first three dividend periods. The tax treatments fall in between by making dividends expensive, but not impossible, in periods 2, 3, and 5. Thus there is some evidence for a behavioral result. Alternatively it could be that outsiders are risk averse and the tax treatments lead to uncertainty over which type of gameplay (i.e., a no-dividend equilibrium or a dividend equilibrium) will dominate. Further theoretical and empricial work are needed to investigate this result.

The second column of Table 8 reports the same regression for the subjects' combined final payoffs instead of initial investment. Reduced initial investment inherently leads to lower combined payoffs because only invested funds earn interest, but the regression on total tokens allows for a comparison that takes into account all leakages (i.e., including uninvested dividends and expropriations) through the first five periods.

Hypothesis 3a proposes the agnostic null that the total number of tokens generated is the same in both the low-protection and high-protection treatments within each dividend treatment. This implies that total leakages combined across all channels is the same across corresponding low-protection and high-protection treatments.[20] The literature has looked empirically at how dividends are affected, but that is just one channel through which leakages occur. Because investment counterfactuals and expropriations are generally not observable, overall efficiency has not been studied using field data. Our experiment, however, allows us to capture leakages through each channel, as well as overall efficiency. This is perhaps the biggest contribution our experiment makes to the literature.

Switching from low to high outsider protection causes a highly statistically significant decrease in the total number of tokens in the game within each dividend treatment. This corroborates the results surrounding hypothesis 3a, which showed that this switch decreased initial investment, increased premature dividends, and increased premature expropriation within all three dividend treatments. An increase in leakages through all three channels should, and does, yield a decrease in overall tokens.

Comparing across dividend treatments, it is interesting to note a similarity between total tokens and initial investment. As before, the total number of tokens is nearly identical in the no-dividend and untaxed-dividend treatments within the low protection regime. However, while

[20] This does leave open the possibility that leakages from some channels increase while those from others decrease, as long as the total leakage is unchanged. The results for Hypothesis 3b examine the effects on each channel individually.

the decrease resulting from switching to the high-protection regime had the same marginal impact on initial investment for both of those dividend treatments, the decrease in total tokens is much more pronounced given untaxed dividends than when given no dividends. Each of the tax treatments again produced the smallest results within each respective protection regime.

The third column reports the same regression for cash on hand at the beginning of period 6, measured after interest was earned but before dividends or expropriations, which we interpret as the final value of the firm. Periods 6 and 7 are devoted solely to disbursing this cash, through dividends and expropriations in period 6 and the default split of remaining cash in period 7. Both untaxed low-protection treatments enabled firms to grow to a statistically-significant 108 tokens, but the untaxed high-protection treatments dropped these by a highly-significant 75 tokens in the baseline treatment and by a highly-significant 101 tokens in the dividends treatment. Thus, high investor protection reduces firm value, which contrasts with the empirical findings of La Porta, Lopez-de Silanes, Shleifer, and Vishny (2002). Taxes also reduce firm value in the low-protection treatment, but the reduction is not statistically significant.

4 Discussion and conclusions

Like much of the empirical literature, our experimental findings support the original results from La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) favoring the outcome model over the substitute model of agency motivations for dividend policy. In our study, dividends are higher in the high-protection treatments than in the corresponding low-protection ones. In the La Porta et al. (2000) setting, this was interpreted as outsiders demanding dividends to reduce insider access to cash on hand and thereby reduce expropriations, which is unobservable in their data.

A close look at the games corresponding to the low-protection and high-protection treatments reveals an alternative reason why this might occur. The low-protection treatments closely resemble the standard trust game, while the high-protection treatments more closely mirror the centipede game. Switching to the high-protection treatment gives the outsider more control, thereby reducing the amount of trust they must put in the insider. However, when this happens, both sides must now simultaneously trust each other to not remove tokens from the firm. This leads to a backward unraveling of payouts, meaning more of both expropriations and dividends are demanded prematurely, ultimately stifling initial investment.

The effects of this unraveling are thus twofold: the outsider reduces the total potential value of the firm by initially investing less, and both parties then race to remove the firm's funds before the other can. Initial investment (relative to outside options) and insider expropriation generally cannot be observed in financial data. In our experiment, however, these are observable. Both of the unraveling effects in turn *increase* insider expropriation, the opposite of what La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) posit as the outsider's intent. Holding initial investment constant, moving expropriations sooner means an identical expropriation comes from a smaller pot, increasing the expropriation percentage. Holding the expropriation timing constant, a decrease in initial investment implies a smaller pot in each period, thus lowering the expropriation percentage. While the outsider's intent may be to decrease insider expropriations by reducing insider access to cash on hand, in doing so this decreases firm value and thereby increases insider expropriation.

The effects to the pair of agents jointly are then threefold. Lower initial investment reduces the firm's potential earnings regardless of dividend and expropriation behavior. As discussed in Section 2.1, this falls in line with the literature showing a negative correlation between shareholder protection and firm size. As a percent of cash on hand, which is now smaller, both dividends and expropriations naturally increase. Additionally, the unraveling affect creates an increase in *premature* dividends and expropriations, both of which in turn hurt overall efficiency.

Indeed, the major discovery in this paper comes not from the new exploration of whether dividends are higher in high investor protection markets, but from the effect of investor protection on investment. While the existence of dividends has no impact on initial investment within either low- or high-protection treatments, switching who sets dividends from the insider to the outsider leads to a drop in initial investment of about 17 percentage points, which is close to half of the amount invested in the low-protection treatments.

Losses continue throughout the relationship. If the outsider invests the entire 100-token endowment and the two parties leave it untouched throughout the relationship, they can share 286 tokens at the end. In the baseline low-protection treatment they are able to achieve 60% of this amount, and allowing the insider to pay dividends throughout has no impact on this result. However, combined earnings fall by a quarter when we go from the low-protection baseline to the high-protection one, and they fall by a third when the outsider can demand dividends throughout the course of the relationship.

This finding raises the question of whether strong investor protection laws really are beneficial for economic growth. In our experiment, the subjects in the high-protection treatments left the lab significantly less wealthy than those in the low-protection ones. Most studies relating wealth to legal protection look at overall protection, not just investor protection. Countries with strong investor protection likely also have strong legal systems, because a strong general set of laws probably precedes the adoption of strong specific ones to protect shareholders. Clever identification strategies would be needed to untangle the answer using country-level data, but the laboratory data suggest that it would be worth the trouble.

Beyond the standard context, our experimental design and results can be exported to fit any situation where one party must devote funds to a long-term relationship with opportunities for one or both parties to withdraw them early. Such situations arise in many situations. Industrial R&D projects can take years to complete, always with the chance that the company will pull the plug before the project reaches fruition. Governments also face long investment projects, such as building nuclear power plants, designing new military weapons, fighting climate change, or sending humans to Mars. Taxpayers must pay for these projects as they go along, but different parties have both the opportunity and the incentive to divert funds to other uses. Different settings have different implications for the timing of surplus generation, but our current experiment suggests that long-term relationships are more successful when the payer of the funds has fewer opportunities to reclaim them.

References

Alzahrani, M., and M. Lasfer (2012): "Investor protection, taxation, and dividends," *Journal of Corporate Finance*, 18(4), 745–762.

Bae, K.-H., J.-S. Baek, J.-K. Kang, and W.-L. Liu (2012): "Do controlling shareholders' expropriation incentives imply a link between corporate governance and firm value? Theory and evidence," *Journal of financial Economics*, 105(2), 412–435.

Bates, T. W., K. M. Kahle, and R. M. Stulz (2009): "Why do US firms hold so much more cash than they used to?," *The Journal of Finance*, 64(5), 1985–2021.

Berg, J., J. Dickhaut, and K. McCabe (1995): "Trust, reciprocity, and social history," *Games and economic behavior*, 10(1), 122–142.

Berkman, H., R. A. Cole, and L. J. Fu (2009): "Expropriation through loan guarantees to related parties: Evidence from China," *Journal of Banking & Finance*, 33(1), 141–156.

Breuer, W., M. O. Rieger, and K. C. Soypak (2014): "The behavioral foundations of corporate dividend policy a cross-country analysis," *Journal of Banking & Finance*, 42, 247–265.

Charness, G., and U. Gneezy (2010): "Portfolio choice and risk attitudes: An experiment," *Economic Inquiry*, 48(1), 133–146.

Chetty, R., and E. Saez (2005): "Dividend taxes and corporate behavior: evidence from the 2003 dividend tax cut," *The Quarterly Journal of Economics*, 120, 791–833.

Durnev, A., and E. Kim (2005): "To steal or not to steal: Firm attributes, legal environment, and valuation," *The Journal of Finance*, 60(3), 1461–1493.

Faccio, M., L. H. Lang, and L. Young (2001): "Dividends and expropriation," *American Economic Review*, pp. 54–78.

Fama, E. F., and K. R. French (2001): "Disappearing dividends: changing firm characteristics or lower propensity to pay?," *Journal of Financial economics*, 60(1), 3–43.

Farre-Mensa, J., R. Michaely, and M. C. Schmalz (2014): "Payout Policy," *Available at SSRN 2400618*.

Fischbacher, U. (2007): "z-Tree: Zurich toolbox for ready-made economic experiments," *Experimental economics*, 10(2), 171–178.

Fudenberg, D., D. G. Rand, and A. Dreber (2012): “Slow to anger and fast to forgive: cooperation in an uncertain world,” *The American Economic Review*, 102(2), 720–749.

Gompers, P. A., J. Ishii, and A. Metrick (2010): “Extreme governance: An analysis of dual-class firms in the United States,” *Review of Financial Studies*, 23(3), 1051–1088.

Greiner, B., A. Ockenfels, and P. Werner (2012): “The dynamic interplay of inequality and trustAn experimental study,” *Journal of Economic Behavior & Organization*, 81(2), 355–365.

Grullon, G., and R. Michaely (2002): “Dividends, share repurchases, and the substitution hypothesis,” *The Journal of Finance*, 57(4), 1649–1684.

Jensen, M. C., and W. H. Meckling (1976): “Theory of the firm: Managerial behavior, agency costs, and ownership structure,” *Journal of Financial Economics*, 3(4), 305–360.

Jiang, G., C. M. Lee, and H. Yue (2010): “Tunneling through intercorporate loans: The China experience,” *Journal of Financial Economics*, 98(1), 1–20.

Jordan, B. D., M. H. Liu, and Q. Wu (2014): “Corporate payout policy in dual-class firms,” *Journal of Corporate Finance*, 26, 1–19.

Knack, S., and P. Keefer (1995): “Institutions and economic performance: Cross-country tests using alternative institutional measures,” *Economics & Politics*, 7(3), 207–227.

La Porta, R., F. Lopez-de Silanes, A. Shleifer, and R. W. Vishny (2000): “Agency problems and dividend policies around the world,” *The Journal of Finance*, 55(1), 1–33.

——— (2002): “Investor protection and corporate valuation,” *The Journal of Finance*, 57(3), 1147–1170.

Levati, M. V., J. Qiu, and P. Mahagaonkar (2012): “Testing the Modigliani-Miller theorem directly in the lab,” *Experimental Economics*, 15(4), 693–716.

Levitt, S. D., J. A. List, and S. E. Sadoff (2011): “Checkmate: Exploring Backward Induction among Chess Players,” *American Economic Review*, 101(2), 975–90.

Lunawat, R. (2013): “An experimental investigation of reputation effects of disclosure in an investment/trust game,” *Journal of Economic Behavior & Organization*, 94, 130–144.

McKelvey, R. D., and T. R. Palfrey (1992): “An experimental study of the centipede game,” *Econometrica: Journal of the Econometric Society*, pp. 803–836.

Modigliani, F., and M. H. Miller (1958): "The cost of capital, corporation finance and the theory of investment," *The American economic review*, pp. 261–297.

Rietz, T. A., R. M. Sheremeta, T. W. Shields, and V. L. Smith (2013): "Transparency, efficiency and the distribution of economic welfare in pass-through investment trust games," *Journal of Economic Behavior & Organization*, 94, 257–267.

Rosenthal, R. W. (1981): "Games of perfect information, predatory pricing and the chain-store paradox," *Journal of Economic Theory*, 25(1), 92–100.

Skinner, D. J. (2008): "The evolving relation between earnings, dividends, and stock repurchases," *Journal of Financial Economics*, 87(3), 582–609.